IMPACT OF AGRICULTURAL SERVICES AND TRAINING CENTRE (ASTC) PROJECT ON TOMATO FARMERS' LIVELIHOOD IN PLATEAU STATE, NIGERIA

BY

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DOCTOR OF PHILOSOPHY DEGREE IN AGRICULTURAL EXTENSION AND RURAL SOCIOLOGY

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DECLARATION

I hereby declare that this thesis titled**: "Impact of Agricultural Services and Training Centre (ASTC) Project on Tomato Farmers' Livelihood in Plateau State, Nigeria"** has been written by me and it is a record of my research work. No part of this work has been presented in my previous application for another degree at any institution. All borrowed ideas have been duly acknowledged in the text and a list of references provided.

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CERTIFICATION

This thesis titled: **Impact of Agricultural Services and Training Centre (ASTC) Project on Tomato Farmers' Livelihood in Plateau State, Nigeria** by Yakubu Onaivi **MOMOH** meets the regulations governing the award of degree of Doctor of philosophy in Agricultural Extension and Rural Sociology of the Ahmadu Bello University, and is approved for its contribution to scientific knowledge and literary presentation.

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DEDICATION

This thesis is dedicated to God Almighty through our Lord Jesus Christ who is the author of life, who plays the beams of the foundation of the earth and calls those things that are not as though they were.

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ABSTRACT

This study assessed the impact of Agricultural Services and Training Centre (ASTC) on tomato farmers' livelihood in Plateau State, Nigeria. A multi-stage sampling procedure was used for this study. Firstly, a purposive sampling was used to select three Local Government Areas out of each three senatorial zones and three villages from each Local Government Areas while random and purposive sampling were used to select 206 participants in ASTC project and 206 non- participants respectively making a total sample size of 412 farmers in Plateau State. Structured questionnaire, interview schedule and focus group discussion were used for data collection while data were analyzed with descriptive statistics and inferential statistics such as multiple regression models, chow test model and paired t-statistical tools. The result revealed 90% and 77% males of the participants and the non-participants respectively while the females are 10% and 23% respectively. The findings of the study showed that participant farmers' level of awareness of the project was 54.4% while non- participants was 24.3% and level of participation by the participants in the project were quite high with 77.2%. Farmers' participation in ASTC project were influenced by marital status, education, house hold size, access to credit, farming experience and income which were statistically significant at 10%, 5% and 1% level. The chow test model analysis indicated a positive mean on output with F-cal value of 149.87, income F-cal value 3.952 and level of living with F-cal value of 24.24 on participant than non-participant farmers of ASTC project. The output, income and level of living difference were significant at 5% level of probability which means there were significant difference in output, income and level of living of farmers participating in ASTC tomato production. This implies that ASTC project contributed positively on the participants over that of non- participants. The study indicated untimely distribution of inputs, high costs of inputs and no access to water were some of the major constraints faced by participants' farmers in the project implementation. The non-participants' farmers claimed that they did not participate in ASTC project due to bad experiences, complacency and failure of the government in the past government agricultural intervention projects and lack of capital to meet up with the contributory commitment of individual participant. Based on these findings, it was concluded that ASTC project intervention had positive impact on tomato production and livelihood of participant farmers in the study area. The study recommended that the network of inputs provision and distribution be redesigned to include early and constant availability in the scheme, so as not to discourage the participants. Besides, subsidizing the net houses and irrigation materials is an open window for programme support by any interested non- governmental organization in the State.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Everywhere around the world, agricultural production is central to the overall wellbeing of the populace because of its importance in the provision of foods, income for farmers, raw materials for industries, employment and foreign exchange for the nation. National Bureau of Statistics/Central Bank of Nigeria (2006) stated that agricultural production provides for 2/3 of Nigerians who are low income earners and it is presently one of the world largest producers of food and raw materials for its major enterprise. However, despite the importance of agriculture in terms of employment creation and its potential for contributing to economic growth, but it is still far from being fully exploited (USAID, 2005). For example in 1960, 1970 and 1980, its contribution was only 55.20%, 40.70 and 18% to GDP respectively, while its contribution to the GDP in 1996, 1997 and 1999 only stood at 39%, 39.4 a%, and 40% and the first quarter of 2012 stood at 34.47% (National Bureau of Statistics, 2012).

However, there has been a decline in agriculture's contribution to the national economic growth for over four decades persistently since early sixties till date due to inadequate attention from the government since the emergence of the oil sector in Nigeria. This has led to the neglect of agriculture and over dependence on oil sector (Ugwu and Kanu, 2012). Therefore, the agricultural sector has been constrained by other factors such as poor rural infrastructures, poor fertilizer distribution and application, crop vulnerability to pests and diseases, high cost of farm inputs, low quality of production practices and use of low input technologies that could have enhanced its production capacity and contribution to the national economy as well as income of farmers considerably, but

reversal is the case in Nigeria. The oil boom has also led to the importation of superior food items on a massive scale at the expense of locally produced ones which the farmers depended upon for livelihoods. Since the locally produced crops cannot compete with the imported ones, this discourages the farmers from producing much because they no longer realized the much needed profit as this is been negated (Ogunwole, 2004).

Tomato is a versatile and widely grown vegetable throughout the world in nearly every home garden. Both wet and dry seasons cropping system contribute immensely to the national requirement, though bulk production is from the dry season cropping system grown yearly under irrigation. Nigeria is ranked the second the largest producer of tomato in Africa and thirteenth largest producer in the World, producing 1.701 million tones of tomato annually at an average of 25-30 tones per ha (FAO, 2010). In Nigeria alone, annual total area of 1 million hectares is reportedly used for its cultivation (Annon 1993, Bodunde *et al*., 1993).

The use of tomato is about 18 percent of the average in vegetable in Nigeria (Annon, 1993). Tomato (*Lycopersicon esculentum* mill) is one of the most cultivated vegetable in most regions of the world, ranking second in importance to potatoes in many countries (Ojo *et al.,* 2009). This crop does not only contribute to the share of agriculture in national economy, but possess a great potential and comparative advantage to compete in the liberalized economy. Tomato has become an important cash and industrial crop in various parts of the world. It is not only important as protective food and highly beneficial for the maintenance of health and prevention of disease, but also a source of livelihood for small scale farmers, food security of the people as well as foreign exchange earner for the national economy. In Nigeria, areas of high production and concentration lie within the northern parts of the country.

Vegetable production forms a substantial percentage of the major food crop cultivation in Nigeria. Tomato contributes to a healthy well balanced diet. They are rich in minerals, vitamins B and C, iron, phosphorus essential amino acids, sugars and dietary fibres. Tomato fruits are consumed fresh in salads or cooked in sauces, soup and meat of fish dishes. They can be processed into purees, juice and ketchup, canned and dried products.

Agricultural techniques have remained rudimentary despite many years of works on technology generation and transfer by the Federal and State governments making Nigeria to still be a major importer of tomato because of its low quality, a lot of it gets wasted during peak period of harvest, difficult to cultivate at commercial level by many farmers due to vagaries of weather condition, decline in soil fertility, lack of improved planting materials, inaccessibility to credit facilities, high cost of fertilizer, pest and disease problems, and inefficient transportation network resulting in spoilage of output, inappropriate application of modern agronomic practices, un-protective type of tomato faming system, lack of capital, physiological decay, water loss, or sometimes simply because there is a surplus or glut in the market and no buyer can be found (Bodunde *et al*., 1993). Besides, in developing countries like Nigeria, storage, packaging, transport and handling techniques are virtually non-existent. Tomato has a limited shelf life and high glut during its short production season and become very scarce and expensive during its off season, its short life and inadequate processing and preservation leads to loss of revenue to the farmers.

In recent years, the need to reverse the declining agricultural production has led the Federal Government of Nigeria, and Plateau State government in particular, to embark on several agricultural policies and programmes some of which are defunct or

abandoned, while others are still in place. This ASTC project is aimed at ensuring farmers participation in different parts of the State so as to ensure all year round tomato production, sustainable increase in income of ASTC participants through the expansion of farm size with added value output.

1.2 Problem Statement

Nigeria is currently facing serious food shortages to meet up the need of ever increasing population in the country. This has manifested in the declining per capita food production, decline of per capita income, growing food importation and accelerated ecological degradation (Iheanacho and Ogumbameru, 1997). Vegetables in Plateau State have over the years been mainly produced during the dry season by irrigation farmers usually around low lying areas that are near stream channels. Most of these vegetables however become scarce and expensive during the rainy season. This is in spite of the fact that the country has the human and natural resources to produce sufficient quantity of the kinds of food needed and increased income per capita.

In a bid to solve the declining food challenges, the Federal and State Government of Nigeria initiated many food production policies and programmes over the years to tackle the daunting challenges faced in the farming sector. For instance, on May 21st, 1976, the Obasanjo led Military Government launched the Operation Feed the Nation (OFN) (Federal Government of Nigeria, 2000). The aim of this programme was to make the nation self-sufficient on food availability as the basic needs of the people. There was also the Green revolution launched in 1979 under the Shehu Shagari administration, which was another practical approach taken to address the growing poverty and malnutrition problems among Nigerians. The National Directorate of Employment of the Babangida's administration programmes which aimed at national youth

empowerments and vocational skills development, especially in livestock and poultry production was launched in 1987 by (Federal Government Nigeria, 2000).

In addition, the Directorate of Foods, Roads and Rural Infrastructures (DFRRI) was established in 1986 (Oruche, 2012). Under this programme, people were mobilized and organized to participate actively in production activities which would ensure abundance of food. This programme had to be abandoned at some point in time due to change in government and in certain cases, perceived ineffective (Alli, 2012). Among other programme initiated are the National Accelerated Food production programme (NAFPP), Nigeria Agricultural Cooperative and Rural Development Bank (NACRDB), National Agricultural Land Development Authority (NALDA), Agricultural Development Project (ADP), Nigeria Agricultural Insurance Company (NAIC), River Basin Development Authorities (RBDA), Bokkos Farm Project, Longkat Irrigation Scheme, Sabon Gida Gagnom Farm Project, Kuru Livestock Complex project and Panyam Fish Farm project. Besides, these programmes and a number of other ones, failed to meet the target of self-sufficiency in food production and increases in income of farmers substantially. This situation raised serious concern regarding Nigeria's vision of becoming one of the world's twenty strongest economies by the year 2020.

Despite Nigeria's rank of 2nd to Egypt in Africa and 13th position in the world hierarchy of tomato production, the country is still lagging behind in tomato production compared to Egypt and USA. Nigeria still imports 65,809 tonnes of processed tomato annually, worth over N11.7 Billion despite its massive local production (CBN, 2012). The yield of tomato in Nigeria is low, the average in guinea savannah zones of the country being only 20 tonnes per hectares (FAO, 2010). The global production area for tomato in 2010 was estimated at 444, 12757 ha with world production quantity estimated at 151,699,

405 tonnes (FAO, 2010). However, the yield of tomato in West Africa, particularly Nigeria, is still not encouraging especially when compared to developed countries. For instance, Nigeria production was estimated at 1,860,600 tonnes in 2010 while the United State of America has an estimate for the same year as 12,858,700 tonnes (FAO, 2010). Yield per hectare in Nigeria was estimated at $1/7^{th}$ of that of the USA (FAO, 2010). Besides, within the Africa context the estimated annual average yield per hectare of tomato in Nigeria is at 7.1 tonnes per hectare comparable to 39.5 tonnes per hectare for Egypt (CBN, 2012). This short fall necessitated the importation of processed tomato worth N11.7billion ($75.5million) yearly. This makes Nigeria one of the primary importers of tomato globally and a major consumer of tomato paste, with only between 20-30 percent is produced domestically, 25-50 percent of the import of this domestic paste is from China (CBN, 2011). This leaves the market for domestically produced tomato paste underserved.

In the same vein, the government of Plateau State in 2008 entered into a joint venture agreement with an Israeli SEC company specialized in agricultural development and thus initiated and implemented the Agricultural Services and Training Centre (ASTC) intervention project, as an alternative approach, with emphasis on tomato production. The vision is aimed at agrarian reform through the introduction of modern farming techniques referred to as protective farming system, which could make tomato production attractive, create employment opportunities for the youths, and to prove that agriculture could serve as the nation's dependable and sustainable alternative source of income /revenue generation. In pursuance of this objective, a comprehensive Farm Centers have been established and operated in each of the three Senatorial Zones of the State. Some of the activities carried out by the center or agency includes; provision of agricultural inputs, effective and efficient training of farmers on tomato production,

modern agronomic practices on tomato production, use of net protective farming, provision of drip and family irrigation facilities, green house application style, efficient tractor hiring services and effective marketing channels for the products (ASTC Bulletin, 2012). However, since six years of inception now, billions of Naira had been invested in the implementation of the project; very few empirical studies have been available to confirm the intended impact in Plateau State (ASTC bulletin 2012). This has constituted a gap in knowledge that needs to be filled making this study particularly imperative. According to Delta State Ministry of Agriculture (2004) research findings show that the reasons for failure of past development programmes were poor data base used for policy formulation. Besides, without adequate evaluation, one cannot be sure whether the objectives of the project were comprehensively achieved. It is therefore necessary to assess the impact of the project on the target population.

Food and Agriculture Organisation (1986) asserted that most development experts often remain frustrated by the limited success of most programmes, occasioned by small scale farmers frequently rejecting or partially participating in a programme regardless of how the agency's design and formulation demonstrate higher levels of productivity. It is in view of this that the study has been conceived to answer the following research questions:

i. What are the socio-economic characteristics of the project participants and non-participants in the study area?

ii. To what extent are the farmers aware of the ASTC activities in the study area?

iii. What is the level of participation of the participants in ASTC intervention project in the study area?

iv. What are the factors influencing participation in ASTC intervention project?

v. What is the impact of ASTC intervention project on tomato production, income and livelihoods of the participants?

vi What are the constraints to the effective implementation of ASTC intervention project on the participants in the study area?

1.3 Objectives of the Study

The broad objective of the study is to assess the Impact of Agricultural Services and Training Centre on tomato production and livelihoods of the people of Plateau State. The specific objectives are to:

i. describe the socio-economic characteristics of the project participants and non-participants in the study area.

ii. determine level of awareness of ASTC activities in the study area.

iii. examine the level of participation of the target beneficiaries in ASTC intervention project in the study area.

iv. determine the factors influencing participation in ASTC intervention project.

v. assess the impact of ASTC intervention project on tomato production, income and livelihood of the participants in the study area.

vi. identify the constraints associated with the effectiveness of ASTC intervention project in the study area.

1.4 Justification of the Study

The fight against rural poverty, ignorance and underdevelopment require concerted efforts of both the private and public agencies. Obibuaku (1983) observed that the number of people that have to contend with incomes of very minimum threshold for survival or even below is actually increasing.

This study is expected to examine and provide valuable information on the impacts of ASTC technologies on the livelihoods of farmers. The implication of this is that ASTC project is expected to address some of the daunting challenges plaguing tomato production and thus increasing the income of tomato farmers substantially. Understanding the impact of ASTC on the livelihoods of the farmers will help to justify the financial allocation to ASTC project by Plateau State Government.

Also in many agricultural intervention programme, the actualization of its objectives is a measure of the extent to which it has made impact on the beneficiaries or participating farmers. Therefore, this study seeks to bring out the performance of ASTC activities in relation to the participating farmers as well provide information on the problems affecting ASTC project in terms of attainment of its goals. It intends to add to literature information about the extent of farmers' changes as a result of ASTC activities which serve as basis for further research and policy initiation in any rural development programmes. It further seeks to know how these improved technologies, training and services of this project is locally adaptable, provides solutions to stress and shocks in the production process and its impact in the volume of agricultural production.

Besides, most Nigerian elites believed that formulation of policies in the past is easier made comparable to holistic implementation of most governmental programs and policies. This means that most evaluation results have not reflected most agricultural

programmes and policies because they were not sufficiently based on in-depth studies and realistic assessment.

In relation to participation and adoption, stated that there are various determinants that positively or negatively contribute to participation and adoption of technologies, it is therefore necessary to identify specific determinants factor so as not to generalize one mode of participation and adoption within a particular socio - cultural context. This shows a distinction and variability in the socio- economic, institutional and technological aspects of participation and adoption. It is in view of this irrevocable fact that makes it imperative that studies on farmers' participation and adoption under different conditions or settings be undertaken to ascertain its peculiar determinants and so as to add to the existing adoption theory.

Since there has been continuous public and private support for agricultural programmes in recent times, it becomes imperative to carefully evaluate such programme periodically in order to justify public investment in agricultural development as well as determining whether the project need to be redesigned or repackaged to meet the emerging challenges.

The evaluation of the programme would help to objectively review comprehensively its experiences and effects on the target group as basis for future policy formulation and programme design. It is hoped that the findings would give the state and the public in general the privilege of having a perfect understanding of the activities of the programme.

Also in many agricultural intervention programme, the actualization of its objectives is a measure of the extent to which it has made impact on the beneficiaries or participating

farmers. Therefore, this study seeks to bring out the performance of ASTC activities in relation to the participating farmers as well provide information on the problems affecting ASTC project in terms of attainment of its goals. This study is envisaged to add to literature information about farmers' perception toward ASTC activities as well as basis for further research and policy initiation in any rural development programmes. This study also seeks to know how this project is locally adaptable, provides solutions to stress and shocks in the production process and its impact in the volume of agricultural production. Besides, most Nigerian elites believed that formulation of policies in the past is easy to be made comparable to holistic implementation of most governmental programs and policies. This means that most evaluation results do not reflect most implementation process of agricultural programmes because they were not sufficiently based on in-depth studies and realistic assessment.

Recommendation from this study will also serve as blue-print for policy makers researchers, extension officers and organization involved in the development of the State in a bid to carry out transformation in agricultural development process. This study is therefore significant to highlight how far the goals and objectives of ASTC project have been accomplished in Plateau State and its consequent impacts on the farmers' livelihood.

1.5 Hypotheses

The following null hypotheses will be tested in this study:

i. There is no significant difference in the output of tomato production between the participating and non- participating farmers in ASTCs project in the study area.

ii. There is no significant difference in the factors influencing participation of participants in ASTCs intervention project in the study area.

iii. There is no significant difference in income between the participants and non-participants of ASTCs intervention project in the study area.

iv. There is no significant deference in the level of living between the participants and non-participants of ASTCs intervention project in the study area.

1.6 Limitation of the Study-: This study was inhibited by the reluctance of the officials of the project to release official information and literatures from ASTC office. However due to persistent visits to the management of the project on the need and relevance of the required information regarding this project, hence they were able to furnish the researcher with some required information. Another limitation encountered by the study was in tracking some of the respondents for administration of the questionnaire and structured interview, as most of the participant and non- participant farmers were suspicious and reluctant to honour the interview or release information regarding the ASTC activities in the area. This can be attributed to the insecurity situation prevailing in the study area. Besides, four hundred and twenty questionnaires were administered but only four hundred and twelve were returned by the respondents. Despite these challenges, the result, validity and reliability of the finding of the study were not affected negatively by this short coming.

CHAPTER TWO

LITERATURE REVIEW

2.1 An Overview of Agricultural Services and Training Centres (ASTCs) Project in Plateau State

Different attempts had been made by Plateau State to revolutionize agriculture from the traditional methods into a modern mechanized method supported with modern techniques and technologies with different approaches established across the State to improved the standard of living of farmers. The government of Plateau State therefore came up with a vision of developing the agricultural sector into a self sustaining economy which was encapsulated in the 10 point agenda (No.5) with a view of modernizing agriculture, water resources and rural development. To actualize this vision, the government of Plateau State signed a joint venture agreement in 2008 with an Israel company specialized in agricultural development. The Government initiated Agricultural Services and Training Centres (ASTC), which will accelerate agricultural productivity by providing divers field of services and technical training of staff and farmers. In view of this, a comprehensive farm centres were established in the three senatorial districts of Plateau State, which are Kassa and Vom in Northern zone; Mangu in central zone and Shendam in the Southern zone.

The objective of the project is aim at raising Agricultural production, boosting yield of tomato production and improving the quality of produce through mechanized agricultural services, training of farmers so as to create employment generation, wealth creation and food security. The aim is to increase Plateau State growers' agricultural know-how, using advanced agro-techniques to produce a wide range of products, such as tomatoes, peppers, egg plants, cucumber, melons, lettuce and cabbage. The greenhouses and the open fields are also equipped with modern techniques, amongst

others for irrigation. The vision is to make plateau state a self-sustaining agricultural state, increase farmers productivity and income and to attain self–sufficiency in food production through modernized agricultural practice. The mission is to apply modern and scientific practices to management production, training and marketing as well as taking services closer to the farmers at local government, district and village level for self –reliance. (ASTC bulletin, 2012).

Some of its components reported in ASTC bulletin, 2012 ranges from:

i. Inputs – Division: Improved Seeds and seedlings of tomato, cabbage, and pepper are made available for farmers. These are very important at boosting the quality of produce that would be harvested by farmers in Plateau State. This improved seeds and seedlings are usually able to tackle the problem of substandard and disease prone seedlings. The centre provides herbicides, cold storage, marketing facilities and host of others.

ii. Agricultural Extension Services Division: ASTC has put in place participatory and farmer friendly extension approach of passing innovation across to the farmers for the benefit of the entire Plateau State.

iii. Sustained Agricultural Research Division: - ASTC focuses on the agricultural research system to provide valuable solution to the farmers' problems and to develop economically viable and location – specific technologies required to make farming more attractive and profitable.

iv. Marketing division: This provide a highly structured marketing channel for farmers at any seasons to.

v. Training of farmers on production practices and knowledge acquisition.

vi. Soil testing division-: ASTC provides comprehensive soil testing services for farmers.

vii. Tractor Hiring Division -: Owing to farmers' limited financial resources, the division sets to provide a flexible arrangement for farmers in order to have access to tractors in order to actualize their dreams.

2.2 Tomato production in Nigeria

Tomatoes are juicy berry fruits of the nightshade family (*Solanaceae*). They came originally from Central and South America and were brought back to Europe by Christopher Columbus on his second voyage in 1498.Tomatoes are important in the daily meal preparation since it can be eaten raw or cooked. Larger quantities are used to produce soups, juice and sauces, ketchups, purees and paste. It could also be used in canning industries and green tomatoes are used for prickles and preserve. The seeds which are extracted from the pulp and its residues contain 24% oil which is used for salad dressing and in the manufacturing of margarine and soap. The residual press cake is used as stock feed as well as fertilizer. In addition, vegetable such as tomato apart from being consumed at home also earns foreign exchange to the producer countries, due to exportation. Tomato lycopene is a very powerful antioxidant which can help prevent the development of many forms of cancer. Cooked tomatoes and tomato products are the best source of lycopene since the lycopene is released from the tomato when cooked. A raw tomato has about 20% of the lycopene content found in cooked tomatoes. In developing countries, tomato is becoming a more important part of the food basket but the goal of the farmer is to produce quantity not quality. Tomatoes, aside from being tasty, are very healthy as they are a good source of vitamins A and C. Vitamin A is important for bone growth, cell division and differentiation, for helping in

the regulation of immune system and maintaining surface linings of eyes, respiratory, urinary and intestinal tracts. Vitamin C is important in forming collagen, a protein that gives structures to bones, cartilage, muscle and blood vessels. It also helps maintain capillaries, bones and teeth and aids in the absorption of iron.
As varieties improve and new cultivars with better resistance to various diseases are developed, it will become easier to grow the crops in more marginal conditions and the tomato will become a more important part of the diet in poorer countries as well. Tomato is a major vegetable crop that has achieved tremendous popularity over the last century. It is grown practically in every country of the world - in outdoor fields, greenhouses and net houses. The tomato plant is very versatile and the crop can be divided into two categories; fresh market tomatoes, which we are concerned with and processing tomatoes, which are grown only outdoors for the canning industry and mechanically harvested. In most cases, world production and consumption has grown quite rapidly over the past 25 years. Besides, the area used for tomato production in tropical Africa is about 300,000ha with an estimated annual production of 2.3 million tonnes. According to FAO (2012) about 126 million tonnes of tomatoes were produced in the world in 2007. Similarly, FAO reported that the global tomato production which can be roughly assimilated to global consumption amounted to 141 million tonnes in 2009.

Tomato is virtually used by every tribe in Nigeria. Tomato can be grown anywhere in Nigeria, but the best area is the Savannah zone because some diseases of tomatoes are less common in the Savannah. In agriculture, horticultural crops including vegetables have a significant place not only because it contributes to the share of agriculture in national economy, but possesses a great potential and comparative advantage to compete in the liberalized economy. Vegetables are a source of income support as well

as important for food security of the people. Tomato is an important vegetable crop of *solanaceae* grown universally with the production of 124.75 million tonnes (FAO, 2007). Onion, tomato and chilies are most common and important kitchen items cooked as vegetables, used as condiments and salad. The consumption of tomato and onion has high income elasticity of demand. Thus, there will be more demand for these vegetables with the continuous population growth, economic growth, and urbanization (Fateh, 2009). Tomato production requires a high level of management, large labor and capital inputs and close attention to detail. Tomato production is subject to the variations that occur in weather, which may result in severe crop damage and losses. Labor requirements for production, harvesting, grading, packaging and transporting are very intense. Tomato production is labour intensive and bulk of production is mostly supported by small family farm (Erdogan, 2007).

Commercial production of tomato in Nigeria has more concentration in the guinea savannah due to optimum climatic condition for its Production within the ecology. Unfortunately, some part of the guinea savannah ecology, particularly Plateau State is unable to produce enough tomato for local consumption due to non-availability of improved planting material ASTC Bulletin (2012). The available local variety for production has low fruit yield, with poor quality fruits, short shelf life, high susceptibility to insect pest and disease, and hence tomatoes are transported at exorbitant prices to augment the supply deficit. Nigeria is the 13th largest producer of tomatoes in the world and 2nd only to Egypt in Africa at 1.51 million metric tons valued at 87.0 million (USD 556.1 million) with a cultivated area of 264,430 ha. Yet the nation imports 65,809 tons of processed tomato worth 11.7 billion annually. This is as a result of dysfunctional agricultural value chain system culminating to about 50 percent of our locally produced being lost. This simply because the estimated annual average yield per

hectare of tomato in Nigeria is very low at 7.1 tons per hectare compared with 39.5 tons per hectare for Egypt (CBN, 2012).

2.3 Empirical Studies of Socio-economic Characteristics of Project Beneficiaries

Socio-economic characteristics of farmers play a significant role in the adoption process and participation of farmers in any agricultural technology, in the sense that they influence the willingness to accept changes which contributed significantly in raising farm productivity and ultimately their standard of living. Some of the most commonly used socio-economic variables include age, sex, marital status, level of education, farm size, household size etc.

Ayandiji and Adeniyi (2011) in their study of Determinant of Post Harvest Losses among Tomato Farmers in Imeko-Afon Local Government Area of Ogun State found out that majority of the respondents (51.1%) were males and (48.86%) were females, showing that more males were involved in the production of tomato in the study area. This is in consistent with the fact that agricultural activities are seen in the western part of Nigeria as labour intensive, and hence the male dominance. Majority of the farmers are below 41 years of age (69.32%). This indicates a good supply of agile workforce in tomato production. The result of the marital status shows that majority of the farmers were married (86.4%) while 13.64% are either single or divorced. This could have an implication on post harvest losses in tomato production since; married farmers are likely to have access to more family labour especially for harvesting. The time taken to do the harvesting may be longer and in an attempt to rush the works fruits are badly handled due to poor skill in handling as compared with hired labourers. It also showed that 82.95% of farmers have no formal education, those with secondary education are 15.91% and for post secondary education 1.14% respondents. This statistics shows that

majority of the farmers are illiterate. This could be a contributory factor to high post harvest losses in tomato production because only farmers with knowledge to read and write can appreciate and use most of the post harvest technologies available. The result shows that majority (68.17%) of the farmers had below 6 years of experience in tomato production. This could also have an effect on post harvest losses in tomato production. The low years of experience in tomato production might also be responsible for their lack of knowledge and the unavailability of technology of preservation among the farmers. 11.36% of the farmers are with only one person in the household, 30.68% with 2-6 persons in the household, 25% with 7-11 persons in the household and 32.95% household greater than 12 persons. Ahmad *et al*. (2012) observed in the study titled: Factors Influencing Adoption of Protected Tomato Farming Practices among Farmers in Jordan Valley that 3.8% of the farmers were below 30 years of age. Those that fell within the age range of 30-45 years accounted for 48.5%, about 44.7% of the respondents were of the age range of 46 - 61 years, while about 3.0% of the respondents were either 61 years of age or more. The average age of the respondents was about 45.8 years. The implication of these findings is that majority of the respondents belong to the young and middle aged group. This is an advantage since they are supposed to be physically able and more mentally alert in learning new technologies than the older farmers. It further showed that those who had between zero and less than five people in the family consisted 42.4% of the respondents.

Also about 46.2% of the respondents had between five and ten people in the family, while about 11.4% had over ten people in the family. The average family size of the respondents was approximately 6. One of the most important factors conditioning the level of production and productivity of small-scale farmers are the composition and size of family. Hence the relatively large family size of the farmer is an obvious advantage,

since it may likely enable the farmers to use family labor, thereby reducing labor cost required in tomato production. It is also evident that 9.8% of the farmers had no education. About 53.0% of the respondents are illiterate, 28% had primary school education, 9.1% had secondary school education and the remaining 9.8% attended university education. Education has been shown to be a factor in the adoption o f yields increasing modern farm practices. The low proportion of illiterates in the respondents' group implies that the majority of them are in a better position to beware of, understand and adopt protected tomato practices. About 17.4% of the respondents had below five years of farming experience. 28.8% had between 5 and 10 years of farming experience, while about 53.8% had 10 years of farming experience and above. The average number of the farmers is 13.4 years. This implies that majority of tomato farmers had long period of farming experience and therefore would be conversant with constraints to increased tomato production. This could increase their level of acceptance of new ideas as a means of overcoming their production constraints and hence could serve as an advantage for increased tomato production.

In the study of Economic Analysis of Fresh Tomato Marketers in Bauchi Metropolis of Nigeria, Haruna *et al*. (2012) found out that majority of the respondents (40%) belongs to the active population group of 36-40 years. The findings signified that they are relatively young and active to engage in marketing. Only 12% of the respondents are less than 25 years old, while 18.00% fell between the age bracket of 40 and above. This also indicated that old people are more engaged in tomato marketing than middle aged in the study area. It was further revealed that majority (88%) of the respondents were men while only 12% were women. The very low percentage that accounted for women participation in tomato marketing has to do with religion and culture of the people in the

study area, which emphasized more on domestic economic activities of women than outdoor home ventures.

Another factor could likely be connected with the tedious nature of the business, in which most women are considered to be weak in handling it than their men counterpart. Most of the respondents were married with 98% while 2% were unmarried. This result indicated that family size of 6-10 and 1-5 accounted for 46% and 32%, respectively, while 14% and 8% accounted for family size of 11-15 and 16 and above, respectively. The result implies that only small to medium family size holders in the study area were engaged in the tomato business. The very low percentage of family size may perhaps be connected with few numbers of wives in the marriage institution even when predominated by Muslims faithful whose religion permit practicing of polygamy. Majority (76%) of the respondents had post primary education while minority (24%) had primary education. The results signifies that the sample size are fairly educated which is of significant importance in their marketing decision making process. This finding is in consonance with Aighemi and Lyonga (1989) that revealed that literate traders that have been found to adopt new marketing ideas more faster than illiterate's ones and would find it relatively easy in their dealings with people more especially in the exchange process. Majority (40%) had 6-10 years of experience while 30% had 1-5 years of experience. The results revealed that majority of the respondents in the study area were household (76%), followed by hotels (10%), industrial processors (8%) and caterers (6%). This implies that the high percentage of household consumers is likely connected with the affordability of the tomatoes being sold in bits and the nutritional status of tomato which contains vitamin "A" nutrient transformed into active healthy living individuals consumed as diet, provide taste and variety in prepared food.

In the study of Comparative Economic Analysis of Tomato *Lycopersicon esculentum* under Irrigation and Rainfed systems in selected Local Government Areas of Kogi and Benue States of Nigeria, Josephine (2014) pointed out that all the farmers under irrigation system were male while about 72% of farmers under rained system were female farmers indicating gender inequality in access of farmers to irrigation facilities, and insensitivity of the irrigation programme to the Millennium Development Goal of gender equality and women empowerment (United Nations Development Programme, 2002, and International Food Policy Research Institute, 2006). About 62% of farmers under irrigation system and 22% of farmers under rain-fed system were above 50 years of age; indicating that majority of the farmers were getting advanced in age and may lack sufficient vigor for large scale and efficient production of vegetable crops. About 73% of farmers under irrigation system and 68% of farmers under rain-fed system have no formal education; indicating that low literacy rate among the farmers and this might hinder adoption of innovations since education has been reported to influence the level of technology adoption (Chinaka *et al*., 1995).

Despite the family size that was above six for about 94% of the farmers, more than 80% of farmers under irrigation system employed hired labor for farm operations; indicating that family labor was not a preferred option for reducing the cost of labor. About 98% of farmers under irrigation system have more than 10 years of farming experience; suggesting the possession of necessary farming and irrigation skills for increased productivity and efficiency. About 53% of farmers under irrigation system were land owners while about 47% obtained their farm land on lease from government; land ownership structure might be a decision factor with respect to investment on irrigation facilities as farmers that owned land could guarantee continuous access to the use of irrigated land. Majority of the farmers (58% under irrigation system and 98.4% under rain-fed system) cultivated less than 2 ha of farm size; indicating that tomato crop farming is generally small scale and corroborating Kalu (2013) that tomato is produced on small holdings in the northern savannah.

Nabuzale (2014) revealed in the study titled on the Effect of Farmer's Knowledge and Attitudes on Management of the Tomato Spotted Wilt Virus in Sironko District showed that tomato growing is male dominated with 84.4% being males. The respondents' age

ranged between 18 as minimum and maximum being above 50 years. The most active age group involved in tomato production is age 21- 30 years with mainly the males participating. Age was also compared with gender and indicated that the males were more involved in tomato production than the females. The findings of the respondents on educational level showed that the secondary level is (21.9%) and 17.5% having not attended formal education. Across gender, it was found that more males (84.4%) attended school than the females.

In the study of Factors Affecting the Productivity and Profitability of Vegetables Production in Swaziland, Bongiwe and Micah (2013) observed that the mean age for the farmers was 50 years with a standard deviation of 15 years. The distribution of the farmers by gender revealed that there were a larger proportion of males (80 %) than females (20 13 %). In this study, the level of education was included to ascertain the respondent's ability to use and interpret agricultural information. People with high education level are likely to analyze and interpret information than those who have less education or no education at all (Marther and Adelzadeh, 1998). The results showed that 4% of the respondents had no formal education at all, whilst 96% had formal education for those who attended school, 25 % had gone up to primary level, whilst 54 % had attained secondary education and 16 % had tertiary education. The mean number of dependants for the respondents was 7 people. Both household size and number of dependants had an influence on production since they affect consumption and production (Randela, 2005). A large household size discourages selling of produce because the farmer has to supply household consumption needs before selling. Distribution of sampled farmers according to years of experience in vegetable production revealed that on average, the farmers had 14 years of experience. The respondents according to total farm size and the mean value for farm size was 4.8 ha.

The results show that only 10% of the vegetable farmers interviewed had title deed to the land they used and 90% of the farmers had the right to use the land they were farming on, through communal permission or lease.

Ownership of land influences agriculture productivity, because farmers who do not own land can be reluctant to develop and maintain the land (Randela *et al.,* 2000). Furthermore, such farmers may have difficulty in obtaining loans for agricultural purposes because they cannot use the land as collateral since they do not have title deed for it. The results indicate that 60% of the respondents had farm income of less than E20, 000 per annum.

In the study of profitability of small scale dry season Tomato (Lycopersicon esculentum Mill.) production in Adamawa State, majority of the respondents (85 %) were males and (76 %) were married. The dominant of married men in tomato production could be due to traditional belief of the people in the area which prohibits women from going out freely to engage in economic activities (Usman and Bakari, 2013). This agrees with the study of (Ojo *et al.,* 2009) also found out that tomato production in Niger state is dominated by male. Majority (85 %) o f respondents fall within the age range of 30-50 years and 66 % and have been cultivating tomato for 6-20 years. This implies that the production is dominated with experienced adults who are in active years of their life. It is therefore, expected that farmers will achieve high level o f productivity. The finding shows that there is a positive and significant relationship between farming experience and technical efficiency. The result further reveals that majority 71 % of respondents acquires their farm land through renting and 60 % o f them have farm sizes ranging between 0.5-2 .0 hectares.

This result also shows that most of the respondents were small scale farmers possibly due to lack of Money (loan) to pay for rent and other production inputs. It also revealed that majority 52.5 % of respondents have no formal education which may hinder their acceptance of improved storage technology since education facilitates farmers' adoption of innovation. This result showed that high level of illiteracy in his study area. The finding revealed that all the respondents use local methods to preserve tomato despite its perishability. This implies that there will be greater percentage of post harvest loses of tomato which may discourage farmers from increasing their production. It further reveals that 80 % of the respondents used their personal savings in tomato production. This shows that most of the farmers cannot have access to improved farm inputs and ability to expand their production. It is also reported that lack of credit facilities affect production. Finally, it showed that majority (63.5 %) of the respondents had no contact with extension worker at all during their last year cropping season. The result shows that most of the farmers are likely to be technically less efficient to those in contact with extension agent. This means that lack of extension services hinder s farmers from adopting new innovation.

Also, in the study of adoption and profitability of improved tomato variety in the Chittagong Region of Bangladesh that the socioeconomic characteristics of the farmers affected their production patterns, Mohiudden *et al.* (2007) observed that in Patiya, they have a larger family size than Satkania. The average family size of the respondents was 5.28% which was smaller than the national average (5.48%). Literacy had its own merits and contribution towards the process of progress or modernization. On an average 86% and 81% sampled farmer were literate in Patiya and Satkania respectively in which primary education was highest (52%) in Patiya followed by secondary education (26%) in Satkania and 14% & 19% farmers were illiterate in Patiya and

Satkania respectively. It might favour them to involve in service and business along with agriculture. Agriculture was the main occupation of the selected farmers and 15% & 17% farmers have no secondary occupation in Patiya and Satkania respectively i.e. they are fully engaged in agriculture. Considering only owned cultivated area most of the sampled farmers belonged to the small and medium size groups in Satkania and Patiya respectively. About 11% & 15% tomato growers received agriculture related training in Patiya and Satkania respectively. It may be indicated that agriculture related training can help to increase technology adoption and increased farmers income from crop production.

2.4 Level of Awareness of Agricultural Innovations

In the study of planning extension program for the development of the knowledge of tomato growers in Fayoum Governorate in the Area of Egypt on safe use of agricultural pesticides, Shaaban *et al.* (2002) found out that 9.9% of the respondents had low knowledge of the studied recommendations, and 56% had average knowledge, while 34.1% of them had high knowledge. It also revealed that there was a significant relationship at the level of significance 0.01 between the degree of knowledge of tomato growers of the safe use of agricultural pesticides and each of the age, agricultural expertise, distance from the pesticide dealer to farms, the attitude towards extension activities. There were significant positive correlations at the level of significance 0.05 with the degree of education, awareness of the pesticide companies in the region, and the attitudes towards the use of pesticides, while there was not significant relation between the degree of knowledge of tomato growers of the safe use of agricultural pesticides and the rest.

Ogunremi (2011) posited that most farmers acquire information from various sources such as government departments (76%), neighbours and fellow farmers (13%), agricultural universities and research institutes (9%), and Non-Governmental Organistions (2%). Mass media instruments like newspapers, televisions, etc. play an important role in disseminating information about various insurance products or schemes implemented by the public sector and the private insurance companies.

Oladoja *et al*. (2008) in agricultural Programme designs, considerations was given to certain aspects which determine the viability and sustainability of such progaramme. These aspects include social, financial, technical and institutional, organizational, managerial and level of awareness. Ani (2007) observed that the awareness and perception of farmers on the benefits of any agricultural development Programmes could greatly influence their decisions to accept/ rejects new practices brought by the programme.

Also awareness of Farmers about Risk Mitigation Measures Implemented by Government was found to be very high. Awareness was high more among marginal farmers (about 74 %). At the farmers' level, there are other non-monetized strategies such as crop diversification, water harvesting structure, growing perennial less water-consuming trees, drilling new bore-wells, growing rainfed crops, farm diversification and so on. It was observed that these resulted in lesser awareness of farmers about crop insurance details (48 %). The perception about crop/livestock insurance was reported to be 15 per cent among the farmers in the study area (Ogunremi, 2011). While two-thirds of the farmers were aware about the risk mitigating measures being implemented by the government, only half of the target group was aware about the crop insurance schemes/products.

Yahaya and Olayide (2006) found out in the study of level of awareness of improved cassava production technologies among cassava farmers, revealed that 46% of cassava farmers had medium level of awareness of improved technologies, and while 33% had high level of awareness. The mean awareness score for the respondents' level of awareness was 8.21 with standard deviation of 4.57. It was therefore concluded that, despite the rigorous efforts of the extension agents towards dissemination of the improved technologies, farmers' level of awareness is still at medium level. This means that the achievement of high level of farmers' awareness of agricultural programmes will not necessarily result in high level of adoption. The farmer will only adopt those innovations which he judges to be useful or beneficial to his prevailing situations. (Yahaya and Olayide, 2006) posited that despite the current cassava revolution in Nigeria there is high level of awareness of the technologies but adoption rate of cassava production is still low.

The awareness and participation of rural fish farmers in each of the agricultural extension agents' activities recorded high level of awareness among the fish farmers. Oladoja, *et al.* (2008) also reported high level of awareness of farmers in demonstration and field trips. While Oladele and Fawole (2007) noted that the reasons for this high awareness could be traced to the high intensity of extension services provided by Agricultural Development Programmes (ADP).

Oruche *et al*. (2012) in the study of impact of National Special Programme for Food Security on Livestock Farmers in Ideato South Local Government Area of Imo State observed that 80% of the farmers were not aware of any of such programme management practices, while 20% agreed that they were aware of few of the practices. It could be that the 20% who admitted having knowledge of few practices had

participated in a similar programmes in the past or they got the knowledge from their friends outside the study area. Others empirical studies have identified a number of factors influencing farmers awareness and perception in agriculture and rural development programme, this includes agricultural education/ training of farmers, the farmers' economic holdings, participation by farmers, neighbors or relatives and old age of farmers among others. Aboh and Akabio (2008) observed that agro forestry technologies were not reaching poor farmers. The reason is the poor linkages between research organization and extension.

Farmers Awareness about Crop Insurance schemes in Tamil Nadu showed from the probit regression performed to identify the factors that influenced the awareness of farmers about crop insurance schemes/products implemented by government and other financial institutions. The social participation and education level of the farmers were found to significantly influence the farmers' awareness about crop insurance schemes or products. Participation in social and community-based organizations like farmers association, self-help groups, watershed association, and cooperative credit societies, increased the probability of being aware. Thus encouraging participation of farmers in social activities, education has been found as an important tool of improving the awareness about insurance schemes.

2.5 Level of Farmers Participation in Agricultural Programmes

The involvement of beneficiaries or participants in any project start from the decision-making stage, planning, implementation, execution, operations and even evaluation is called participation. Ekong (2003) defines participation as "playing active, though not necessarily direct, roles in community decisions, knowledge of local issues,

attendance of public meetings related attempts to influence proposed measures through individual and group actions, belonging to groups and committees and financial contributions towards community programmes". United Nation Development Programme (1993) defines participation as when people are closely involved in the economic, social, cultural and political processes that affects their lives.

Osebeyo and Aye (2014) found out in the study of Transport Cost and Participation in tomato market revealed decreased in the probability of a household participation in tomato market. Transport cost is negative and significant at 10% level. This means that an increment in transport cost will reduce the number of market participants in the sales of tomatoes. The education variable revealed a positive relationship with the probability of house-hold to participate in the tomato market, but education was only statistically significant for the tertiary level at 10% level. This means that probability of market participation increased with the level of education. A unit increase in the level of education increases the probability to participate in market. Education should help a farmer to develop better skills and ability to analyse market situations. Therefore, it can be said that households headed by more educated people are better empowered to participate in tomato market. Dependency ratio was found to be negative and statistically significant at 10%. It, therefore, means that the higher the dependency ratio the lower the probability of the household to participate in the market. This may be explained by the fact that households with more dependants are likely to consume greater part of their produce and hence have little or nothing left for the market.

The study of level of participation of farmers in the International Institute of Tropical Agriculture (IITA) spear grass (Imperata cylindrica) control project, Agwu and Agbada (2010) revealed that involvement of participants in project activities was highest at the

consultative level where key decisions were made by project officials and farmers. The study concluded that participation of farmers in IITA spear grass control project has not empowered them with the skills and knowledge but revealed the extent to which local opinion and practice was given recognition in the project. The result indicated mean involvement of participants at contractual level in the following activities: planning for the next cropping season ($\bar{x}$=0.10), project planning and design ($\bar{x}$= 0.30), managing "mother" trials ($\bar{x}$= 0.30), plan for training and capacity building of farmers X= 0.43) and managing of financial resources ($\bar{x}$=0.50).Similarly, consultative level of farmers" involvement were found in these activities. The findings of this study show that participants were mostly involved at the consultative level where key decisions were made by the project officials, while farmers contributed their views. The non-attainment of participation at the collegiate level could be attributed to the projects short duration of (2 years).

Also in the study of Assessment of the Effectiveness of Lake Chad Research Institute "Adopted Villages Scheme" in the Dissemination of Improved Farm Technologies in Borno State by Mustapha *et al.* (2012) showed that the level of participation of respondents in dissemination of improved farm technologies of high yielding and early maturing millet varieties were high with mean scores of 2.83 and 2.60 respectively, there was medium participation in trial for fertilizer application, weeding and spacing as compared to chemical application which was low. The high level of participation in trial in high yielding and early maturing millet varieties could be attributed to common interest developed by farmers on these technologies. While the low participation recorded in chemical application might not be unconnected with their associated costs to the respondents in the study area. Farmers participation in research and extension have

been found to be effective in ensuring uptake of new technologies, promoting farmer to farmer extension and positive attitudes to innovation.

The involvement of the Agricultural Research Institutes in the preparation of extension materials such as radio programmes, bulletins, posters among others led to high degree of variation in fish farmers' participation in each of the agricultural extension agents' activities. This confirms the assertion of (Ogunremi, 2011) that extension work in the country has not been participatory. This has the tendency of affecting the ultimate adoption of technologies that extension agents might introduce to fish farmers.

The findings of Montshwe (2006) identified livestock farming as an enterprise that has a likely chance of improving household food security and addressing poverty alleviation in the rural areas of South Africa. However, very few small-scale cattle farmers participated actively in main-stream cattle markets. This showed that 97 % of farmers participated in agricultural projects and only 3% never participated. Farmers' participation is considered necessary to get community support for agricultural development projects (Cole, 2007).The major determinants of farmers' participation in agricultural programmes are household size, effectiveness of rural development programme, constraints and effectiveness of the programmes. The top-down approach practiced in most countries contributes a lot to participation and non-participation of farmers in the projects; this is because major stakeholders or farmers are only involved in the later stages of all the programmes. Unavailability of funds, natural and physical capital reduces farmer participation within the agricultural projects.

In the study of the of impact of national special programme for food security on livestock farmers in Ideato South Local Government Area of Imo State, Oruche *et al.* (2012) observed that there is increase in their level of production due to high level of

participation in the programme, while the non participating farmers recorded low productivity and income due to traditional method of production. In the study of factors influencing women participation in agricultural programmes, Tologbonse *et al.* (2013) observed that 42.7% of the participants were involved in four enterprises, while 28.7% participated in all the six agricultural enterprises.

Agbamu (2000) reported that most fish farmers' participation in training of group leaders was low because there were few group leaders involved and not meant for all the fish farmers. Fish farmers meetings and researchers' organized seminars and workshops recorded a high level of participation among fish farmers. This may be attributed to the fact that fish farmers would be free to rub mind with their counterparts. Agbamu (2000) affirmed that it is easier to adopt a participatory approach or a farmer-led extension or farmers' association than the top - bottom approach in a government extension organization.

Douglah and Siciliama (1997) also added that poor adoption and failure of agricultural projects was lack of participation of the target group in all stages of the projects and people are not usually given chance to participate in all decisions that affects their lives directly. Government officials and experts support the idea of participation in principles but at ground level there is no common agreement.

2.6 Factors Influencing Participation in Agricultural Programmes

Ogunbameru (2001) observed that the number of farmers adopting recommended technology is often used as an indicator of the effectiveness of extension service. However it is a presumption that farmers will adopt any improved and proven agricultural technology that is communicated to them. It is always a system perspective

rather than an individual as a unit of analysis. There are always differences in the rate of participation in the same innovation in different social system.

In the study of farm and farmer characteristics that influence tomato farmers' awareness and willingness to adopt mobile phone based MIS in Ghana, Bismark and Agbeti (2012) observed that the ability to send SMS, Education, farm size, income, location and district are the most important variables explaining tomato farmers' awareness of mobile phone based MIS in Ghana. Farm size and location was found to be collectively important in explaining awareness and willingness to adopt mobile phone based MIS. A larger farm size, all things been equal, is likely to translate to higher output and hence the likelihood of the farmer searching or demanding for market information in order to get a good price for output and increase income. By demanding or searching for market information farmers are likely to become aware of mobile phone base MIS and can translate to the willingness to participate. Empirical studies show that increases in farm income could result in the farmer's ability to purchase of mobile phones (or even other technologies such as television, radio, etc.) and hence become more exposed to information and thus be aware of mobile phone based MIS. The study areas have both urban and rural characteristics with urban areas generally having better mobile telecommunication infrastructure and coverage, hence influencing awareness positively. In the case of willingness to adopt, urban tomato farmers have alternative means of getting market information and also selling their tomatoes because of the closeness to market centres. They can therefore get direct market information from market centres and hence their unwillingness to adopt mobile phone based MIS.

Ahmad (2012) pointed out that farmers' characteristics that influence adoption of protected tomato practices, adoption scores of the farmers on the selected characteristics

were regressed stepwise order in which the variable (family size, farming experience and level of education) out of the four selected variables (age, holdings type, holdings Size and exposure to sources of information) entered into the regression equation. The result indicated that only three variables of the four selected variables (age, holdings type, holdings Size and exposure to sources of information) positively and significantly influenced participation in protected tomato practices ($p < 0.05$) and hence were important in predicting adoption behaviors. Family size contributed 21.7% the variation in adoption; farming experience contributed 20.2% the variation in adoption, while level of education contributed 17.3%. The three variables jointly explained 59.2% of the variation in adoption of protected tomato practices and by implication; increases in family size, farming experience and level of education would increase the adoption of and level of education would increase the adoption of protected tomato practices. The result also shows that age, holdings type, holdings Size and exposure to sources of information had no significant influence on the adoption of protected tomato practices. However the study of Shadiadeh (1993) showed that farmers' age, farming experience and organizational participation significantly influenced adoption. The difference might be the type of technologies studied among other factors.

Australia Centre for International Agricultural Research (2012) reviewed its activities in Africa with more than $101.8 million (Australian dollars) used to fund over 80 projects that focused either entirely or partly on African agricultural productivity primarily in Southern and Eastern Africa. The major key findings influencing participation in this project are higher output because final users were also engaged in the research findings and there was a clear dissemination strategy in the most effective way of delivering information to final users.

Nsoanya and Nenna (2011) in the study of adoption of improved cassava production technologies found out that high yielding, resistance to diseases, early maturity period, and high market value and drought resistant are major reasons influencing cassava growers' adoption of improved cassava production technologies. Also, Adesina and Zinnah (1993) suggested that farmers, perception of technology with specific characteristics to productivity, suitability, yield, taste, tillering capacity, ease of threshing and cooking influences adoption agricultural innovation. Okike *et al.* (2001) reported that specific factors influencing productivity in West African zones were socio-economic factors and it accounted for 76 percent and resource allocation accounted for 68 percent.

Socio economic factors such as age, household size, formal education, income, social status, family size, social participation and extension contact were all found to be significantly related to adoption (Atala, 1998). In addition, other factors like political and environmental could have a strong influence on the potential for meaningful local level participation and adoption. Onu and Madukwe (2002) stated that the most important factors influencing adoption behavior of farmers are their personal and socio economic characteristics such as age, education, farming experience, income and social status. This means adoption of improved technologies is influenced by certain factors and it is a function of farmer's characteristics, extension agency and the new technologies as a material components. Overall farmers' response to agricultural innovations is attributed to a number of institution, national, economic and environmental factors like credit, extension agent, input delivery, land tenure and source of information. Information source have been reported as important stimulus to individuals in the adoption process (Rogers, 1995).

In the study of factors influencing women participation in agricultural programmes, Tologbonse *et al*. (2013) found out that extension contact, access to market, access to land, capital and rate of literacy were factors influencing women participation and adoption of agricultural programmes, while challenges faced by non-participants includes discrimination against women in the distribution of farm inputs like fertilizers and seeds. Alimba and Mgbada (2003) found out that appropriateness of innovation is responsible for adoption of agricultural technologies among farmers while on the contrary view in most cases some farmers fail to adopt because they often seem they are wise and not because they are ignorant, and rationally weigh the changes in incomes and risks associated with agro-forestry technologies under their socio-economic circumstance.

Australia Centre for International Agricultural Research (2012) undertook a review of a subset of ACIAR's investment in Africa to develop some key findings on factors influencing adoption and some lessons for the future, some of its observation includes: understanding outputs that could be adopted, sufficient consideration of socio-economic factors in the development of solutions and disseminating them to final users and clear understanding of partners' capacity.

Ogumbameru (2001) identified several factors that influencing the adoption of innovation viz:

i. **Cost of innovation:** new practices that are high in cost generally tend to be adopted more slowly. The affordability of a technology in terms of cost largely determines it s adoption or otherwise.

ii. **Complexity:** New practices that are relatively simple to understand and use will generally be accepted more quickly than more complex ones.

iii. **Divisibility:** A practice that is divisible for trial will generally be adopted faster than a practice that is not. Some practices like the use of fertilizers, weed spray and seed varieties may be divided for a comparison of trial result with previous practices.

iv. **Compatibility:** Farmers attitudes towards a new idea are often affected by his past experience with similar ideas. A farmer is likely to adopt new ideas if he values efficiency, progress, achievement, and material comfort. However, if a farmer values security and conservatism, he is not likely to adopt new farming practices readily.

v. **Relative advantage:** If a new practice is viewed by farmers as a major improvement over existing methods, it is likely to be adopted rapidly.

vi. **Group Action:** Some new ideas required group consensus and acceptance before they will be adopted. Others may be adopted on an entirely individual basis, provided they do not conflict with the community norms.

vii. **The educational level of farmers:** Farmers literacy level influences the type of media to be used in passing across innovations. The written media have limited use in largely illiterate communities.

viii. **Risk and Uncertainty:** Farmers concerns about the likelihood that capital outlay but can also involve the yield of the innovation in one or a number of seasons.

ix. **Conflicting Information:** Whenever any technology is introduced to any environment, it could be subject to debate with regards to its applicability, suitability and possible effectiveness.

In the study conducted by Oruche *et al.* (2012) on the of Impact of National special programme for Food Security on Livestock Farmers in Ideato South Local Government Area of Imo State showed that 92% of the participants adopted the modern method of production, while 83 % of non-participants still used the traditional methods of production. This was attributed to adequate provision information about the programme.

In agricultural Programmes designs, considerations are given to certain aspects which determine the viability and sustainability of such progaramme which includes social, financial, technical and institutional, organizational, managerial.

Tologbonse *et al*. (2006) observed that radio plays an important role in the adoption of technologies by the various segments of rural dwellers. Also in the study conducted by Akpoko (2004)) found out that there is a positive and significant relation between farmers' extension contacts and adoption of technologies.

Besides, personal and social characteristic of the potential users of new practices influences the rate of adoption for example; younger people are more adventurous, less risky and therefore favorably disposed towards trying new things. Ersado, (2004) found institutional factors such as credit, availability of information and availability of extension services influence adoption. The decision of whether or not to adopt a new technology hinges upon a careful evaluation of large number of technical, economic, and social factors (Atala and Abdulahi, 1991) among these are relative advantage,

compatibility, complexity and trialability of new technology as qualities or attributes of innovation that influence adoption.

In most cases the performance of Nigerian agriculture so far indicates that the farmers neither used nor absorbed most of the improved technologies being introduced to them. This appears to be the case considering the findings of Yayock and Misari (1990) which showed that there existed a wide gap between farmers' improved technology yields and farmers' traditional technology yields. This scenario, the authors attributed to the gap between available agricultural information on improved practices and its use.

Agbamu (2006) found out that factors influencing the adoption of agricultural innovations in Nigeria can be broadly classified as follows:

i. Personal characteristics of the farmers which includes age, family size, farm size, gender, economic status, level of education, social participation level, leadership status, nearness to research station or university, contact with extension workers, cosmopolitenesss, mass media exposure, knowledge of recommended practices, years of farming experiences.

ii. Characteristics of the innovation includes cost of the innovation/ trialability (tendency to try an innovation without committing too much money), complexity and technicality, compatibility with cultural norms and farming system, relative advantage to farmers methods in economic gains, observability (degree to which results are observable).

v. Psychological factors include change proneness of farmers, level of aspiration to socio-economic goal, fear and anxiety, perceived risk and uncertainty/ suspicious.

viii. Situation constraints are insecure land tenure (insecure rights to land resource), lack of access to credit, lack of access to ready markets, inaccessibility to locality (hilly places) and inability to obtain specific inputs.

2.7 Empirical studies on Impact Assessment of Agricultural Extension Programmes/Projects

The impact of project relates to changes in the production and actual living condition among project beneficiaries. Project impact refers to the positive and negative changes produced directly and indirectly by the programme. An impact evaluation report of the analysis of effect of Integrated Farmers' Scheme Project On Beneficiaries Income In Akwa Ibom State, Nigeria by Onumadu and Inyang (2015) revealed that the income of the beneficiaries increased appreciably more than that of the non-beneficiaries by N194, 727.17 and was significant at one percent level of probability with z-test value (7.852) indicating increased income for the beneficiaries. Similarly, Impact of National Fadama II Project on the Social-Economic Characteristics of Crop Farmers in Adamawa State, Nigeria conducted by Girei and Dire (2013) observed that the Fadama II crop farmers has effectively enhance food crop production and it has been possible to established the fact that during Fadama II project, the income of the beneficiary farmers increased significantly more than before the project and also more than the non-beneficiaries' income.

Besides, an evaluation study by Ugbomeh *et al.* (1994) on young farmers, scheme revealed that there was increment in enrolment of youths in the scheme between 1985 and 1989 resulted in concrete contributions made by the clubs in terms of crop and livestock production. An impact evaluation of Shell Petroleum Agricultural Extension programme in Imo state by Agwunobi, (1993) revealed that there was higher annual

income for participating farmers than non-participating farmers. An evaluation of Imo state ADP by Asiabaka (1991) revealed an increased hectare of land with increased yield performance.

Fadoyemi (1998) carried out an impact evaluation of Gombe ADP (1975-1981) and this revealed a smaller considerable impact on crop production and rural living standard than was envisaged at the inception of the project. Agricultural technologies and practices increase the employment rate, productivity and income of the farmers.

In Bangladesh, modern rice varieties introduced have increased not only higher real wages but also more dignity. Productivity increases also affect income, which may have other complex impacts on institutional arrangements, such as creating demand for other products, which, in turn, creates more employment opportunities. (Michelle and Ruth, 2002).

Daudu and Ajayi (2009) conducted research on the impact assessment of the performance of the National Special Food Security Programme in Benue State, Nigeria. The results of the study indicated that there was high performance in the following components: farm intensification, water management, diversification, fisheries, and group management based on performance indices while input distribution, credit and cost recovery and agro-processing recorded low performance. The study indicated that participants expressed satisfaction in the implementation of farm intensification, input distribution, diversification, group management, and agro-processing.

In the study of factors influencing women participation in agricultural programmes conducted by Tologbonse *et al.* (2013) observed that the mean income of participants

was (N134, 389.04) which was discovered to be much higher than that of the mean income of participants which amounted to (N5, 605.35).This means that participants have higher output and income than the non-participants from their agricultural enterprises.

The activities of the Belter Life Programme were remarkable to the extent that its impact was felt throughout the length and breadth of the country. Some of its achievements were; It exposed the potentials of women in creativity and management, women became actively involved in all government programmes from the grassroots, credit other inputs now flow to rural organizations more than ever before and it had the establishment of ministries of women affairs in all the states of the federation (Ijere, 1990).

Under the Directorate of Food, Roads and Rural Infrastructure (DFRRI) established in 1986 (Oruche, 2012) identified that people were mobilized and organized to participate actively in production activities which ensured abundance of food in terms of protein, availability of housing, rural health and nutrition, manpower development, and rural industrialization.

The Agricultural Development Projects (ADP) commenced in Nigeria in 1975 and was supported by the World Bank, the Federal and State Governments. The ultimate objective of the Agricultural Development Project was to raise productivity, increase farm output, income and standard of living of the rural people. The project assisted in promotion of small-scale autonomous projects operated by a multi-disciplinary management unit using the cooperative approach. It also tackled many aspects of agriculture, which include production, marketing, infrastructure and training Chukwuemeka, (2012). Ayoola (2001) succinctly summed up the impact of agricultural

farm settlement scheme programme initiated in (1963) in Nigeria, provides a basis that it was able to solve the unemployment problems among primary school leavers with policy instrument that included agricultural extension, cooperative societies and credit facilities. The National Fadama II Development Project (2004) has sustainably increased the incomes of Fadama users who depended directly or indirectly on Fadama resources through the empowerment of community members to take charge of their own development agenda and this has reduced conflict among fadama users (Blench and Ingawa, 2003).

2.8 Past Methodological Approaches Used in Impact Studies

2.8.1 Double difference estimate

Albouy (2010) reported a study conducted in 1994 by Card and Krueger on the topic: "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania" to try to evaluate the effect of the minimum wage (the treatment) on employment (the outcome, Y). On April 1, 1992, New Jersey's minimum wage rose from $4.25 to $5.05 per hour. To evaluate the impact of the law, the authors surveyed 410 fast-food restaurants in New Jersey (the treatment group, T) and eastern Pennsylvania (the control group, C) before and after the rise.

The Double Difference Estimator (DDE) model was used in the following form… (1)

Y_i^T = Average outcome (productivity) of the beneficiaries after the technology.

Y_0^T =Average outcome (productivity) of the beneficiaries before the technology.

$Y_i°$ = Average outcome (productivity) of the non - beneficiaries after the technology.

$Y_o°$ = Average outcome (productivity) of the non - beneficiaries before the technology.

An alternative approach is to use a regression in which project participation is an explanatory dummy variable. This approach is equivalent to (that is gives identical results to) single or

double difference, depending on the specification of the regression. However, other variables may also be included, giving a better result, allowing for analysis of differential effects within sub-samples of the treatment group, and removing selection bias under certain conditions.

According to the model, comparisons of employment growth at stores in New Jersey and Pennsylvania (where the minimum wage was constant), provide simple estimates of the effect of the higher minimum wage. The result revealed the effect of minimum wage on employment in New Jersey and Pennsylvania before increase as 20.44 and 21.03 respectively with a difference of 0.59 while after the increase was 23.33 for the New Jersey and 21.17 for Pennsylvania with a difference of -2.16. The difference in difference estimator shows a small increase in employment in New Jersey where the minimum wage increased. This came as quite a shock to most economists who thought employment would fall. Notice that prior to the increase in the minimum wage, Pennsylvania had higher employment than New Jersey and that it was bound to fall to a lower level. This may be a failure in the parallel trend assumption. However the small, albeit insignificant increase in employment in New Jersey makes it hard to accept the hypothesis that employment actually decreased in New Jersey over this time. Although still somewhat controversial, this study helped change the common presupposition that a small change in the minimum wage from a low level was bound to cause a significant decrease in employment.

Kudi *et al*. (2008) found out from the study of impact of National Fadama Development Project II (NFDP II) in alleviating poverty among farmers in Giwa Local Government Area of Kaduna State, Nigeria .The study examined the impact of National Fadama Development Project II on the socio-economic status of the farmers and equally assessed the extent to which participation in the programme had enhanced the level of

production efficiency. The analytical tools used include descriptive statistics and stochastic frontier production function, which incorporates technical inefficiency model using the maximum likelihood estimation (MLE). The MLE estimates of the parameters of the stochastic frontier production function revealed that the elasticities of output with respect to farm size was (0.3246) and family labour (0.003) were significant at 5% level of probability while, hired labour (0.6382) and fertilizer (0.0994) were significant at 1% level. This implies that a 10% increase in the use of these variable inputs will increase output by 3.2, 0.033, 6.38 and 0.1% for land area, family labour, hired labour and fertilizer respectively. The sum of the elasticity of the estimated parameters was 1.0529, implying constant returns to scale in the enterprise. The study revealed that the levels of technical efficiency ranged from 47.38% to 99.54%, with a mean of 91.77%. The mean (91.77%) level of technical efficiency indicates a high level of technical efficiency on an average farm unit. The study also revealed that these efficiencies are positively and significantly correlated with years of irrigation farming, number of visits by extension agents, level of education household size and ownership of water pump.

Ater *et al*. (2006) undertook a study on the comparative analysis of the impact of World Bank on root and tuber expansion programme on poverty alleviation of periurban and rural communities in Benue state, Nigeria. The study used discriminant function to analyse causal effect of poverty alleviation indicators in twenty World Bank beneficiary communities of the expanded programme on root and tuber production in Benue State. Using the fitted discriminant function, the rural and peri-urban producers were correctly identified up to 99% with the total discriminant score of 87%. The study found that even though peri-urban and rural producers had impressed conditions, there was a distinct dichotomy in the poverty alleviation index/score and valued marketable

surpluses of the two distinct groups. The distinction was due mainly to: sales income from marketable surpluses, distance to nearest urban centres and distance to the nearest point of product evacuation for sale. These three variables all favoured the peri-urban producer more than the rural. Similarly the variables accounted for 55% sales income from marketable surpluses , 15.2% distance to nearest urban centres of best revenue receipts and 10.5% distance to the nearest point of product evacuation for sale to variability in the function .The study therefore suggests a re-focusing in the micro and macro-economic policy framework of developing economies to provide improved markets and marketing opportunities, improved road network and collection centres that check waste and deterioration in quality of agricultural products. These, if done, will reduce transportation cost, improve income earnings and enhance the ability of the typically rural to alleviate poverty and thus achieve the desired better quality of life in the shortest time.

2.8.2 Achievement index model

The Achievement Index Model used by Okorie (1982) in the study of impact and performance evaluation of Funtua and Gusau agricultural Development Project in Nigeria. The achievement index model approach was used to measure the impact. The achievement index model is defined as follows:$Ii=A_i/T_i$, where I =index of Target Achievement…….. (2)

A=Actual Achievement Level,

T=Target Level

I= Project input, Infrastructure, service item, or Expected output.

The result obtained shows the output achievement indices of the following major crops in Funtua and Gusau for four years period showed a statistics of 178.3% for guinea corn, cowpea to the index of 711.3% and maize with least achievement of 3.7%.

2.8.3 Chow test model

Chow test model was used by Simoyan and Omolehin. (2010) in the study of analysis of impact of Fadama II project conducted on beneficiary farmers' income in Kaduna State. A significant change between the coefficient and intercept of the respondents' income implying that fadama II project contributed positively to the increased income realized by the beneficiaries over the non-beneficiaries. The standard F test for the equality of two sets of coefficient in linear regression models called a chow test was used for the study. This is expressed mathematically as:

$$F * Chow = \frac{(RSS_3 - SSR_1 + SSR_2)/K}{(\mathrm{RSS}_1 + \mathrm{RSS}_2)/\ \mathrm{n}_1 + \mathrm{n}_2 - 2\mathrm{k}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where;

$RSSR_3$ = the sum of squared residuals from a linear regression in which b_1 and b_2 are assumed to be the same (pooled data).

SSR_1 = the sum of squared residuals from a linear regression of sample 1 (participants)

SSR_2 = the sum of squared residuals from a linear regression of sample 2 (Non-participants).

Both have dimension k and these are number of observation in total. The total number of observation is;

K = is the total number of regression estimates including intercept of

$N_1 + N_2$ = number of observation of the 1st and 2nd regression (participants and non participants).

The computed F chow statistics was 227.09, with V1=6 and V2 =398 degree of freedom at 5% level of significant and F tabulated is 2.10 confirming the heterogeneity of slopes of beneficiaries and non-beneficiaries, hence indicating a positive impact of the project intervention on the beneficiaries income. The higher difference in net- farm income of the beneficiary over that of non-beneficiary may be attributed to income realized by the respondents from fadama project intervention which is above the average rural household income of ₦42, 644 reported by the 2003 - 2004 living standard survey (FOS, 2004). This result is consistent with the findings of Ezeh, (2004) who reported that fadama project beneficiaries were better than their non-beneficiary counterpart in terms of income and productivity.

The International Institute for Environment and Development (1998) has pointed out that very few impact studies in Agricultural Development Project has been undertaken probably due to methodological difficulties involved in estimating the benefits. Khandker *et al*. (2010) identified several qualitative and quantitative methods being used in the literature to examine the impact of a programme or an intervention on the beneficiaries. Among these are randomization, double difference estimator, project achievement index, multivariate regression, and propensity score matching, cost benefits ratio and technical efficiency. The double difference estimator has been used, to determine the average change in productivity of the beneficiaries before and after adopting the technology on one side and after the dissemination of the technology on the other side (second difference). But it is difficult to administer the same set of respondents and use of baseline information before and after the programme intervention. In addition to this, randomization has been used in evaluating impact of several programmes. The randomized control trial (RCT) estimate the impacts of intervention as the difference in mean outcomes between the treatment group (those

receiving the intervention) and the control or the comparison group (those who do not). However, randomization has been criticized for withholding the programme from those who need it, given to those who do not (what is term as unethical). It also faces the problem of selective attrition, external validity and spill -over effects (Khandker *et al*. 2010).

Also the double difference estimator (DDE) has been used to compute the difference in a given outcome between recipients of the project (the treatment group) and a comparison or control group before the project is implemented. Again this technique faces two defects, Firstly, in practice, one sometimes may not be able to regroup the same participants in the program during baseline survey and during end- line survey. In most cases the baseline data are not usually accurate and available for further use. Secondly, the consequence is that DD will then be biased estimator, since the subsequent change outcome are function of initial conditions that has influenced the assignment of treatment. Thirdly, the DD assumption of time- invariant selection bias is implausible for many anti- poverty programmes in developing countries. (Ravallion, 2008, Khandker *et al*., 2010).

Other methods include the use of multivariate regression procedures that include per capita income or consumption expenditure among some set of explanatory variables. The use of this technique had failed to deal with the problem of endogeneity in the outcome equation and also to deal appropriately with the self - selection bias. (Woodldridge, 2009).

The propensity score matching (PSM) technique which tries to find comparison groups who did not receive the project, but given their observable characteristics, had the same probability of receiving the project as individuals in the treatment group. However,

PSM is faced with the defect of identification, which is, finding credible groups that look alike, and in practice one would rarely finds two households that are exactly similar to each other in terms of many characteristics Khandker *et al*. (2010). Among other performance evaluation models which most researchers have also used in the time past are production function measures, economic surpluses measures and project achievement index.

Therefore, this study intends to use the chow test statistics model for comparing various changes of actual achievement of the project with respect to output, yield, income, employment and level of living on the participating and the non- participating farmers. The use of this model is due to its practical applicability and appropriateness for addressing the clumsiness, inaccuracies associated with other impact models.

2.9 Constraints Encountered in the Implementation of Agricultural Programmes

In Nigeria like other places, project implementation has been characterized by many impediments; the most recurring factor was the top- down approach that is usually forced on farmers irrespective of their felt needs. This shows that rural farmers are usually not involved in the concept, planning and monitoring, which often leads to massive failures in the project implementation. Other factors that militate against project implementation include lack of understanding the socio - economic and socio – cultural and religious factors of the beneficiaries' communities.

In the study of assessment of potential economic impact of genetically modified crops of tomato in Ghana, IFPRI (2006) observed that several factors affect tomato production and ultimately the cost of tomato cultivation. For one, farmers obtain seed either from their own fields, from neighbors and friends, or from women's groups that maintain and distribute varieties that are in high demand in the marketplace. This recycling drives

down seed price, but has a negative effect on seed quality. Also, most tomato varieties used in commercial production are introduced varieties, which are not well adapted to local conditions in Ghana. This, along with the seasonality of tomato production, creates periods of abundance and scarcity, which dramatically affect market prices. On average, labor (land preparation, transplanting and harvesting) represents more than 50 percent of total production costs, but farmers who use family labor are hardly aware of this. Services and equipment costs together account for only 6 percent of the total expenses incurred by a tomato producer. Manure is often used as fertilizer by producers across the region. During the rainy season, fungal diseases and pests are common. Because synthetic insecticides and fungicides are generally too expensive for the average farmer to use, such expenses represent on average only 2 percent of the total costs. Access to irrigation facilities also conditions production. Still, despite these constraints, farmers consider tomato production to be a profitable activity.

Maheswari *et al*. (2008) in the study of precision farming technology, adoption decisions and productivity of vegetables in resource-poor environments identified the following Constraints in Adoption of Precision Farming. The result showed that lack of finance and credit facilities were the most important reasons for non-adoption of precision farming technology, adoption decisions and productivity of vegetables in resource poor environment. Obtaining credit was a difficult process, because farmers could not produce collateral security. Drip installation and use of water-soluble fertilizers were very expensive and required credit. Also because of output price fluctuations, farmers were not ready to make investments. Lack of knowledge about precision farming technologies was another important constraint, because a majority of small farmers were illiterate and were not able to follow and adopt latest technologies. Labour scarcity was also a problem in adopting precision farming. Due to urbanization

and migration, there was a scarcity of labour for agricultural operations. Since precision farming was highly labour intensive technology and operations were time-bound, farmers faced the dearth of labour, especially during stacking and harvesting. The traditional farmers had a wrong perception about the higher yield from the précised quantity of inputs. It was a major constraint to the adoption of precision farming.

Edi *et al*. (2007) observed that labour intensive farming types and high dependency on household income on farming activity constrained farmers' participation, whereas previous experiences, easy access to implements, environmentally friendly farm practices and adequate compensation of extra costs encourage participation. Tarfa (1990) noted that fertilizer, water availability, capital, high cost labour, tractor hiring, pest and diseases, marketing and prices were constraints to dry season farming irrigation system. (Food and Agriculture Organization (1997) pointed out that many Sub-Saharan countries have realized the critical role of irrigation in food production, but a number of constraints have been responsible for a relatively slow rate of irrigation development in this region. The constraints include inadequate physical infrastructure and markets, poor investment in irrigation, lack of access to improved technologies, lack of cheap and readily available water supplies.

Arokoyo (1995) identified some constraints associated with management and implementation of agricultural policies and programmes and which are lack of understanding of the socio-economic and socio-cultural elements of the communities or participants by the pogramme implementers, lack of appropriate institutional frame-work and linkages between the government's agencies and research institutes charge with responsibilities of agricultural development. Besides inappropriate technology also serves as strong factor hindering the transfer of many technologies to most farmers

practicing irrigation. Olawepo (2010) identified that farming is a lucrative business but production has been hindered by participants, poor access to credit facilities, inappropriate technology, and climate change.

A significant proportion of the rural poor lives in less favored areas which are vulnerable to agro-climatic conditions such as poor soils, low and unstable rainfall, steep slopes, short growing season inadequate infrastructure and support services to support agricultural development. Thiruchelva, (2005) observed that producers experience, farm specialization and labour were found to be the major factors associated with production efficiency.

And that the number of inputs, such as tractors and fertilizer employed in production were significant factors accounting for differences in agricultural productivity between farmers in developed and the developing countries.

Adebayo *et al*. (2009) found out that lack of public participation in agricultural design, formulation, implementation and evaluation of policies as well as limited implementation capacity among the stakeholders and a poor understanding of the details and specifics of policy by implementers had been found to constitute constraints to participation in most agricultural programmes. Olaiyide (1990) maintained that the failure of most agricultural development programmes can largely be ascribed largely to non- involvement of local council chiefs in commodity oriented rural development. This frame work hinders participation among majority of the farmers.

Conroy (2003) reported that institutional context for agricultural development with less emphasis on extension accountability on the part of government agricultural development agencies to their clients, lack of information sharing between different

stake holders in the projects and centralization of decision making are major constraints to participation in most agricultural programmes. National Directorate of Employment (NDE) programme came into being in Nigeria to deal with the rising unemployment in the country. It was structured to offer job seekers with an employment or working on their own through agriculture, industry and handicrafts. Each participant in the scheme was to be empowered with jobs or otherwise to benefit from loans guaranteed by the establishment. But some of the problems encountered in the implementation of the programme in NDE included low funding.

CHAPTER THREE

THEORETICAL FRAMEWORK

Theoretical framework is viewed by (Ekong, 2003) as a broad system of explanation that is founded not so much on prior research findings but largely on interest and perhaps improvable assumptions. The focus of theory construction is to provide conceptual framework, to facilitate the accurate observation and reliable description of social events, laws and theories by which social phenomena can be explained. The theoretical background for this study will be social change theory and modernization theory.

3.1 The Theory of Social Change

Ekong, (2003) defined theoretical model as a broad system of explanation that is found not so much on prior research findings but largely on untested and perhaps approvable assumptions.

Social Change Theory pervades all aspect of life and may manifest as economic, technological, cultural and behavioral changes (Ekong, 2003). The theories of social change have in general concerned with the explanation of the sources of social change, the time span of change and the effect of change on the changing unit (i.e target population). Social change may be planned or unplanned. Planned change entails the direct human intervention in reforming and directing change towards some defined goals while unplanned change is that which occurs suddenly usually through the act of nature thereby affording man the no chance to plan before it happens. Based on these perspectives, therefore, the planned change resulting from the project intervention in terms of improvement of livelihoods would be adopted. This situation reflects such factors as the introduction of new techniques, new ways of making a living, changes in place of residence, new innovations, ideas and social values. Thus social change means

modification of the way people work, rear their family, educate children, govern them and seek ultimate meaning in life. The term ‘development’ is mostly used to designate a holistic approach in sociological literatures.

The social change theory will help to provide a framework for the understanding of the social changes that have taken place in the study area as a result of the introduction of the ASTC Project. It will provide a guide in analyzing the way rural poor farming communities use science-based interventions of ASTC to reduce extreme poverty while improving income, output, yield performance and livelihoods of the people. The term ‘development’ is mostly used to designate a holistic approach in sociological literatures.

3.1.1 Modernization theory

This approach focuses on the premise that change will occur when there are changes in technology, level of capital investment and market demand. The approach further stresses to achieve the goals of change programmes such as modernizing agriculture, close attention must be paid to the attributes of the innovations, socio-economic characteristics of the clients (farmers). Michael and John (2001) described modernization theory as the explanation of the processes of transformation from traditional or underdeveloped societies to modern societies. It is also the process of change towards those types of social, economic, and political systems that have developed in Western Europe and North America from the seventeenth century to the nineteenth and have then spread to other European countries and in the nineteenth and twentieth centuries to the South American, Asian, and African continents. Modernization theory has been one of the major perspectives in the sociology of national development and underdevelopment since the 1950s. Of recent attention has focused on ways in which past and present pre-modern societies become

modern (i.e., Westernized) through processes of economic growth and change in social, political, and cultural structures.

In general, modernization theorists are concerned with economic growth within societies as indicated, for example, by measures of gross national product. Mechanization or industrialization is an ingredient in the process of economic growth. Modernization theorists study the social, political, and cultural consequences of economic growth and the conditions that are important for industrialization and economic growth to occur (Michael and John, 2001). Modernization is also the process by which individuals change from traditional way of life to a more complex technologically, advanced rapidly-changing style of life. For instance, adoption of modernization strategy in agricultural production was based on the assumption that the programme designed to increased agricultural production must resolve the problem of welfare or social equity and increase agricultural production through some trickle-down effect. It should be noted that the sociological concept of modernization does not refer simply to becoming current or "up to date" but rather specifies particular contents and processes of societal changes in the course of societal development.

3.2 Conceptual Framework

Conceptual framework is a theoretical structure of assumption, views, principles, perception and rules that hold together the ideas comprising a broad concept.

3.2.1 Concept of Impact

There are several definitions of impact evaluation. For the purpose of this work, impact evaluation is defined as an attempt to create a causal linkage (attribute) for given extension outcomes to extension interventions/inputs using quantitative method. The International Initiative for Impact Evaluation (2008) defines impact evaluation as the

analysis that measures the net changes in outcome for a particular group of people that can be attributed to specific programmes using the best methodology available, feasible and appropriate to the evaluation question that is being investigated and to the specific context. It is also refers to the broad, long term socio-socio economic and environmental effect of the programme on the beneficiaries and the general ecosystem (IAEG, 1999). Impact of a programme can be manifested in relation to what the services actually resulted on the people who received them. Impact studies are of paramount importance in agricultural programme as it shows the benefits derived by the participants as a result of their involvement in the programme as well as show their preferences to the programme. It is therefore, important to evaluate impact in terms of all the goals and objectives that were set when the programme was established. (IAEG, 1999) reported that in order to establish whether the programme has impacted on the livelihoods of the beneficiaries therefore, assessment of all the goals objectives should be carried out.

Mayong *et al.* (2001) stated that impact assessment of agricultural research is a continuous process which is conceptualized as a cycle involving different types of impact studies at different stages using 'before and after' impact assessment approach. This is further stressed as the studies essentially have the same process as technology development and base on technology development process, four stages of impact assessment make the impact cycle. These include impact for priority setting ex-ante impact, on –farm technology evaluation, adoption and ex—post impact. For this study therefore, before and after impact assessment will be used.

Mosley (2011) considered impact assessment as the grandchild of welfare economics, by way of social cost benefits analysis. Mosley argues that there are three questions which the authors of impact assessment need to answer:

i. What are the benefits conferred by the intervention i.e. the difference between the project and without project situation?

ii. How did the benefits divide between the different parties affected by the intervention?

The terms impact assessment and impact evaluation is used interchangeably to mean an attempt to find out the effects of an intervention after it has occurred, and the term appraisal to mean an attempt to predict the effects of an intervention before it occurs. Manyons *et al*. (2001) viewed impact assessment as a critical component of agricultural research that helps to define priorities of research and facilitate resource allocation among programmes, guide researchers and those involved in technology transfer to have a better understanding of the way new technologies are assimilated and diffused into farming communities, and show evidence that clients benefits from research. Impact of a social intervention on the output of an organization is related to the achievement of its objective.

Also, impact Assessment and Evaluation Group IAEG, (1999) reported that in order to establish whether the programme has impacted on the livelihood of the beneficiaries, then, assessment of all the goals and objectives should be carried out.

The International Service for National Research (ISNAR) provides seven alternatives standards by which quality and impact may be measured Farrington *et al*. (1997): This includes:

i. Past performance

ii. Performance of other system

iii. Desired impact

iv. Professional standards

v. Survival impact

vi. planned impact

vii. Optimal impact.

However, for the purpose of this study, the chow test statistics for 'participants" and non- participants" method will be used. This is because the approach will likely give much proper assessment of the impact of the programme in the study area. The use of impact assessment concept would therefore help to examine the technological packages introduced by ASTC project under the adoption and diffusion theory and its implication on the livelihoods of the participating farmers in the study area.

Sanginga *et al*. (1999) stated that impact analysis deals with the investigation of the changes that occurred or likely to occur on the people's life as a result of a project or program. According to them, impact assessment tries to find out how far the introduction of technology have been successful in meeting the socio-economic objectives and how well agricultural technologies have satisfied the needs and priorities of household and other units in the target population. Impact assessment is a special form of evaluation that deals with the effects of intervention programme output on the target beneficiaries. It is also the influence of social programme on its client and or its social content, the impact of a programme therefore, can be said to be what the service actually does to the people who receive them.

In conducting impact assessment, researchers often use ***with "*** **and** ***"without"*** *impact method,* while others use the ***"before"*** **and** ***"after'*** method. The ***"with"*** **and** ***"without"***

approach to impact study involves the study of population, villages or communities that benefited or did not benefit from the execution of a project. For this study, the researcher will use the difference between the beneficiaries and non- beneficiaries, or participants and non- participants. Mayong *et al.* (2001), argued that impact assessment of Communities lift themselves out of extreme poverty. Therefore, identifying the asset base of the poor is the starting point to poverty reduction. These assets are reflected in the natural resource base, human capital, financial capital, political capital and social network. This will help in the analysis of the causes and nature of poverty in the study area; and how the project has helped in the alleviation of poverty among the participants.

3.2.2 The concept of livelihoods

In developing countries, majority of families is in the farm and agro- allied sectors for their livelihoods sustenance. Livelihood is an adequate stock flow of food and cash to an individual or a family to meet its basic needs. Livelihood is often referred to as "how a person acquires money to make a living" but this is more encompassing than this. Livelihood is referred to as comprising the capabilities, assets (stores, resources, claims and access) and activities required for a means of living.

Rahman *et al.* (2007) sees livelihood as being broader than income; it includes everything done to obtain a living. Livelihood comprises of the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household" Livelihood security then means secured ownership of, or access to resources and income-earning activities, including reserves and assets to offset risks, ease shocks and meet contingencies. There are four principal ways of acquiring livelihoods by the rural households. Firstly, is the production-based livelihood. A large

proportion of the small and marginal farmers gain livelihoods through production on small pieces of land. For these households, availability or access to inputs and improved methods of production are quite critical for their livelihoods. Secondly, is the labour-based livelihood; most of the small landholders and landless rural households derive livelihoods by selling their labour. For their livelihoods, they seek for labour. Wage rates and prices of food are most critical in this regard. Thirdly, is the exchange or market- based livelihoods; those rural households which produce surplus food and non-food agricultural products or non-farm goods earn their livelihoods by selling these surpluses in the market. The marketing system for these products and relative prices of what they sell and what they buy, affect their livelihoods. The fourth set of livelihoods is transfer-based entitlements. The households without any income-earning asset or able-bodied person to work depend on government or other social organizations for their livelihoods.

A rural livelihood is defined as: "the capabilities, assets and activities that rural people require for a means of living". It is considered sustainable "when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets both now and in the future while not undermining the natural resource base" (FAO, 2003). Rural men and women, especially in poor households, engage in diverse and multiple activities to improve their livelihoods by maximizing in – generating activities while minimizing vulnerability and risk, and achieving other house hold objectives (improved health, nutritious and education etc). These activities may include farm and non-farm actions, many times linked with other activities carried out by rural, as well as non-rural households. The effectiveness and profitability of these diverse livelihood systems will vary depending on the general development environment, each household member's

accessibility and control of the asset base, their productive reproductive roles and responsibilities, their capabilities and their linkages with other rural and urban actors**.**

Frankenberger and Curt (1994) defined livelihood as the sustainable access to meet basic needs including adequate access to food, portable water, health facilities, educational opportunities, housing, time for community participation and social integration. Chamber and Conway (1992) considered livelihood to comprise the capabilities, asset, including both materials and social resources and activities required to make a living. Livelihood are based on income (in cash, kind or services) obtained from employment, and from remuneration through assets and entitlements. It is usually a measure of the quality and quantity of goods and services consumed by the farmer and his household such as expenditure on consumable goods, fixed assets acquired, children in school and other services such as healthcare, portable water, good shelter etc (Taimi, 2003) reported that rural sector is lagging behind in social amenities, and the gap between the rural and urban areas is widening.

Level of living is the way an individual lives, not the way he wants to live. According to Benjamin (2010) stated that living level is concerned with the consumption or use of economic goods. But also observed that if apply to a family level, it means the content or consumption of the total of food, fuel, and other non durable goods used up, the services of houses, automobiles, clothing, and other goods varying durability, and the services of human being enjoyed by an individual, or group in a given period of time. For measurement, he developed a series of cost-consumption unit scales for farm families, including separate scales for food, clothing, rental, healthcare, personal goods and furnishing.

Benjamin (2010) stated that US census of agriculture data to measure the rural famers' level living was based on seven living items, (possession of telephone, electricity, Television, piped running water, freezers, automobiles, and tractors). Also, a number of indicators that would provide quantifiable components of the level of living can be summarized under the following major headings namely: health, food, education, conditions of work, employment situation, aggregate consumption and savings, transportation, housing, clothing, recreation, social security and human freedoms. Besides, available personal disposable income, household income, and net worth as perceived income adequacy and perceived economic well being present an indicator of good level of living. Essentially, level of living refers to the variety, quantity and quality of the goods used to meet the physical psychic needs of an individual or family.

3.2.3 Concept of participation

The involvement of beneficiaries or participant in any project from the decision-making stage, planning, implementation, execution, operations and even evaluation is called participation. Ekong (2003) defined participation as "playing active, though not necessarily direct, roles in community decisions, knowledge of local issues, attendance of public meetings related attempts to influence proposed measures through individual and group actions, belonging to groups and committees and financial contributions towards community programmes". United Nation Development Programme (UNDP, 1993) defines participation as when people are closely involved in the economic, social, cultural and political processes that affects their lives. According to Kolawale (1990) participation may involve multi-sectoral approach whereby people take part in decision making. This may entail prior consultation with the beneficiaries not just for the purpose of ascertaining their "felt needs" but also their priorities, and other factors that can lead to equitable access and use of productive resources and also

employment opportunities which allow the rural dwellers to contribute and benefit from the development process.

According to Yoon (1996), four different ways of participation can be observed in most development projects. They are:

i. Participation in implementation.

ii. Participation in evaluation

iii. Participation in benefit

iv. Participation in decision making.

And that participation in decision-making is the most important form to promote as it gives people a say over their future and environment, it also helps the people to acquire problem solving skills and full ownership of projects, these are two key elements of sustainable community development. Pretty (1994) reported seven types of participation. They are manipulative participation, passive participation, and participation by consultation, participation for material incentives, functional participation, interactive participation and self- mobilization. It was stated that participation ranges from manipulative and passive participation where people are told what is to happen and act out predetermined roles, to self-mobilization where people take initiatives largely independent of external institutions. To them, the most appreciated type of participation is the interactive participation where fanners or their representatives participate in the organization of extension service, in decision-making on goals, targets, messages and methods and in evaluation of activities. Hence, participation should be seen as right, not

just the means to achieve project goals. Therefore, active participation which allows people to realize their full potential and make their best contribution to society is an end in itself. Understanding the concept of participation will help in analyzing the various levels of participation by the participants. It will show what levels the participants were involved from the project conception to execution and finally evaluation.

3.3 Conceptual Model

A model is a construction that shows the relationship of variables. This relationship is depicted mathematically. A model is simply an attempt at classifying the major elements of an entity or a phenomenon with regards to their functions and interrelationship in order to observe more closely how these elements function within the entity. According to Asika (2001) these relationships and functions are represented mathematically and schematically to show the casual relationship.

The model developed for this study will observe the changes over time among the project participants. It is expected that the project interventions might have brought changes on the livelihood of farmers. The observed changes will be computed over time period between 2008 and 2015. The same procedure will also be applied for non-participants. The changes observed overtime among the participants and non-participants will produce an estimate of the impact of the project on changes in output, yield, income and living standard. This is based on the assumption that the project intervention will create changes among the participants and non-participants.

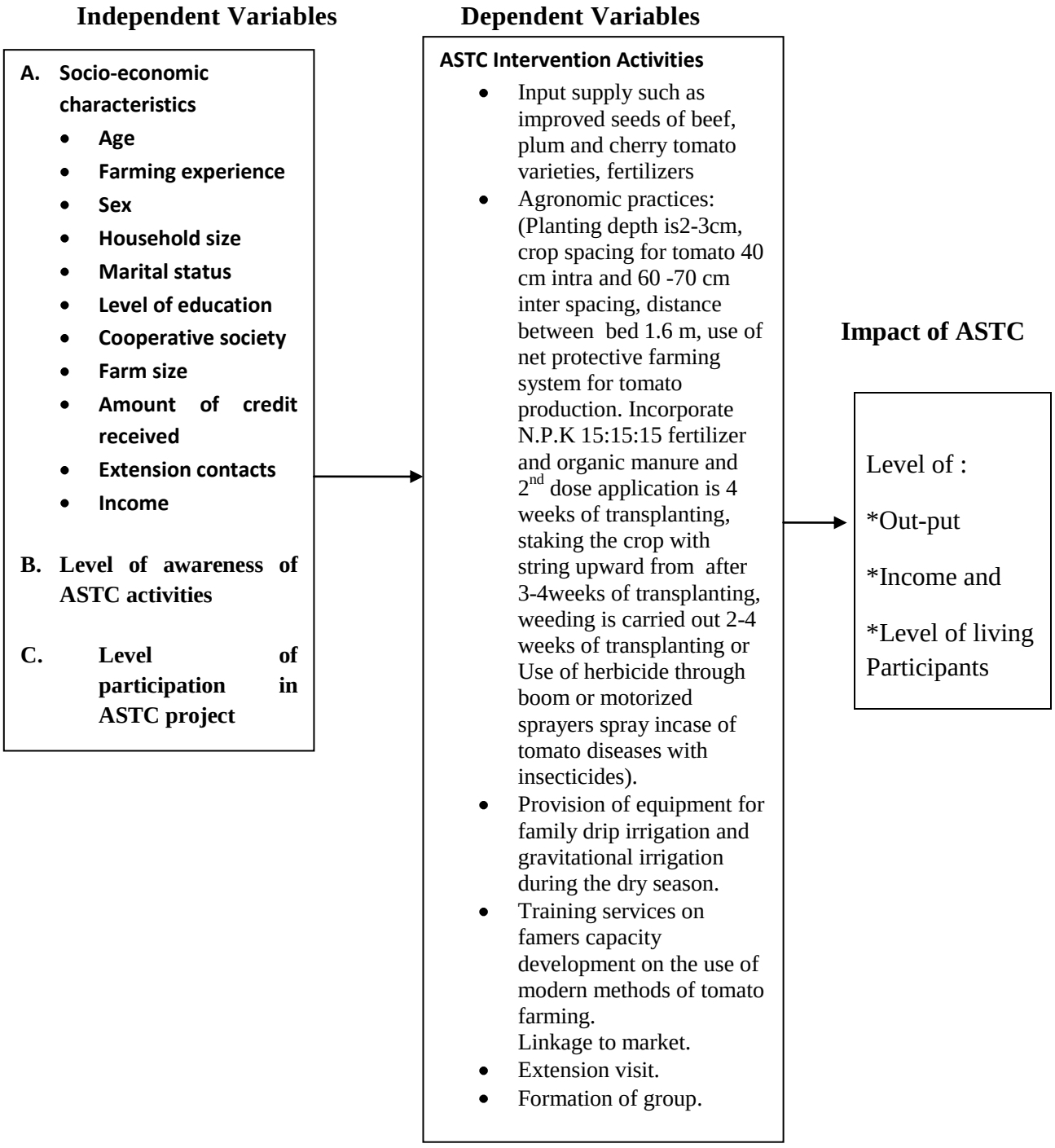


Figure 3.1: Impact of ASTC Project on Tomato Output, Income and Level of Living of Participating Farmers.

CHAPTER FOUR

METHODOLOGY

4.1 Description of the Study Area

Plateau State is located in the northern middle belt area of Nigeria. The State is mostly rocky and the area contains within its infractions chains of hills and many captivating rock formations. The name 'Plateau State was derived from the State's spectacular geographical landscape, with the high lands rising from 1,200 meters above sea level at the low lands to a peak of 1,829 meters above sea level. It shares boundary to the West with Kaduna State, to the North with Bauchi State, to the Southern part with Benue State, and to the East with Taraba and Nasarawa States. The State has seventeen Local Government Areas and has Jos town as its headquarters. It lies between the latitude of 80^0 24^1 and longitude of 80^0 32^I and 10^0 38^I East of the Greenwich Meridian. It is situated in the tropical zone, with a higher altitude ranges from 12,metres about 400 feet to a peak of 1829 meters above sea level. The State covers a total land area of 53,585 square kilometres (FOS, 2006). It has a population of 3,178,712 persons consisting of 1,593,033 males and 1,585,679 females with a population growing rate of 2.7 % per annum (NPC, 2006). The projected population for 2014 is 3,933822.

The State is classified into three senatorial zones which are Northern, Southern and Central zones. Plateau State is a multi-cultural and multi- ethnic State and the main ethnic groups include: Berom, Ngas, Jukun, Wase, Fulani, Kanke. As culturally diverse people, Plateau State has rich cultural heritage in her diverse religious practices i.e. Christianity, Islam, Traditional cultural festivals and culinary among others. Hausa is a major language spoken by majority of the people due to the influence of Hausa people. Plateau State provides a meeting point for the earliest Europeans for settlement in view

of the cold weather climate. The mean annual rainfall varies from 131.75 cm in the southern part to 146 cm on the Plateau, and highest rainfall is usually recorded in the months of July and August. The weather is always cold between the months of December and February as a result of the charlatan winds. Even though the temperatures appear highest between March and April, Plateau weather remains the coldest in Nigeria. Rainfall pattern is unimodal and ranges between 900mm - 1250mm per annum and average daily temperature between 18^0 -22^0C. The length of the growing period is 150- 200 days. Plateau State is located in the northern guinea savannah belt with scattered vegetation with grasses of different species. Farming is the major occupation in the area and agricultural production is mostly at subsistence level. The soil is developed from undifferentiated complex metamorphic and igneous rocks. The top soil coupled with reasonable organic matter enhances the fertility status of the soil. The physical properties of the soil are moderately good and allows continuous cropping of wide variety of crops such as tomato, cabbage, maize, irish potatoes, "acha" (*Digitaria spp)*, groundnut, sorghum, millet, cocoyam, sweet potatoes, beniseed, bambara nut, soy bean and vegetables, goats, sheep, piggery, fisheries and poultry. Non-farming activities of the people in the State include mining and civil service with majority of the government worker engaging in part time farming.

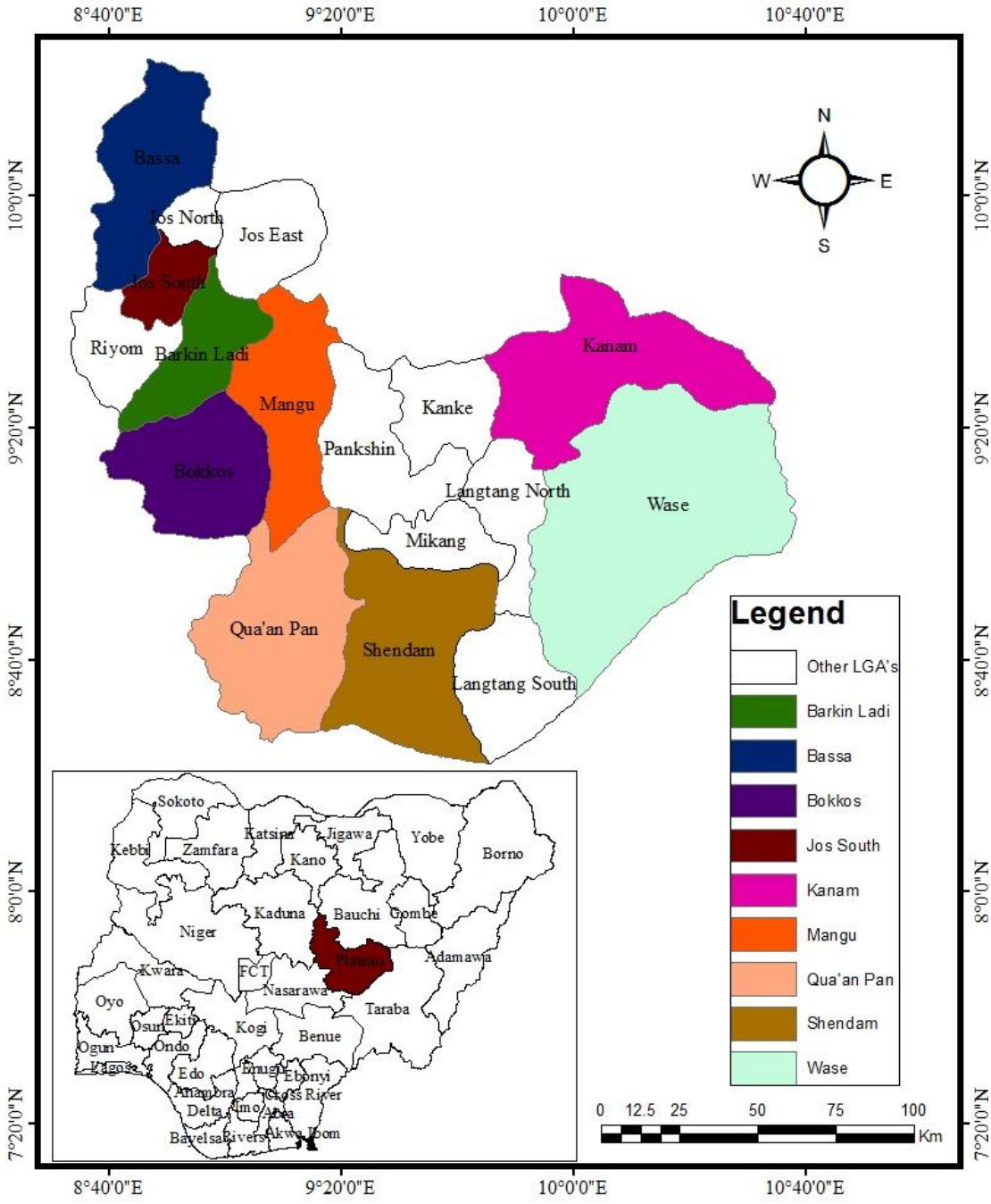


Figure 4.1: Map of Plateau State Showing the Study Area

4.2 Sampling Techniques and Sample Size

This study employed a multi stage sampling technique. In the first stage, three Local Government Areas were purposively selected from each of the three senatorial zones which are Jos-south, Barkin-Ladi, Bassa, Shendam, Quanpan, Wase, Bokkos, Mangu and Kanam making a total of nine Local Government Areas, this because of the active ASTC activities on tomato production in the areas of the zones. In the second stage, three villages having high ASTC participating farmers were purposively selected making a total of twenty- seven villages. Reconnaissance survey was conducted to identify registered participating tomato farmers of ASTC in the State. This was carried out with the assistance of Agricultural Extension Agent in the first stage. The third stage was based on random selection of 50% of 420 sampling frame of participant farmers of ASTC activities, which is 210 participating farmers, while fifty percent 50% of 420 sampling frame of non- participant farmers of (210) were also selected as the sample size. In all, 420 farmers were randomly and purposively selected.

Table 4.1: Distribution of project participant farmers (PPFs) according to district under ASTC in Plateau State zones and selected sample size of 50% from sampling frame of each village

Zones	**Purposively Selected LGAs**	**Randomly selected villages**	**Sampling frame of Participating farmers**	**Participating Farmers randomly selected at (50%) each**	**Non-participating Farmers purposively selected at (50%) each**
Northern zone	Jos-south	Kuru,	22	11	11
		Vom	30	15	15
		Du	20	10	10
	Barkin-Ladi	Kassa	32	16	16
		Ro	16	8	8
		Merit	24	12	12
	Bassa	Gingiri	20	10	10
		Binchi	18	9	9
		Mista ali	26	13	13
Southern zone	Shendam	Yelwa	16	8	8
		Kalong	26	13	13
		Shendam	14	7	7
	Quanpan	Namu	18	9	9
		Barkin	20	10	10
		Chiawa	16	8	8
	Wase	Kadariko	8	4	8
		Wadata arewa	4	2	2
		Gimbi	4	2	2
Central zone	Bokkos	Maikatako	10	5	5
		Tenti	10	5	5
		Bokkos	12	6	6
	Mangu	Mangi	6	3	3
		Gindiri	18	9	9
		Marabaushit	4	2	2
	Kanam	Dengi	14	7	7
		Jerimai,	6	3	3
		Garga	6	3	3
Total		**27**	**420**	**210**	**210**

4.3 Methods of Data Collection

The primary data was used as sources of information for this study. Primary data were collected from participating wand non-participating farmers, using (1) structured questionnaires, (2) personal observations and (3) Focused Group Discussion with the assistance of extension agents from ASTC project, this serves to support data gathered through the use of questionnaires. Information sourced includes socio- of farming experience, the institutional variables which are access to credit, frequency of extension contact and membership of cooperative societies and level of participation in ASTC project, factors influencing farmers' participation in ASTC project.

4.4 Analytical Procedure

The analytical tools to be used in achieving the objectives of the study are the following:-

i. Descriptive statistics

ii. Multiple regressions

iii. Chow test model

iv. Z -test statistic

4.4.1 Descriptive statistics

Descriptive statistics such as frequency distributions, percentages and means were used to achieve objectives i, ii, iii and vi of the study.

4.4.2 The multiple regression analysis

Multiple regression was used to identify factors influencing farmers' participation in the programme in (objective iv). In the regression analysis, the dependent variables (Y), and the independent variables (X) include variables such as Age (X_1),) Farming experience

(X_2), Sex (X_3) Household size (X_4))Marital status (X_5) Level of education (X_6) Membership of cooperative society (X_7) Farm size (X_8) Amount of credit received (X_9), Extension contacts (X_{10}) Income from tomato production (X_{11}).

The regression model is specified as follows:

$$Y= a + \beta_1 Xi+ \beta_2 X2+ \beta_3 X_3+ \beta_4 X_4+ \beta_5 X_5+ \beta_6 X_6+ \beta_7 X_7+ \beta_8 X_8+ \beta_9 X_9+ \beta_{10} X_{10}+ \beta_{11} X_{11}+ e \quad (4)$$

Where:

Y	=	Level of participation
a	=	Constant
β_1- β_{11}	=	Régression coefficients
X_1	=	Age (years)
X_2	=	Farming experience (Years)
X_3	=	Sex (Male, Female)
X_4	=	Household size (Number of persons in the household)
X_5	=	Marital status (Married=1,Single=2,Divorce=3,Widow=4)
X_6	=	Level of education (Years)
X_7	=	Membership of farmers, association or cooperative Societies (Yes= 1, No=2)
X_8	=	Farm size (Hectares) of tomato under cultivation
X_9	=	Amount of credit received (Naira)
X_{10}	=	Extension contacts (Number of contacts made)
X_{11}	=	Income from tomato production (Naira)
e	=	Error term

4.4.3 Chow test statistics

Chow test was used for objective (v) to measure the impact of ASTC intervention project on output, income and level of living of the participants and non-participants. The Z- test model was used to analyze hypotheses i, iii and iv and the regression model is used for hypotheses ii. Chow test is an econometric test to determine structural change in slope and equality in intercept of the income function of beneficiary and non beneficiary farmers. According to William (2011) the standard F test for the equality of two sets of coefficient in linear regression models is called a chow test. In programme evaluation, the chow test is often used to determine whether the independent variables have different impact on different sub groups of the population (Mohammad, 2014). The model for chow test is expressed mathematically as:

$$F * Chow = \frac{(RSS_3 - SSR_1 + SSR_2)/K}{(\mathrm{RSS}_1 + \mathrm{RSS}_2)/\ \mathrm{n}_1 + \mathrm{n}_2 - 2\mathrm{k}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where;

$RSSR_3$ = the sum of squared residuals from a linear regression in which b_1 and b_2 are assumed to be the same (pooled data).

SSR_1 = the sum of squared residuals from a linear regression of sample 1 (participants)

SSR_2 = the sum of squared residuals from a linear regression of sample 2 (Non-participants)

Both have dimension k and these are number of observation in total. The total number of observation is;

K = is the total number of regression estimates including intercept of

$N_1 + N_2$ = number of observation of the regression of sample 1 and 2 (participants and non-participants).

4.4.4 Z-test statistic

The Z- test model was used to analyze hypotheses i, iii and iv and the regression model is used for hypotheses ii. The z-statistic is expressed as follows:

$$z = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_1^2}{n_2}}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where; Z = calculated Z value

$\overline{\mathbf{X}}_1$ = Mean of ASTC participant farmers in tomato production

$\overline{\mathbf{X}}_2$ = Mean of non- ASTC participant farmers in tomato production.

S_1= Standard deviation of participant farmers in tomato product

S_2 = Standard deviation of non- participant farmers in tomato production.

n_1= Number of ASTC participant farmers in tomato production.

n_2= Number of non- ASTC participant farmers in tomato production farmers.

4.5 Measurement of Independent Variables

a Socio-economics characteristics

i. Age: It is believed that age is capable of influencing an individual's interest, perception, view and conduct. This means that the older the farmers, the less likely they are to quit farming. It is assumed that age affects productivity due to decline in agility, strength and decay or coordination over time. Thus age is included here to assess the level of the participants as they grow old. This was measured by actual number of years of the respondent at the time of data collection.

ii. Farming experience: Refers to the number of years a respondent has been involved in tomato farming operation. This was measured in years.

iii. Sex: male =2, female =1

iv. Household size: A farmer's major task is to provide enough food, security and shelter for his family and those that eat with him from the same pot. This was measured by total number of people in a household including; husband, wife, children and dependents.

v. Marital status: This was measured on: married = 1, single = 2, widow=3, divorce= 4.

vi. Level of education: Education refers to level of education of an individual which was measured by the total numbers of years spent in various levels of formal school Education has been found to contribute to the growth of non farming economy of villages and small rural towns. It has been linked with higher productivity in trading and other activities (Gordon, 2010).

vii. Membership of cooperative society: This was measured in by assigning 1 = for membership of a cooperative society, while 0 = will be assigned to non member to cooperative society.

viii. Farm size: This is the area of land puts under tomato cultivation and it was measured in hectares.

ix. Amount of credit received: Refers to capital in naira that respondents have received or borrowed from formal or informal institution for agricultural practices. Nigeria was rated as one of the 25 poorest countries in the world (UNDP, 1999) and it is worrisome to observe that the levels of poverty have risen from 27.2% of the population in 1980 to 65.6%.

x. Extension contact: It was measured by the total number of times a farmer received training or information on tomato production from extension workers whether on weekly, fortnightly or monthly. The more the numbers of meetings, the more the respondents tend to accept the innovation. Farmers contact with agricultural extension agent has been reported to improve adoption of technologies (Smith *et al*., 1994).

xi. Income received from tomato production. This was measured in naira.

b. Level of awareness of ASTC packages on tomato production:

For this study awareness of at least four out of six packages typify high level, while less than four packages reflect low awareness. The following were the packages of ASTC tomato programme; (1) supply of inputs (2) agronomic techniques in tomato production (3) sales of net houses and drip irrigation equipment (4) farmers capacity training (5) Linkage to market and (6) membership of group formation.

c. Level of participation in ASTC packages in tomato production:

For this study, participation in at least four out of six packages typify high level, while less than four packages reflect low level of participation. The following are the packages of ASTC tomato programme; (1) supply of inputs (2) agronomic techniques in tomato production (3) sales of net houses and drip irrigation equipment (4) farmers capacity training (5) Linkage to market and (6) membership of group formation.

4.5.1 Dependent variables

The dependent variable is the impact of ASTC intervention programme on the livelihoods of the farmers. The level of impact was determined based on the output, income gained by tomato farmers and level of living. .

4.5.2 Observable impacts are:

i. **Level of output:** This is the total quantity of tomatoes the farmers harvested in the previous growing seasons different years from his or her land measured in kilogram.

ii. **Level of income:** This was based on the money realized by the participants from tomato production. This was measured in monetary value (naira).

iii. **Level of living:** is seen as the material and impersonal resources with which individuals can master and command in their living conditions. It is the way an individual lives, not the way he wants to live. According to Benjamin (2010) stated that living level is concerned with the consumption or use of economic goods such as the total of food, fuel, and other non durable goods used up, the services of houses, automobiles, clothing, and other goods varying durability, and the services of human being enjoyed by an individual, or group in a given period of time. This was measured by the value of durable assets the farmers own such as motor cycle, bicycle, car, tractors, house, farm equipment, radio, television, livestock, motorized pump, knapsack and thresher. The price of each asset obtained was computed in monetary value (naira) in addition to farmers' income to determine the farmer's level of living as a result of the ASTC intervention project.

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1 Socio-Economic Characteristic of the Respondents

5.1.1 Sex distribution of farmers

The result of the analysis presented in Table 5.1 reveals that 89.8 % of the project participants are males and 72.2 % of non- participant while 10.2% and 22.8% are females of the participant and non- participant farmers respectively. This shows that males dominate tomato production in the study area. This may be attributed to the land ownership system that prevails in the area, which allows only male members of the society to inherit and own land. This study is in line with the previous studies of Ayandiji and Adeniyi (2011) who pointed out in a similar study that males have dominance in tomato production activities unlike their female counterparts because agricultural activities are seen in Western part as labour intensive.

Table 5.1: Distribution of farmers according to sex.

	Participants		**Non-Participants**	
Sex	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Male	185	89.8	159	77.2
Female	21	10.2	47	22.8
Total	**206**	**100**	**206**	**100**

5.1.2 Age distribution of farmers

Analysis in Table 5.2 shows that 72.8% and 71.8% of the participants and non-participants farmers respectively examined were within the age bracket of 31-40 years followed by 41-50 years of 12.1% and 12.6% participants and non-participants farmers respectively. This shows that large numbers constituted the active labour

force. This implies that, majority of the respondents were young, active and likely to be more productive, if given adequate levels of farming resources, the farmers have the potential to maximize their farm resources. This result is in conformity with Haruna *et al*. (2012) who found out that majority of the respondents (40%) belongs to the active population group of 36-40 years. The mean age value for participants and non-participants were 38.8 and 39.7 years of age respectively. Age has been found to be an important variable in agricultural productivity. The younger respondents formed the cream of the work force, implying the capability and willingness to participate, practice new innovations and utilize it effectively to higher degree. This agreed with Ayandiji and Adeniyi (2011) who reported that age bracket of 30-40 years is an indicator of good supply of agile workforce in tomato production. Therefore capacity building or training of these youth farmers on the value chain approach and its application can be used for the development of selected agricultural products, economy and poverty reduction.

Table 5.2: Distribution of respondents according to age

Age	**Participants**		**Non-Participants**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
20-30	14	6.8	10	4.9
31-40	150	72.8	148	71.8
41- 50	25	12.1	26	12.6
51- 60	5	2.4	10	4.9
61- 70	8	3.9	9	4.4
71- 80	4	1.9	3	1.5
Total	**206**	**100**	**206**	**100**
Mean	**39**		**40**	

5.1.3 Marital status distribution of farmers

The result reveals that majority (83.5%) of the participating farmers and (81.6%) of non-participating farmers were married while 10.7% and 12.6% were singles respectively. What the findings in Table 5.3 imply is that there is the possibility of both the

participating farmers and non-participating farmers having one or more dependants with adequate labour than the singles to send to work on the farm. The study reveals that since most families are married, it therefore suggests higher engagement and commitment towards the project as well as a sustainable means of family livelihood. The finding lends credence to the study of Ayandiji and Adeniyi (2011) who observed in the study of post-harvest losses in tomato production that majority of the farmers were married with 86.4% while 13.64% were singles. This implies that married farmers are likely to have access to more family labour in tomato production in the study area.

Table 5.3: Distribution of farmers according to marital status

	Participants		**Non-Participants**	
Marital Status	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Married	172	83.5	168	81.6
Single	22	10.7	26	12.6
Widow	12	5.8	12	5.8
Total	**206**	**100**	**206**	**100**

5.1.4 Educational qualification distribution of farmers

The findings in Table 5.4 reveals that (58.7%) of the participants' farmers and (46.1%) of non- participants' farmers attended primary school and this constituted the largest number of educational qualification attained in the study area. Secondary level of education accounted for (16.0%) and (29.1%) for participants and non participant farmers respectively, while only 12.5% and 10.2% of participants and non participant farmers had no formal education. The result has revealed a high preponderance of the educated respondents having one form of formal education or the other. In general, 87.3% and 89.8% of the participants and non- participants respectively have some form of education and 12.5% and 10.2% do not have any form of formal education. The implication of this is that education provides a platform for participation and adoption

of available innovations and easy access to information. This agrees with Mohiudden *et al.* (2007) who observed that in Patiya, that literacy had its own merits and contribution towards the process of modernization of agricultural revolution. Education has been identified as a catalyst in agricultural and other productive activities.

The preponderance of the educated respondents in ASTC farming is an incentive towards participation and adoption of improved farm practices thus translating to increased tomato productivity among the farmers. As they are educated they can manage their resources in an efficient manner. This study is also in line with the finding of (Marther and Adelzadeh, 1998) who reported that people with high educational level are likely to analyze and interpret information than those who have less education or no education at all. This implies that education has been found to be a catalyst in the participation and adoption of agricultural practice. The more educated a farmer is, the more he is receptive to changes and has the ability to adopt improved agricultural practices.

Table 5:4 Distributions of farmers according to educational attainment

Edu. attainment	Participants		Non-participants	
	Frequency	**Percentage**	**Frequency**	**Percentage**
No formal education	4	1.9	5	2.4
Quranic certificate	11	5.3	6	2.9
Adult education certificate	11	5.3	10	4.9
PSLC	121	58.7	95	46.1
SSC/ GCE/ grade II	33	16.0	60	29.1
Tertiary education	26	12.6	30	14.6
Total	**206**	**100**	**206**	**100**

5.1.5 Household size distribution of farmers

The result of table 5.5 reveals that majority 78.2% and 75.2 % of the beneficiaries and non-beneficiaries farmers respectively have family size of between 6-8, followed by16.5 % and 17.5% of between 9-11 family sizes of the beneficiaries and non-beneficiary farmers respectively. This household size implies the availability of family labour for tomato production. This agrees with Haruna *et al*. (2012) who found out that family size of 6-10 and 1-5 accounted for 46% and 32% respectively, while 14% and 8% accounted for family size of 11-15 and 16 above respectively. This minimizes the employment and expenditure on hired labour. Also large household size provides a repository of labour for production. Such large family size has also been known to put pressure on family heads in devising means of livelihood. Both household size and number of dependants had an influence on production since they affect consumption and production (Randela, 2005).

Table: 5.5 Distribution of respondents according to household size

Household size	Participants		Non-Participants	
	Frequency	Percentage	Frequency	Percentage
3-5	7	3.4	8	3.9
6-8	161	78.2	155	75.2
9-11	34	16.5	36	17.5
12	4	1.9	7	3.4
Total	**206**	**100**	**206**	**100**
Mean	**7**		**7**	

5.1.6 Farm size distribution of farmers

Farm size is an important fixed input resource factor in agricultural production. This is because it determines to a large extent the level of agricultural production (i,e small or large scale production). As indicated in Table 5.6, majority (68.4%) of the participating farmers had 1ha and (88.3%) of non- participating farmers had farm size of less than 0.5 ha respectively. The result could imply that most of the participating farmers had increased their farm size as a result of participation in ASTC project than the non participating farmers in the study area. Besides, both participating and non participating farmers were small scale holders with less than 2.0 hectares of farm holdings. This may be due to the inheritance system of land ownership common in the area of study which often results in land fragmentation among farmers leading to small land sizes. This agrees with the study of (Ojo *et al.,* 2009) in his study tomato production revealed that majority 71 % of respondents acquire their farm land through renting and 60 % of the farmers have farm sizes between 0.5-2 .0 hectares. Ownership of land influences agricultural productivity, because farmers who do not own land can be reluctant to develop and maintain the land (Randela *et al.,* 2000).

Table 5.6: Distribution of farmers according to farm size

	Participants		Non participants	
Farm size	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Less than 1	20	9.7	182	88.3
1	141	68.4	19	9.2
2	31	15.0	5	2.4
Greater than 3	14	6.8	0	0
Total	**206**	**100**	**206**	**100**

5.1.7 Membership of cooperative society distribution of farmers

Majority (52.9 %) of the participants farmers belong to cooperative societies while 78.6% of non participant farmers do not belong to cooperative as indicated in table 5.7. This implies that most of the activities carried out in tomato production are influenced by membership of group of formation and thus creating an opportunity for the participating farmers to have access to rub minds on tomato production problems as well as access to decision making process that affects them. The implication of this for the non participating farmers is that they operate at individual level in facing challenges in tomato production. This scenario could lead to ineffective and inefficient use of resources consequently resulting to low output production.

Table 5.7: Distribution of farmers according to membership of cooperative society

Membership of cooperative society	**Participant**		**Non-Participants**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Yes	109	52.9	44	21.4
No	97	47.1	162	78.6
Total	**206**	**100**	**206**	**100**

5.1.8 Farming experience in tomato production distribution of farmers

The result of the analysis of years of farming experience in tomato production shows in table 5.8 that the number of farming experience in tomato production is 11-15 years

which was higher for both the participating farmers and non participating farmers. The participating and non participating farmers had 77.2% and 82.5% experience in tomato production. This shows that both categories of farmers had a good number of years of experience in tomato practices. Farming experience is an important factor in determining both the productivity and the production level in farming. In some cases, it would appear that up to certain number of years of farming would have a positive effect. But in some cases, it becomes negative. The negative effect may be derived from aging or reluctance to change from old and familiar practices to those that are modern and improved. This also agreed with (Ojo *et al.*, 2009) who found out that tomato production is dominated by adults who had 6-20 years of experience in tomato cultivation. This implies that the production is dominated with experienced adults who are in active years of their life. It is therefore, expected that the participating farmers coupled with the years of experience in ASTC programme will no doubt culminate into higher level of productivity.

Table 5.8: Distribution of farmers according to farming experience in tomato production

Farming experience	**Participants**		**Non-participants**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Less than 5	9	4.4	17	8.3
6- 10	20	9.7	8	3.9
11-15	159	77.2	170	82.5
16 -20	2	1.0	0	0
21- 30	9	4.4	6	2.9
31- 40	7	3.4	5	2.4
Total	**206**	**100**	**206**	**100**
Mean	**4**		**13**	

5.1.9 Access to credit distribution of farmers

The result of the analysis of agricultural credit in table 5.9 shows that only 56.8% of participating and 80.6% of non participating farmers had access to credit to the tune of

₦450001-₦650000 and ₦50,000-₦250000 respectively. While the amount of credit accessed by the participants is higher than that of the non participants could be adduced to high potential harvest from the improved tomato production. While the access by non- participants is of little significance, it is worthy to mention that if the amount accessed is small then increased farm size and other operation may be limited . It is very clear from the result of the analysis that credit has a critical role to play in participation and adoption of ASTC activities among farmers in Plateau State. The implication of credit can be clearly understood in view of its role in agricultural development. This of course guarantees a better platform for participation in the ASTC project.

Table: 5.9 Distribution of farmers according to access to credit facilities.

Access to credit facilities	**Participants**		**Non-participants**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
₦50,000-₦250000	35	16.9	166	80.6
₦251001-₦450000	48	23.3	22	10.7
₦451001-₦650000	117	56.8	18	8.7
₦651001-₦850,000	4	1.9	0	0
₦8501001-₦1050,000	2	1.0	0	0
Total	**206**	**100**	**206**	**100**
Mean	₦414, 174		₦98,494	

5.1.10 Level of extension contact distribution of farmers

The result in Table 5.10 reveals that 73.8% of the participant famers had contact with the extension agents: while 81.1% of the non participants had no contact with the extension agents. Participants had weekly and fortnight contact between 2-3 times while the non participants do not have contact but 1-2 times at 12.1%. The study reveals that extension contact is high among the participating farmers and low among the non-participating farmers respectively. This is in line with Conroy (2003) who reported the existence of institutional context for agricultural development but with less emphasis on

extension accountability and lack of information sharing between different stake holders of the projects.

Table 5.10: Distribution of farmers according to extension contact

Extension contact	Participants		Non-participants	
	Frequency	Percentage	Frequency	Percentage
No contact	3	1.5	167	81.1
1-2	152	73.8	25	12.1
3-4	45	21.8	13	6.3
5-6	6	2.9	1	0.5
Total	206	100	206	100
Mean	5		2	

5.1.11 Level of awareness of ASTC packages distribution of farmers

The result presented in the Table 5.11 reveals that 54.4% of the participants were aware of the existence of 6 packages, while 17.0% of participants were aware of the existence of 4 packages and 10.2% aware of 3 packages, while the non-participant farmers 19.9% were aware of 6 enterprises or packages, 19.4% were quite aware of 4 programmes, 16.0% were aware of 3 programmes and 24.3% were aware of 1 programme. This implies that about 98.5% participating farmers and 79.6% of s non -participating farmers had high knowledge of the existence of at least 4 programmes of ASTC respectively. Both categories of farmers had a very high level of awareness of the project activities. It reveals that farmers are well informed of the tomato production practices carried out by ASTC. Mass media instruments like newspapers, televisions, etc would have played an important role in disseminating information about various ASTC packages or schemes implemented. This is in agreement with Ani (2007) who observed that level of perception of farmers on the benefits of any agricultural development Programmes could greatly influence farmers' awareness level and decisions to accept/ rejects new practices brought by the programme. (Yahaya and Olayide, 2006) observed in a

different positions that despite the high level of awareness of current cassava revolution in Nigeria, but level of participation in the technologies and adoption rate is still low. Oladele and Fawole (2007) noted that reason for high awareness of agricultural development programmes could be traced to the high intensity of extension services provided. This finding also agreed with the view of Shaaban *et al.* (2002) who found out that 56% had average knowledge, while 34.1% of respondents had high knowledge and 9.9% of the respondents had low knowledge of the studied recommendations.

Table 5.11: Distribution of farmers according to level of awareness

Number of ASTC enterprise awareness	**Participants**		**Non-participants**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
6	112	54.4	41	19.9
5	35	17.0	27	13.1
4	21	10.2	15	7.3
3	34	16.5	40	19.4
2	2	1.0	33	16.0
1	2	1.0	50	24.3
Total	**206**	**100**	**206**	**100**

5.1.12 Level of participation of farmers in ASTCs activities

Table 5.12 shows that 77.2% of the participants were involved in all the 6 enterprises, while 9.7% participated in 5 enterprises, 7.3% into 3 enterprises , 4.9% participated in 4 enterprises and 1.0% in 2 enterprises. For this study, participation in at least four packages typifies high level, while less than four packages reflect low level of participation. The following are the packages of ASTC tomato programme; (1) supply of inputs (2) agronomic techniques in tomato production (3) sales of net houses and drip irrigation equipment (4) farmers capacity training (5) Linkage to market and (6) membership of group formation. This implies that most of the respondents participated actively in at least 4 programmes out of six. And these participants were mostly regarded as the elite farmers. The high level of participation is mostly on the use of agronomic practices (72.

2%) ranking first. This shows that participation is quite high with interest and desirability by farmers to obtained new knowledge on the tomato production process. The high level of participation in the trial of high yielding and early maturing tomato varieties could be attributed to common interest developed by farmers on these technologies. This also agreed with the study of Agwu, (2010) who observed in the study of level of participation of farmers in the International Institute of Tropical Agriculture (IITA) spear grass (*Imperata cylindrica*) control project, that involvement of participants in project activities was highest on key decisions made by project officials and farmers. Farmers' participation is considered necessary to get community support for agricultural development projects (Cole, 2007). This also conform to the study of the of impact of national special programme for food security on livestock farmers in Ideato South Local Government Area of Imo State, Oruche *et al.* (2012) observed that there is increase in the level of production due to high level of participation in the programme, while the non participating farmers recorded low productivity and income due to traditional method of production. However, the study disagreed with Douglah (1997) who observed that poor adoption and failure of agricultural projects was due to lack of participation of the target group in all stages of the projects and people are not usually given chance to participate in all decisions that affects their lives directly. Government officials and experts support the idea of participation in principles but at ground level there is no common agreement.

Table 5.12: Distribution of farmers according to number of enterprise participated in.

Number of enterprise participation in	Participants	
	Frequency	Percentage
6	20	9.7
5	159	77.2
4	10	4.9
3	15	7.3
2	2	1.0
Total	**206**	**100**

5.1.13 Factors influencing participation in ASTC project distribution of farmers

The result in Table 5.13 shows the factors influencing farmers' participation in ASTC project. Outcome of the result shows the coefficient of marital status as (2.932), household size (1.816), income (2.501), education (3.320), access to credit (3.923) and tomato farming experience (2.225) and these were all found to be positive while the coefficients of age, sex and farm size were found to be negative. A positive coefficient indicates that higher values of the variables tend to increase the likelihood of farmers participation in ASTC programme. Similarly, a negative value of the coefficient implies that a higher value of the variable would decrease the probability of participating in ASTC programme.

Marital status: X_1 had estimated coefficient of 2.932 was found to be positive at 1% which implies that the more of change in marital status, the more the increase in the probability of being a participant in ASTC project. This could have been so because relatively change in marital status of headed household experiences pressure on food security and demand for higher responsibility than the single farmers. This finding also suggests that more married farmers were likely to have been involved in the farm work than the single, divorce and the widows.

Household size X_2 had estimated coefficient of 1.816 which is positive at10%. This implies that household head is directly linked with the possibility of participation in ASTC project. This finding suggests that larger household size were likely to be more participating in ASTC programme.

Income X_3 had an estimated coefficient of 2.501 which is positive at1% which implies that the more income received by the household the higher the likelihood that such a household will become more participative in the programme. This so because income received from the use of new package farmers provides the likelihood of bettering the living standard of the farmers. Bismark and Agbeti (2012) observed that the ability to send SMS, Education, farm size, income, location and district are the most important variables explaining tomato farmers' participation.

Education X_4 had estimated coefficient of 3.320 which is positive. This implies that level of education attained by the household head had significance at 5 %. This finding implies that the higher the level of education attained, the greater the possibility that such a household head will be more willing to participates in ASTC programme. This so because the level of education attained helps the household head and invariably members of the household in their understanding of extension messages available to them. Once such messages are well understood and implemented, participation was most likely to improve. The farmers would most likely be involved directly in the programme. In this way this will increase the probability of the household to be an active participant in the programme.

Access to credit X_5 had estimated coefficient of 3.923. This had a positive coefficient which was significant at 1% level o significance. The implication of this is that, the

greater the access to credit the more likelihood of participation. Access to income translates into higher participation in a programme.

Tomato farming experience X_6 had a positive and having statistical significance at 5% of estimate regression coefficient of 2.225. The positive and significant coefficients of years of farming experience have the implication that more years on the farm will enhance higher participation in ASTC programme. That is, the more number of years of farming experience, the more it translates into higher participation.

The coefficient of determinations (R^2) which is the percentage of the variation of the dependant variable explained by the independent variables was 60% while the adjusted R^2 value was 56% for the participants. The result of the study shows the cumulative contribution of independent variables to ASTC project participation with a coefficient of determination (R_2) value of 0.56.This implies all the variables explained about 56% of the total variability in participating in ASTC project in the study area. This agreed with Ahmad (2012) who pointed out in his study that only three variables of the four selected variables (age, holdings type, holdings Size and exposure to sources of information) positively and significantly influenced participation in protected tomato practices.

But his disagreed with Nsoanya and Nenna (2011) in the study of adoption of improved cassava production technologies found out that high yielding, resistance to diseases, early maturity period, and high market value and drought resistant are major reasons influencing cassava growers' adoption of improved cassava production technologies.

Table 5.13; Factors influencing participation in ASTC project distribution of farmers:

Variables	Participants		
	Coefficient	**Standard error**	**t-value**
Constant	71.469	23.726	3.012***
Age	-0.287	0.219	-1.306
Sex	-4.398	5.867	-0.750
Marital status	8.444	2.880	2.932***
Household size	2.102	1.157	1.816*
Education	2.576	1.111	2.320**
Membership of cooperative	5.558	3.694	1.505
Access to credit	5.620E-5	0.000	3.932***
Extension visit	0.808	1.108	-729
Land size	0-495	3.894	-.127
Farming experience	4.863	2.186	2.225**
Income	0.025	0.1	2.501***
R-square	0.600		
R-square adjusted	0.559		
F value	96.4***		
*** P< 0.01	** P< 0.05	* P< 0.10	

5.1.14 Impact of ASTC on the output of participant and non- participant farmers

The impact of ASTC on output of the participant and non- participant farmers in the study area was achieved using chow test statistics. Chow Test is a test that determines if the coefficients from two regression analyses are the same. However, three different linear regressions were carried out comprising of the pooled samples of participant and non- participant farmers, and separate linear regression for participant and non-participant farmers respectively. The residual sum of square of each of the three regressions was used to compute the chow test. The decision rule was that if Chow F-statistics is greater than that of F-table, then there is impact of ASTC on the output and structural differences between participant and non- participant farmers in terms of output, if otherwise there is no impact of ASTC in the study area.

The result from Table 5.14 revealed that the Chow F calculated was 149.87, while F table value at 10 degree of freedom with sample size of 412 is 1.85 at 5% level of

probability since the F calculated was greater than the F table value it therefore implies that there is a significant impact of ASTC on output of the participants in the study area. Chukwuemeka (2012) in his study of impact of ADP in Imo State revealed that the project assisted programmes help in promoting small-scale autonomous enterprise. It also tackled many aspects of agriculture, which include increased production, marketing, infrastructure and training. The impacts of ASTC was supposed to reflect positively on all assets of the beneficiaries income and productivity due to the upper hand they have in acquiring and using some productive inputs provided by the project.

Table 5.14 Impact of ASTC on the output of participant and non- participant farmers

Group Sample	**R^2**	**Residual sum of square**	**N**	**K**	**F-cal**	**F-tab**
Pooled Samples	0.738	118547474.121	412	10	149.87	1.85
participants	0.458	19606179.872	206			
Non-participants	0.521	3072658.231	206			

R^2 = regression coefficient, N = numbers of observation and K = numbers of parameters

5.1.15 Impact of ASTC on the income of participant and non- participant farmers

The result from Table 5.15 revealed that the Chow F calculated was 3.952, while F table value at 10 degree of freedom with sample size of 412 was 1.85 at 5% level of probability implying a significant impact of ASTC on income in the study area since the F calculated was greater than the F table value. This agreed with Agwunobi, (1993) who revealed in his assessment of impact of evaluation of Shell Petroleum Agricultural Extension programme in Imo state stated that that there was higher annual income for participating farmers than non-participating farmers. This is also in agreement with Tologbonse (2013) observed that the mean income of participants was (N134, 389.04) which was discovered to be much higher than that of the mean income of participants which amounted to (N5, 605.35).This means that participants have higher output and income than the non-participants from their agricultural enterprises.

Table 5.15 Impact of ASTC on the income of participant and non- participant farmers.

Group Sample	R^2	Residual sum of square	N	K	F-cal	F-tab
Pooled Samples	0.041	3060353513.647	412	10	3.952	1.85
participants	0.176	1288868664.061	206			
Non-participants	0.058	1464532002.645	206			

R^2 = regression coefficient, N = numbers of observation and K = numbers of parameters

5.1.16 Impact of ASTC on the level of living of participant and non- participant farmers

The impact of ASTC on level of living of the participant and non- participant farmers in the study area was also achieved using chow test statistics. The result in Table 5.16 shows chow test determination of coefficients from two regression analysis. However, three different linear regressions were carried out comprising of the pooled samples of participant and non- participant farmers, and separate linear regression for participant and non- participant farmers respectively. The residual sum of square of each of the three regressions was used to compute the chow test. The decision rule was that if Chow F-statistics is greater than that of F-table, there sis impact of ASTC on the level of living and structural differences between participant and non- participant farmers in terms of level of living, if otherwise there is no impact of ASTC in the study area. The result from Table 4.16 revealed that the Chow F calculated was 24.24, while F table value at 10 degree of freedom with sample size of 412 was 1.85 at 5% level of probability implying a significant impact of ASTC on the level of living in the study area since the F calculated was greater than the F Table. This is because the result of t-test (Table 5.16) further confirms the significant impact of ASTC on the level of living in the study area. This implies that participant farmers have enjoyed some forms of assets in terms of increased household items with the consumption or use of economic goods such as food, motor-cycle, bicycle, car, house, radio, television, motorized

pump, knapsack, thresher, fuel, and other non durable goods used up, thus signifying a significant improvement in their livelihood compared to the non- participating farmers. This is in agreement with Fadayomi (1998) findings of impact evaluation of Gombe ADP (1975-1981) which revealed that there is a smaller considerable impact on crop production and rural living standard than was envisaged at the inception of the project. Agricultural technologies and practices increase the employment rate, productivity and income of the farmers.

Table 5.16 Impact of ASTC on the level of living of participant and non- participant farmers

Group Sample	R^2	Residual sum of square	N	K	F-cal	F-tab
Pooled Samples	0.139	534868150308.257	412	10	24.24	1.85
participants	0.026	293871317789.399	206			
Non-participants	0.063	65622295620.858	206			

R^2 = regression coefficient, N = numbers of observation and K = numbers of parameters

5.1.17 Constraints encountered in ASTC project distribution of participating farmers:

There is no doubt based on the result of the analysis that ASTC had significant impact on the participant farmers' income when compared to non - participant farmers'. However Table 5.17 indicates that participating farmers attributed their major problem to untimely supply of input which accounted for 31.1% of the constraints. Also 22.3% indicated high cost of purchasing the equipment; also 19.4% indicated inadequate access to water for irrigation farming. 15.5% lack capital in form of credit, which plays a crucial role in the transformation of agriculture. This is because ASTC did not involve credit service provision in the project. This also agreed with Maheswari *et al*. (2008) who revealed in his study of precision farming technology, adoption decisions and productivity of vegetables in resource- poor

environments that lack of finance and credit facilities were the most important reasons for non participation and adoption of precision farming technology in a resource poor environment. This also agreed with Tarfa (1990) who observed that fertilizer, water availability, capital, high cost labour, tractor hiring, pest and diseases, marketing and prices were constraints to dry season farming irrigation system.

Table 5.17 Constraints encountered in ASTC project distribution of participating farmers

Constraints	**Participants**	
	Frequency	**Percentage**
Untimely delivery of inputs	64	31.1
Mixture of tomato seedlings with low quality ones	16	7.8
Cost of net house/irrigation equipment	46	22.3
No access to loans	32	15.5
Poor attitude of ASTC staff	6	2.9
No access to water	40	19.4
No ready-made market to absorbed the output	2	0.9
Total	**206**	**100**

5.2 Hypotheses

Table 5.1.18 Impact of ASTC on tomato output of participant and non- participant farmers.

The null hypothesis (H_o) which stated that there is no significant impact of ASTC on tomato output in the study area was tested using the result of a t-test presented in Table 5.1.18. From the result in the table, calculated t-value was 55.05 and greater than the critical value (t-critical two tail) of 1.971, therefore H_o is rejected at 5% level of significance. The result of the analysis indicates that ASTC has impact on output. The null hypothesis was rejected while the alternative hypothesis was accepted.

Table 5.1.18: Impact of ASTC project on tomato output of participant non- participant farmers.

Group of farmer	Mean	Sample size	Std. error	t-cal	t-critical
Participants	2551.74	206	255921.809	55.05	1.97
Non- participants	583.689	206	16099.493		

5.2.1: Impact of ASTC project on the income of participant and non - participant farmers.

The null hypothesis (H_O) which stated that there is no significant impact of ASTC project on participating farmers' income in the study area was tested using the result of a t-test presented in Table 5.19. From the result in the table, calculated t-value was 125.9 greater than the critical value (t-critical two tail) of 1.971, therefore H_o is rejected at 5% level of significance. The result of the analysis indicates that ASTC has impact on income. The null hypothesis was rejected while the alternative hypothesis was accepted. The result of t- test further confirmed this significant impact.

Table 5.19: Impact of ASTC on the income of participants non- participants

Group of farmer	Mean	Sample size	Std. error	t-cal	t-critical
Participants	49325.24	206	9732725.551	125.9	1.97
Non- participants	14847.08	206	7974698.792		

5.2.2: The Impact of ASTC on level of living among the participant and non-participant farmers.

The null hypothesis (H_o) which stated that there is no significant impact of ASTC on the level of living of the participant and non- participant farmers. The study area was tested using the result of a t-test presented in Table 20. From the result in the table, calculated t-value was 7.23 and greater than the critical value (t-critical two tail) of 1.97, therefore

H_o is rejected at 5% level of significance. This showed that ASTC programme has been able to impact positively on the properties enjoyed by the respondents and thus reflecting on high level of living of the participant farmers.

Table 5.20: Impact of ASTC on the level of living of the participants non- participants

Group of farmer	Mean	Sample size	Std. error	t-cal	t-critical
Participants	72742.71845	206	14804570069	7.23	1.97
Non- participants	9486.40	206	359514741.2		

5.3 Reasons for not participating in ASTC distribution of farmers

The study also explore why non-beneficiaries did not participate in the programme despite ASTC project at improving farmers level of income and livelihoods. Findings presented in Table 21 shows that majority 40.8 % of the non- participating indicated bad experiences from previous project. Next to this view are 36.4% of the respondents indicating that there were usually no meaningful results from most of the government projects in time past, 13.1% of the respondents indicated lack of capital and 8.3% indicated no proper awareness of the programme.

Table 5.21: Distribution of farmers according to reasons for not participating in ASTC project

	Participants	
Reasons for non-participation in ASTC project	**Frequency**	**Percentage**
No meaningful result from govt. projects	75	36.4
No proper awareness	17	8.3
Lack of capital	27	13.1
Bad experiences from previous project	84	40.8
Failure of past projects	3	1.4
Total	**206**	**100**

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Summary

The broad objective of the study was to assess the impact of ASTC project on the livelihoods of the farmers in Plateau State. In order to achieve this objective, multi-stage sampling technique was employed to select the farmers' respondents. Nine local government areas were purposefully selected out of the seventeen local government areas in the State. Sample was drawn from twenty -seven villages comprising three villages from each local government area where the activities of ASTC are high. The selection of the farmers was done randomly from the list of farmers' participant provided by the ASTC office and also through the help of the facilitators in each of the local government areas. A total of four hundred and twenty structured questionnaires were administered on both the ASTC beneficiaries and non-beneficiaries in the study areas but only four hundred and twelve questionnaires were found to be useful as the remaining were not properly completed. Data for analysis was based on participants and non- participants experience. The result was analyzed through the use of descriptive statistics, multiple regression, z- test and chow test statistics.

The result of the analysis showed that the average age of the participants- was 38.8 years while that of the non-participants was 39.7, hence there was no significant difference between the age of the participants and non- participants in the study area. Majority (89.8 %. participants and 77.2 % non- participants) examined were males. The mean household size between participants and non- participants were 7.4% and 7.5% respectively.

It was discovered that project participants 58.7% and non participants 46.1% had one form of formal education with significant contribution to participation in ASTC project. The difference between the levels of awareness of the ASTC programme in tomato production between the participants and non participants is at 82% and 40% respectively. Also the level of participation in ASTC among the participant farmers has been found to be high with 98.1% in 4 programmes in tomato production. Regression analysis result shows the coefficient of marital status as (2.932), household size (1.816), income (2.501), education (3.320), access to credit (3.923) and tomato farming experience (2.225) and these were all found to be positive while the coefficient of age, sex and farm size was found to be negative. A positive coefficient indicates that higher values of the variables tend to increase the likelihood of farmers participation in ASTC programme based on the coefficients of predicted variable were positive and were significant at 1%, 5% and 10%.

The chow test analysis of the impact of ASTC project on the output, income and level of living shows increases among the participants outcome with the calculated value of 149.87, 3.952 and 24.24 respectively. The result of the study shows the cumulative contribution of independent variables to ASTC project participation has coefficient of determination (R_2) value of 0.56.This implies all the variables explained about 56% of the total variability in participating in ASTC project in the study area.

The result of paired t-test further corroborated that all the variables selected had significant impact on the participating farmers ASTC, therefore the null hypotheses were rejected and the alternative hypotheses accepted that there is significant impact of ASTC project on output, income and level of living of the participating farmers.

Problems encountered by the participating farmers' ranges from untimely supply of input accounting for 31.1%, and 22.3% indicated high cost of purchasing the net houses and equipment. This result further showed that 19.4% indicated inadequate access to water for irrigation, which plays a crucial role in the transformation of agriculture are some of the constraints faced by farmers' household participation in ASTC project. Also bad experiences from previous project, no meaningful result from government project, lack of capital and no proper awareness were some of the numerous reasons claimed by the not participating in ASTC project.

6.2 Conclusion

The assessment study reveals that, it has been possible to established the fact that majority of the respondents were young, married and had one form of formal education or the other. Male farmers dominated tomato crop production with majority cultivating less than two hectares of land for production. So also, the level of awareness of ASTC tomato packages had been observed to be very high; this led to increase in employment generation with specific focus on improved tomato production. From the findings of the study, it has been possible to established the fact that during ASTC project, the output, income and level of living of the participants farmers increased significantly more than the non – participants farmers in the project. Hence the null hypotheses with regard to no impact of project on participant's output, income and level of living were rejected.

However, the participated tomato farmers had improved their socio-economic status through enhanced quality tomato yield that attracts higher income that culminates into improved level of living. The study recommends that Government should take renewed interest in dry season production by lending support in form of subsidy on irrigation and net house equipment.

6.3 Recommendations

The following recommendations were made based on the findings

i. ASTC should sustain the intensity of awareness campaign among the farmers in the State so as to further increase the number of participants.

ii. This study found out that untimely arrival of inputs due to bureaucracy was hindrance; it is therefore recommended that the network of inputs provision in the scheme be redesigned to ensure early and constant availability, so as not to discourage the participants.

iii. It was discovered in this study that the cost of net houses and irrigation equipment were quite high, because it has to be replaced barely every two years. It is therefore recommended that the materials be subsidized by government so as to sustain and further increase the level of participation already attained.

6.4 Contribution to Knowledge

i. The study revealed that the percentage difference between the output of the participant and non- participant farmers was 77.13%.

ii. The study also revealed that the percentage difference between the income of the participant and non- participant farmers was 69.89%.

iii. From the multiple regression analysis, the study revealed that the R^2 value was 0.6 which means that all the explanatory variables used in the analysis contributed 60% to ASTC project and thus contributing to global understanding of what works.

iv. From the chow test result, the chow F calculated was 149.87 while the F tabulated was 1.85, at 5% level of probability. This showed that there is impact of ASTC on the output of the participants.

v. The study provides concrete feedback and overview of ASTC programme to agricultural practioneers, government of Plateau State and the general public of the outstanding impact of ASTC project on output, income and level of living of farmers in the State.

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APPENDIX I

SECTION A

QUESTIONNNAIRE

A1 Name: …… A2 Village: …….

A3 LGA ---------- A4 Date of Interview: ----------

1. What is your highest educational qualification?

(1) None ( ) (2) Quar'an Certificate ( ) (3) Adult education Certificate ( ) (4) PSLC (5) SSCE/GCE/Grade II (6) Tertiary education

Demographic Characteristics of the household head

2. Sex (1) male ( ) (2) female ( )

3. Age of respondents

4. Marital status: (1) married ( ) (2) female ( ) (3) divorced ( ) (4) widow ( ) (5) others specify ---------- ( ).

5. How many are members of your household?

6. Give the following information on members of your household.

Name	**Age in years**	**Sex 1 = male, 2 = female**

7: How long have you been farming?

8: How long have you been into ASTC farming?

9: Did you participate in ASTC tomato production? Yes ( ) No ( )

10. Are you participating in ASTC Tomato production? Yes ( ) No ( )

11. Are you a member of any farmers, association or cooperative societies? Yes ( ) No ( )

12. Do you receive any amount of credit from any financial institution? (Naira)

13. What problems did you encounter in obtaining credit?

S/NO	Problems association with credit	
1.	Delay in getting the credit	
2.	High interest rate	
3.	Insufficient credit	
4.	Lack of collateral	
5.	Not a customer	

14. What is the amount of credit received?

SECTION B

15. What is/are the source(s) of awareness of ASTC project in Plateau State?

Mass media ( ) Neighbor ( ) Family ( ) Others Specify ( )

16. How often do you hear of ASTC activities? Regularly ( ) Every two days ( ) Every week ( ) Monthly ( ) Very rare ( )

17. Tick any of the ASTC activities you have heard of:

i. Inputs supply ( ) ii agronomic techniques in tomato production ( ) iii. Purchase of net houses and drip irrigation equipment ( ) iv. Farmers capacity training, ( )

v. linkage to market( ) vi. Membership of group formation( ) .

Linkage to marketing channels ( ) membership of group formation

18. Tick any of the following ASTC Intervention Activities you have participated in

(i) Input supply ;such as improved seeds of beef, plum and cherry tomato varieties,

fertilizers ( )

(ii)Agronomic practices: (Planting depth is2-3cm, crop spacing for tomato 40 cm

intra and 60 -70 cm inter spacing, distance between bed 1.6 m, use of net protective farming system for tomato production. Incorporate N.P.K 15:15:15 fertilizer and organic manure and 2nd dose application is 4 weeks of transplanting, staking the crop with string upward from after 3-4weeks of transplanting, weeding is carried out 2-4 weeks of transplanting or Use of herbicide through boom or motorized sprayers spray incase of tomato diseases with insecticides). ( )

(iii) Provision of equipment for family drip irrigation and gravitational irrigation, provision of net houses during the dry season and raining seasons. ( )

(iv) Training services on famers capacity development on the use of modern methods of tomato farming. ( )

(v) Linkage to market. ( )

(vi) Membership of group formation

19. What is the number of ASTCs extension agent visit in your area per month?

20. What is the cost of the technologies purchased from ASTC?

i. Pumping machine ( ) ii.Tomato seedling ( ) iii. Protective nets ( ) iv. Cost of attending training ( ) v. Registration of membership of association ( )

vi. Cost of input ( ) vii. Cost of linkage to market ( )

SECTION C

Factors influencing participation

21. Tick any of the factors influencing your participation in ASTC activities?

i.Access to credit facility ( )

ii.Expectation of support for government (fertilizer chemical) ( )

iii.Ready market for produce ( )

iv.High economic value of produce ( )

v.Expectation of improved management resource ( )

vi.Desire for house income ( )

vii.Quest for food security ( )

viii.Age

ix. Marital status ( )

x. Education ( )

xi. Household size ( )

xii. Number of training( )

xiii. Others specify ----------

22. How long have you been a beneficiary member of ASTC project? ----------

23. If No, Why did you not participate in ASTC Tomato Project?

SECTION D

Production information

24. How many plots of land did you use for tomato production before ASTC Project ----------

25. What is (are) the size (s) of your plot (s)

Field/plot	**Before 2008 intervention. Actual size (Ha) of tomatoes under cultivation**	**Crops grown**	**After 2008 intervention. Actual size of tomatoes under cultivation**
1 2 3 4			

26. In your assessment is there any difference in your crop output as a result of the participation in ASTC Tomato production? Yes ---------- No----------

27. If yes, how (i) decreased (ii) increased (iii) by how much percent.

28. In your assessment, is there any difference in the money earn from the sales of crop as a result of participation and adoption of ASTC technologies? Yes ---------- No-

29. If Yes, how? (i) decrease (ii) increase (iii) by how much percent.

30. Give the estimated area cultivated, output, yield and income for the important crops grown in the last cropping season.

Tomato Crop production	**Cultivation (ha)**	**Output in kg/ or small and large baskets**	Yield kg/ha	Estimate Value (N)
I ii iii iv				

Output includes crops consumer sold, gifts and what remains.

31. In your opinion, is there a difference in the area of land you now cultivate as a result of participation in ASTC Tomato production?

32 If yes, how?

(a) Decreased ( )

(ii) Increased ( )

(iii) By how much percent?

33.

Sales per basket	**2007 small and big basket**	**2014 small and big basket 2015**

34. Indicate your average income before and after participation in ASTC activities.

Income	**2007**	**2014**

35. What are the problems encountered in acquiring and use ASTC technologies (fertilizer, planting materials, spraying machine, chemical, sales of produce inadequate capital, late arrival of inputs.

36. Did you increase your plot size during the ASTC project (a) Yes ( ) No ( )

37. Impact of ASTC on the properties owned by Respondents

Household properties owned	**Before ASTC Project**	**After project/ value of assets**
Bicycle		
Motorcycle		
Car		
TV		
Radio		
Video Player		
Fan		
Gas Cooker		
Stove		

37. Perceived Benefit of ASTC Project by participating in ASTC Project by the beneficiary farmers

Farm output
Increase in farm size
Access to loan
Use improve technology
Ready market for purchase
Profit

38. What problems did you encounter in acquiring and using ASTC facilities? (i. Fertilizers ii .pumping iii. nets iv. tomato seedlings v. chemical vi. Protective materials vii. Linkage to markets viii. Process of becoming a member of group association) etc.

i ----------

(ii) ----------

(iii) ----------

(iv) ----------

(v) ----------

(vi) ----------

(vii) ----------

(viii) ----------

39. Reasons for not participating in ASTC BY Non-Beneficiaries

Option
i.No meaningful result from government project.
ii. No proper awareness
iii. Lack of capital
iv. Bad experiences from past projects
v. Failure of previous project

40. How many plots of land do you have?

Plot No	**Size of plot**		**How it was acquired**	**If purchased or rented amount (N)**

How did you acquire the land? 1. Inherited 2. Purchased 3. Gift 4. Rented 5. Community

41. Did you receive any training from ASTC on

(1) Yes ( ) (2) No ( )

42. If yes, how regular on the average

(1) Weekly ( ) (2) Monthly ( ) (3) Once every quarter, (4) Fortnightly ( )

43. In your opinion did you benefit (1) Yes ( ) (2) No ( )

44. If yes, did the training lead to increased production of.

(1) Yes ( ) (2) No ( )

45. What benefits did you receive from ASTC?

S/N	Benefits did you receive ASTC	2009, 2010 – 2013	2015
1. 2. 3. 4. 5. 6. 7. 8. 9.	Training on Tomato Production Increased visit by Extension Agents Gained knowledge on improved crop management And access to market information Gained access to crop processing equipment Had access to micro credit Training on Net housing Training on herbicides & pesticides application Gained access to improved crop technologies		

46. Source of improved seeds during the following years

S/N	Sources of improved seeds	2008	2009 - 2013	2015
1. **2.** **3.** **4.** **5.**	Own Production Market Friend/Neighbour Seed Growers Association Cooperative Society			

47. Compare your tomato yield performance in terms of size of land used for cultivation in the following years in kg or baskets

i. High ( ) ii. Very high ( ) iii. Undecided ( ) iv. Low ( ) v. Very low. ( )

49. In Your opinion …….ASTC IMPROVED YOUR LIVELIHOOD

S/N	Improved Livelihood	Value of assets
1.	Bought more land for farming	
2.	Bought animals for rearing	
3.	Bought a bicycle for personal use for commercial use	
4	Was able to build a house/rooms and or carryout improvement and also bought furniture for use in the house	
5.	Able to pay children's school fees easily bought furniture for use in the house	
6.	Able to marry second or third wife	
7.	Could buy farm inputs of fertilizers agrochemicals	
8.	Good health.	
9.	Quality foods	
10.	Food secure	
11.	Bought car for use	

50. Tick any of the factors influencing in your participation in ASTC activities?

S/N	1 . Age 2.Marita status 3.Years involved in ASTC activities 4.educational status 5 Households size 6.Access to credit facilities 7.numbers of training 8.Profits 9.High Production 10.Extension visits 11. Others specify

51. Did you benefit from any credit during the 2010?

(1) Yes ( ) (2) No ( )

52. If yes, kindly indicate from which source and …… (if kind, give the value)

S/NO	Source of credit	Amount (N)
1.	Agric Bank (NACRDB)	
2.	Commercial Banks	
3.	Cooperative Society	
4.	Friends/relatives	
5.	Money lenders	
6.	Self-savings	

53. Kindly indicate problems observed while participating in ASTC activities?

i. difficulty in acquisition of inputs( ) ii. Mixture of tomato seedlings with low quality ones ( ) iii. Bureaucracy in obtaining inputs ( ) iv. Insufficient funds v no access to loan ( )

vi. poor attitude of the staff ( ) vii. Untimely delivery of inputs ( ) viii. Cost of group membership ( ) ix. No access to water source ( ) x. No ready market ( ) xi. Others specify -------