IMPACT OF USAID/MARKETS PROGRAMMME ON SORGHUM FARMERS' LIVELIHOOD IN THREE LOCAL GOVERNMENT AREAS OF KADUNA STATE NIGERIA

BY

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DECLARATION

I hereby declare that this dissertation titled **"Impact of USAID / MARKETS Programme on Sorghum Farmers' Livelihood in Three Local Governments Areas of Kaduna State''** has been written by me and it is a record of my research work. No part of this work has been presented in any previous application for another Degree or Diploma in this or any other institution. All borrowed information have been duly acknowledged in the text and a list of references provided.

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CERTIFICATION

This dissertation titled **"Impact of USAID/MARKETS Programme on Sorghum Farmers' Livelihood in Three Local Governments Areas of Kaduna State"** by Umaru Muhammad Ahmad meets the regulations governing the award of the Degree of Master of Science in Agricultural Extension and Rural Sociology of the Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This dissertation is dedicated to Almighty Allah (SWT), The Creator of the universe and everything therein.

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I glorify the exalted name of Almighty Allah (SWT), the cherisher and sustainer of the universe, for His mercy, assistance and protection especially for seeing me through this programme successfully.

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ABSTRACT

The study was conducted in Soba, Giwa, and Kudan Local Government Areas of Kaduna State, Nigeria. It investigated the impact of USAID/MARKETS intervention programme on sorghum farmers' livelihood in the study area. The study also investigated the socio-economic characteristics of the respondents, it identified services rendered by the programme, production constraints and determined the factors influencing farmers' participation in the programme. A multi-Stage sampling technique was used to select respondents for the study. A total of two hundred and forty five respondents comprising of one hundred and fifty three (153) participants and ninety two (92) non-participants were interviewed with aid of structured questionnaire which vital information was obtained. Analytical tools used were both descriptive (frequency distribution, percentages and mean) and inferential statistics (logit regression and chow test statistical tool). The results of the analysis obtained shows that Majority (62%) of the respondents participants and (61%) of the non-participants were within the age range of 40-49 years. Almost all the respondents were married with just few singled. More also, about (16%) of the participants and (67%) of the non- participants had no formal education, while (73%), (28%) of the participants non- participants attended primary and secondary schools with only (11%) and (4%) of the participants and non-participants who attended tertiary institutions. The study revealed that participants benefited from support services rendered by the programme: training on improved sorghum production practices, technical assistance on quality input/field visits, and market linkages ranked 1^{st}, 2^{nd}, 3^{rd}, respectively, among the participants' farmers. Logit regression analysis showed pseudo R^2 of 0.623 meaning that about 62% of the variation in the participation of USAID/MARKETS was explained by the independent variables in models. Household size (x_3), Educational level (x_4), Extension visit (x_6), Cooperative membership (x_7), Farm size (x_8), had positive and direct relationship with participation in the USAID/MARKET programme implying that one unit increase in their variable coefficient result to an increase in level of participation. Chow test F-calculated for output, income and level of living were 4.61, 15.58, and 3.94 respectively, while that of F-tabulated value for 8 degree of freedom with sample size of 245 was 2.80 at 5% level of probability ($p < 0.05$), hence there was significant impact of USAID/MARKETS on sorghum production output, income and level of living of the participants in the study area. All the null hypotheses were rejected while the alternative hypotheses were accepted. Major constraints identified by the participants were pest and disease (53%) and inadequate capital (36. %) and labour shortages (31%) while high cost of fertilizers carried (13%). In overall, there was significant impact of USAID/MARKETS programme on sorghum production in the study area, hence it is recommended that the programme should be sustained and scaled-up and replicated in other LGAs and States in the country including FCT, Abuja that are yet to benefit from it.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Agriculture has been an important sector in the Nigerian economy in the past decades and is still a major sector despite the oil boom. Basically it provides employment opportunities for the teeming population, eradicates poverty and contributes to the growth of the economy. Despite these however, the sector is thus characterized by low yields, low level of inputs and limited areas under cultivation (Izuchukwu, 2011). It involves small scale farmers scattered over wide expanse of land area, with small holding ranging from 0.5 to 3.0 hectare per farm land. It is characterized by rudimentary farm systems, low capitalization and low yield per hectare (Kolawale and Ojo, 2007). Agriculture provides primary means of employment for Nigeria and accounts for more than one third of total Gross Domestic Product (GDP) and labour force in 2009 (Ismaila *et al*., 2010).

The Contribution of agriculture to Nigeria's Gross Domestic Product (GDP), which stood at an average of 56% in 1960-1964 decreased to 47% in 1965-1969 and a further decline to 35% was recorded in 2002-2004 and with crop production accounting for an estimated 85% of this total, the agricultural sector provides a livelihood for the bulk of the rural population (Amaza and Maurice, 2005); provides up to 70% active labour force (Olatunji, 2002; Bello, 2004; Ayinde, 2008), supplies raw materials required by the industrial sector and generate foreign exchange through export. In spite of this, agricultural production has failed to meet the food needs of the country's rapid growing population (Ayinde, 2008).

According to the United States Agency for International Development (2008), sorghum is the fifth important cereal crop in the world after wheat, rice, maize and barley. The crop is grown mostly in northern part of the country. North-west zone is the highest sorghum producer in Nigeria (NAERLS, 2010). Nigeria is the second largest producer of sorghum in the world with an annual production in excess of 8 million metric tons. Sorghum ranks among the top three important grains in the country while its industrial demand is increasing particularly in the food, beverage and livestock feed industries. Significant efforts have gone into research and development of improved sorghum varieties and production practices by both the public and private sectors. In spite of this, the producers, mainly smallholder farmers, are yet to achieve a significant increase in their incomes due to high cost and adulteration of inputs, lack of credit, inadequate extension services and poorly developed market linkages (USAID, 2008).

The United State Agency for International Development (USAID) in its programme Maximizing Agricultural Revenues and Key Enterprises in Targeted Sites (MARKETS) is addressing these concerns through a network of activities under its sorghum improvement programme, an integrated approach to developing a sustainable and effective sorghum value chain. The approach includes the provision of technical assistance to producers through the adoption of improved production practices, facilitation of access to credit and inputs, improvement in value addition and linkages to markets (USAID, 2009).

Since 2005, The USAID /MARKETS have been expanding economic opportunities in the agricultural sector by increasing jobs, sales, and investment for farm and non-farm agricultural businesses. Presently, Nigeria's sorghum production sub-sector is dominated by weak and inefficient production system. This is accounted for by poor

infrastructure including lack of improved processing facilities, low sorghum, poor post-harvest handling and storage, expensive and poor access to inputs (high quality seed, fertilizer, crop protection products), inadequate market information, lack of transparency among actors in the sorghum production, low capacity to meet quality standards and limited efficiency of distribution networks (USAID/ MARKETS, 2009). These problems thus pose great challenges to farmers and other stake holders in sorghum production and utilization.

1.2 Problem Statement

Sorghum constitutes the main food grain for over 750 million people who live in the semi- arid tropics of Africa, Asia, and Latin America (Food Security Department, 2004). In terms of tonnage, sorghum is Africa's second most important cereal. The continent produces about 20 million tonnes of sorghum per annum, about one-third of the world crop (Taylor, 2003). Nigeria was ranked second in sorghum production worldwide after India in 2011 (FAOSTAT, 2011), with production of 6,897,060 tones over 4, 891,150 ha with an average yield of 14,101 kg/ha. Being poor in resources, most of sorghum farmers have only minimum access to production inputs and improved credit facilities for their purchase (Food Security Department, 2004). Even when this crop is produced, farmers face further challenges to get buyers for their produce, resulting in production surplus and subsequently wastage. This marketing problem has taken some farmers out of commercial sorghum production.

Over the years, various agricultural programmes and policies are both public and private sector driven. These include Agricultural Development Projects (ADPs), which started as a pilot project in 1975, Operation Feed the Nation (OFN), in 1976, Green Revolution (GR) in 1979, National Accelerated Food Production Programme (NAFPP), in 1992. Most of these agricultural programmes and policies focused more on

increasing output production with little or no emphasis on marketing strategies. Market access proponents argue that for smallholders to thrive in a global economy there is the need to shift the focus from production based programmes to that of marketing interventions (Barham and Chitemi, 2009). In tune with this perception, much development related programmes have facilitated the establishments of new and strengthening of existing farming groups as a means to enhance farmers' market access through marketing and extension market related innovation activities global (Facheaux *et al*., 2006).

One of these marketing based interventions is USAID/MARKETS programme whose approach begins with identifying a target market, followed by developing strategic partnerships with agribusiness firms that service this market and are committed to local production through backward integration (USAID/ MARKETS, 2009). USAID/MARKETS programme on sorghum production commenced since 2005. However, information on the impact of this programme on the participating sorghum farmers in the study area is inadequate. Though USAID/MARKETS have carried out impact assessment study of the programme, there is the need for such information from an external source in order to avoid possible biased assessment and to ensure balanced evaluation.

Based on the foregoing the study attempts to answer the following questions;

(i) What are the socio-economic characteristics of sorghum farmers under USAID /MARKETS programme?

(ii) What are the socio-economic and institutional factors influencing participation of sorghum farmers in USAID/MARKETS programme in the study area?

(iii) What is the support services provided to sorghum farmers by the USAID/MARKETS programme in the study area?

(iv) What is the impact of the USAID/MARKETS programme on livelihood of sorghum farmers in the study area?

(v) What are the constraints faced by sorghum farmers under the programme?

1.3 Objectives of the Study

The broad objective of this study was to assess the Impact of USAID /MARKETS programme on sorghum farmers' livelihood. The specific objectives were to:

(i) describe the socio-economic characteristics of sorghum farmers under USAID/ MARKETS programme;

(ii) determine the socio-economic and institutional factors influencing participation of sorghum farmers in USAID/MARKETS programme in the study area;

(iii) assess the support services provided to sorghum farmers by USAID/MARKETS programme in the study area;

(iv) determine the impact of USAID/MARKETS programme on livelihood of sorghum farmers in the study area;

(v) describe the constraints faced by sorghum farmers under the programme.

1.4 Justification of the Study

In 2012, Nigeria produced approximately 6.9 million metric tonnes of sorghum; 80% of which is consumed for food while 20% is for cross-border trade and industrial use and it is estimated that the consumption by the major industrial users of sorghum in Nigeria is 200,000metric tonnes per annum (Tonukari, 2012). Sorghum is a local grain that is grown predominantly in the semi-arid savannah and grassland areas of Northern Nigeria and other parts of the world and it is nutritionally rich and serves as a staple food in most parts of Northern Nigeria (Tonukari, 2012).

The grain has assumed commercial relevance lately, especially in the food and beverage industry and it has been found to be a valuable ingredient next to malted

barley used in the industry (USAID, 2009). The combined demand for raw sorghum and malted sorghum is increasing in Nigeria. This provides a guarantee of steady demand and more business opportunities for sorghum farmers. It is expected that increased sorghum production in Nigeria will translate into higher consumption, better nutrition and enhanced marketing for maximum benefits. These benefits can be achieved with USAID/MARKETS programme intervention if adequate information on the impact of this programme on the participating farmer's livelihood is available and recommendations are provided to improve on the programme.

The findings are also expected to be useful to agricultural project/programme planners and implementers, donor agencies, project/programme supervising agencies, the Federal Ministry of Agriculture and Mineral Resources (FMAMR), researchers and beneficiaries of USAID/MARKETS programme in terms of policy formulation and design of programme that better the life of rural people.

1.5 Research Hypotheses

i. Socio-economic and institutional factors have no significant influence on farmers' participation in the USAID/MARKETS programme in the study area.

ii. USAID/MARKETS programme has no significant impact on livelihood of the participating farmers in the study area.

CHAPTER TWO

LITERATURE REVIEW

2.1 Sorghum Crop

Sorghum (*Sorghum bicolor* L.) Moench is a staple food crop for millions of poor in the semi-arid tropics (SAT) and is adapted to a wide range of environmental conditions. It is suitable for cultivation in semi-arid and arid areas of the world even in areas where rice, wheat and corn are difficult to grow (Ezeaku *et al*., 1997).

Sorghum is a cereal of remarkable genetic variability; more than 30,000 varieties are present in the world (Pacific, 2009). It's a thermophilic (26-40^{0}C), drought-resistant plant, which grow slowly at 16-20^{0}C and stops growing under; cultivated sorghums are annual or weak perennials and are essentially non rhizomatous, the roots continue to live and support the plant. Sorghum plants are 0.5 to 5cm in diameter at the base, while the seed could be white, yellow or brown colour, usually at 4 to 5mm long and 2.5 to 4.6 mm wide (www.pacificseed.com). Extremely high temperature during the grain formation is a factor that reduces the seed yield (Onwuem and Sinha, 1991). Meanwhile sorghum can be grown successfully on a wide range of soils. It tolerates ph range from 5.5 to 8.5 and also some degree of salinity, alkalinity and poor drainage. Although, sorghum is the crop of the plains, it is grown even up to an elevation of 2,400 meters in the Kigezi highlands of Uganda. Sorghum requires between 600mm to 1000mm rainfall per annum which should be evenly distributed throughout the season (Nutsugeh, 2001)

Sorghum as a crop originated as far back as 3,000 years ago. The selection in those early times was for grain more than for forage. However, selection for forage varieties has been occurring for the last hundred years. Forage sorghums are similar to grain

types but are taller and have higher forage quality (Newmann *et al*., 2010). It is generally, although not universally, considered to have first been domesticated in North Africa, possibly in the Nile or Ethiopian regions as recently as 1000 BC (kimber,2000). The cultivation of sorghum played a crucial role in the spread of the Bantu (black) group of people across sub-Saharan Africa (Diamond, 1998). Today, sorghum is cultivated across the world in the warmer climatic areas. It is quantitatively the world's fifth largest most important cereal grain, after wheat, maize, rice and barley (FAO, 2003).

2.1.1 Sorghum production in Nigeria

In 2011 the world grain production of sorghum was 44,198,010 tonnes, with an average yield of 15, 274 kg/ha over 35,482,800 ha (FAOSTAT, 2011). In Africa 20,780,959 tonnes were produced at an average yield of 10,623 kg/ha across 19,561,929 ha during the same period. Nigeria was ranked second in sorghum production worldwide after India in 2011 (FAOSTAT, 2011), with production of 6,897,060 tonnes, harvested from 4, 891,150 ha at with an average yield of 14,101 kg/ha.

About 50% of the total area devoted to cereal crops in Nigeria is occupied by sorghum. The area estimated at 6.86 million hectares extends north-ward from latitude 8^0N to latitude 14^0N (Aba *et al.,* 2004). In 1978, the total sorghum production in Nigeria was estimated at 4.8million tonnes and this figure has risen to about 7.0million tones annually (Obilana, 2005). Consequently, Nigeria becomes the highest producer in the West African sub-region, accounting for 71% of the regional total regional total sorghum output. Globally also, the country leads in sorghum production for human consumption and has risen from its 5^{th} position in 1995 (FAO, 1995) to be the third largest producer of sorghum in the world after the USA and Indian where more than 90% of their sorghum harvest is used for animal feed (Obilana, 2005).

The largest growers of sorghum are India (16 million hectares), Nigeria (6 million hectares) and Sudan (2.5 million hectares) and total sorghum production in the world exceeds 50 million tonnes, a third of which is from a small area in the developed countries. Average yields are very high on the American continent (> 3.0 t/ha), while they are low (< 1.0 t/ha) in India and Africa accounts only for a quarter of the world's sorghum production (Idrissa, 2010).

2.1.2 Sorghum adaptation to environmental conditions

Sorghum crop has better drought tolerance than most other field crops and significant variation exists within the species (Walulu *et al*., 1994). As a warm-season crop (photosynthetic pathway), it is a short-day annual grass, growing best under relatively high temperatures and under sunny conditions (Newmann *et al*., 2010). FAO (1995) reported that sorghum is an annual and warm weather crop which comprises 600 genera. The species are native to tropical and sub tropical regions of all continents in addition to the South - west pacific sorghum is similar to corn (maize) in its early stages, with corn-like leaves and stalks but varies considerably from it in later stages.

The inflorescence and grain is a panicle, characterized by spikelet's borne in pairs. It has more shots than corn and produces several head bearing culms from the nodes. It has more extensively branched root system, waxy coating on leaves and stems which helps to retain water even under intense heat and these number of morphological physiological characteristics contribute to its adaptation to dry condition. Hence it is widely grown in different ecological zones of Nigeria and equally grows on a wide range of soils: sandy, loamy, sandy-loamy, saline, and alkaline soils with a pH range of 4.0 to 8.5 (Showemimo *et al*., 2000).

2.1.3 Sorghum breeding and selection

In Nigeria, the most common land races of sorghum are: Kaura, Fara-fara and Guinea . They are variously tolerant to striga (a parasitic weed) in all the Savannah zones and are agronomical alike (Ogbonna, 2007). Improvement by breeding started in 1956 in Nigeria, however, years of selection at the Institute of Agricultural Research (IAR), Samaru Nigeria have resulted in the development and release of sorghum varieties suited to specific ecological zones (Aba, *et al.,* 2004). Some of the improved varieties are; SAMSORG-3 and SAMSORG-40 (Sudan savannah ecology) SAMSORG-13 and SAMSORG-24 (Northern Guinea Savannah Ecology), and SAMSORG-17 and SAMSORG-16 (Southern Guinea Ecology) among others.

Sorghums in general can be classified into two types: Forage types (mainly for forage or animal feed) and grain types (mainly for human consumption). The forage sorghums are further grouped into four types: (a) hybrid forage sorghum, (b) sudan grass, (c) sorghum x sudan hybrids (also known as sudan hybrids), and (d) sweet sorghum. The latter is used mainly for molasses but more recently for biofuel production as well (Newmann *et al.*, 2010).

2.1.4 Sorghum processing and utilization

i. Processing

Sorghum is the most amenable cereal grain to different processing technologies including: primary, secondary and tertiary methods (Obilana, 2005). Primary processing involves: fermentation, malting, wet and dry milling, boiling roasting and popping. Secondary processing involves; brewing, beverage and drinks production, baking and confectionary making, steaming, extrusion (for paste and noodles), while tertiary processing involve; composite flours (mixing of cereal/cereal flours, cereal/legume flours, cereal/cassava flours), bio-fortification and chemical fortification

additives. The different processing levels and there technologies are achieved using different agro-industrial equipments and machineries. These result in diversified end product for foods, feeds, beverages, alcoholic and non-alcoholic drinks.

ii. Utilization

The uses of sorghum in Nigeria can be group into two: traditional and industrial. The traditional uses include a variety of traditional foods, beverages and drinks while its non-food traditional uses include: thatching of roots and fencing of compounds. Sorghum consumption for food is mainly in the form of flour or paste processed into two main dishes: "OGI" or "AKAMU", a thin porridge and "TUWO", tick porridge. Other dishes that are sometimes made from sorghum include a number of deep fried snacks, steamed dumplings, etc (Obilana, 1981). Of all the cereal crops, sorghum contribute about 50% of the calories in Nigeria generally and about 73% in the savannah regions of the country in particular (Taylor, 2003).

Sorghum foods are also high in minerals, vitamins and some essential amino acids which are further enhance through bio-fortification thus, making them superior to other cereal foods. They contribute more energy and digestible protein in the diet of the majority of the people in sub-Saharan regions than those obtained from root and tuber crops (Aba *et al.,* 2004). In addition, its polyphenol (mostly Tanin) contents are used as antioxidant just as the slow digestibility of sorghum starch and protein makes its food useful in diabetic treatments.

2.2 Importance of Sorghum Crop to Nigeria

According to Taylor (2003), sorghum is vitally important cereals for the maintenance of food security in Africa. The same notion is supported by FAO (2008) that small grains are the answer to chronic food shortages to rural communities who reside in

semi-arid regions especially of the sub Saharan region. This is because of their high levels of adaptation to African conditions (Taylor, 2003). They represent about half the total cereal production on the continent and as such are a major source of protein for the population.

Same conclusions were made in a study that was conducted by Alumira and Rusike (2005) which revealed that new sorghum varieties can reduce the probability of zero yields. Thus, they can make a significant contribution to household food security in drought years (Alumira and Rusike, 2005). However, Alumira and Rusike (2005) argued that changes in varieties alone could not guarantee increased yields from sorghum. Rather they have to be accompanied by improved crop management methods.

Regardless of this, Taylor (2003) argues that sorghum is still under researched compared to other cereals. In view of that, Taylor (2003) advocates that with proper research sorghum could play a more important role and will offer better long-term food security than maize. This is because sorghum is indigenous African cereals that, unlike maize and wheat, are well adapted to African semi-arid and sub-tropical agronomic conditions (Taylor 2003). Additional evidence is provided by Taylor (2003) that these grains represent the major source of dietary energy and protein for some one billion people in the semi-arid tropics. The same considerations were mentioned before by Sorghum presents potential food staple for many of the poorest farm households in semi-arid areas if values are added in order to enhance its quality.

According to FMEST (1984) and Sani *et al* (2013), sorghum is one of the most important staple food crops in Nigeria and its production surpasses all other crops and in the Nigerian savannah zone is grown on an estimated area of 4.5 million hectares with annual production output of about 6 million tons. The crop is environmentally –

friendly, requires little or no fertilizers or pesticides and is biodegradable (uses) The leaves and grains are also used for livestock feeds and the stalks for thatching houses and making fences (NAERLS, 1997). Sorghum is a very valuable industrial crop for brewing alcoholic and non alcoholic drinks as well as in the baking and confectionery industries in Nigeria. According to Samson et al (1981) and Sani *et al* (2013), sorghum has greater untapped potentials than any other crop. It even postulated that if the twentieth century was the century of wheat, rice and maize, then the twenty-first century could become the century of sorghum. So of all the cereal crops, sorghum contributes about 50% of the calories in Nigeria generally and about 73% in the savannah regions of the country in particular (Samson *et al.*, 1981 and Sani *et al.*, 2013). The potential for sorghum to be the driver of economic development in Africa especially Nigeria cannot be over emphasized.

2.3 Nutritional Value of Sorghum Grain

To understand more about the uses of sorghum grain, it is important to first know about the nutritional value of this crop. Sorghum has excellent chemical and physical properties, which make it a grain of good quality for processing different types of products. Nutritionally, this grain is a source of protein and energy because it supplies carbohydrates and has more fat than rice and wheat. Additionally, sorghum contains iron, zinc, manganese and copper. Also, its protein structure helps to ensure the quality of various foods: snacks, porridges, flour, and also feed concentrate. Furthermore, it is gluten free and so is consumed by diabetics, and it is a substitute for wheat flour (Hamaker and Bugusu, 2002).

According to Joe Hancock (2011), sorghum grain nutritional value has been subject of myths that limit its consumption in the feed industry: (1) “Sorghum grain has lower content and availability of nutrients than maize:” Compared to maize, sorghum has more

mineral content but has a lower level of some amino acids and vitamins (i e. Arginine, Histidine, Lysine) and higher level of others (i.e. Isolucine, Leucine, Trutophan and Valine). (2) “Sorghum is full of tannins and mycotoxins:” It has been shown that locally grown grains have better quality because of genetically fewer mycotoxins. (3) “Sorghum is not responsive to advanced technology:” The nutritional value of sorghum compared with maize depends on the particle size, thus grinding is very important. A particle size of 500 to 600 microns is recommended when sorghum is used for poultry feed. (4)”Seed grain colour is an indication of the nutritional value of sorghum grain:” Pericarp and endosperm colour do not seem to be nutritionally significant. Also, the white sorghum grain plant may be important in marketing and perception of sorghum but it has no nutritional advantages.

2.4 Uses of Sorghum Grain in Nigeria

Sorghum is used in foods, such as porridge, bread, pastries, couscous, and beverages. In Nigeria, sorghum is mainly consumed as tuwo (local paste) and local beverages. Around the world, it is also used for the production of malt drinks, lagers, other beverages and confectioneries as well as in the livestock feeds industry. It can also be used as a gluten-free replacement for wheat, but due to the lack of gluten, sorghum bread is generally unleavened. Today, breeding has resulted in better nutritional value of sorghum and better flavour (tonukari, 2012). It is used mainly as a substitute for corn in the feed industry. More recently, it has been used to substitute for wheat flour in baked products. Primarily, sorghum has four different areas for classifying its value added products: Bio-ethanol, beer, -human food, and animal food. We will start by looking at general aspects of each of these areas.

In the ethanol market, corn and sorghum are perfect substitutes. Sorghum can be used in three types of ethanol production: Starch, sugar, and cellulosic, which results in approximately 30 to 35% of US sorghum grain production being used for ethanol purposes. Second, in Africa, sorghum grain is used to produce opaque beer on a large scale, and the industry is growing in southern, central, and eastern Africa. In fact, beer is one of the few industrialized products in Africa. Sorghum malt is the main ingredient, and it is used in Zimbabwe and South Africa (Taylor, 2007).

Third, although sorghum grain has great nutritional properties for humans, its consumption has decreased in urban areas because of the time and effort necessary to prepare sorghum food, and also because of the few marketing techniques to promote its products. While it is used to prepare foods for adults and children, it is not well digested by infants unless it is combined with food that contains lysine (Anglani, 1998). Clearly, foods prepared with sorghum do not succeed in the market because of consumer bias against it (i.e. inconvenience, unpopular texture, poor shelf-stability). Despite this, sorghum flour is the main sorghum value added product that is increasing its marketability in Africa and is getting importance the last three years in Central America, especially in El Salvador and Nicaragua.

Ultimately, feed is the main value added product made with sorghum.

Its demand drives production around the world. In fact, 80 percent of total demand for the grain comes from the United States, Japan, Mexico, Argentina, and Venezuela. Central America also uses this grain for feeding animals but uses locally produced sources. It is popular in part because researchers have shown that sorghum grain has 90 to 95 percent of the feeding value of maize. It is especially favoured to feed swine and poultry. Moreover, recent studies have shown that sorghum can substitute for maize

100 percent without reducing animal performance; however, in broilers' diets, 1 to 2.5 percent fat is required for sorghum to meet maize's nutritional value (Douglas *et al.,* 1990).

2.5 Socio-Economic Characteristics of Sorghum Farmers

Socio-economic characteristics of farmers have been found to influence their level of participation in agricultural project implementation (Olufemi *et al.,* 2002 and Banjol *et al.,* 2003). Okwoche *et al.* (2012), in a study titled agricultural information utilization among rural sorghum farmers in Benue State of Nigeria reported that majority (70.77%) were male, while 25.33% were female. The male dominance of this rural source of livelihood implies the laborious nature of sorghum farming operations right from tillage to harvesting which their female counterparts cannot easily undertake. This is because the operations require a lot of energy and is labour intensive especially in the rural areas where crude farm implements are usually used. This agrees with the findings of Asogwa *et al*. (2012), in a study titled Marketing of Agricultural Produce among Rural Farm Households in Nigeria: The Case of Sorghum Marketing in Benue States that the majorities (77%) of the respondents involved in sorghum marketing are males while 23% are females.

Abdullahi *et al.* (2012), which reported that in Ikara Local Government Area of Kaduna State, majority of the sampled respondents were middle aged farmers. . This result suggests that majority of sorghum farmers in the study area are young farmers who are within the age bracket in which people are innovative and active at work (Asogwa *et al*., 2012). Similarly, this findings is in line with Okwoche *et al.* (2012), found that 37.68% of sampled respondents were between 30 and less than 40 years, while 30% of the farmers were between 20 and 30 years. The implication of the

foregoing results is that sorghum farming in the study areas has higher patronage among young people who are energetic enough to withstand the stress involved in the sorghum farm operations and more so that sorghum farming is dominated by men considering the data from these Northern State. The result is also confirmation of Asogwa *et al.* (2012), findings on age, ranging between 31 and less than 40 years is predominant with 42%. Also 32% of the respondents are of the age of between 20 and less than 30 years.

Level of Education of farmers Mustapha *et al.* (2012), shows that most (41.10%) of the respondents had formal education. This implies that the respondents could apprehend the improved technology being disseminated to them. The findings was in agreement with that of Asogwa *et al*. (2012), who asserts that most of respondents in study area have formal education (54 %).This result suggests that almost all the respondents are literate enough to give room for effective communication in doing their sorghum farming business in the study area. This is acceptable on the ground that education affects the way farm business is managed as well as overall production (Nkang *et al*., 2009). Educational level plays a good role in adoption of new policy and undertaking risks.

Farms Size Okwoche *et al.* (2012), found that Most (49.23%) of the sorghum farmers had farm sizes ranging between 1 and less than 5 hectares Those whose farm sizes were less than 1 hectare were among the new entrants into sorghum farming business, thus, they were regarded as small scale sorghum farmers. The other farmers whose farm sizes ranged between 5 hectares and more were those who had some good number of years of experience and had gradually expanded their farm sizes for some number of years as they made profit. They were motivated to expand for more profit as human wants are insatiable.

Household Size: The report of Nigerian Demographic and Health Survey (NDHS, 1990) shows that the average household size in rural Nigeria is six, and less than 5% of households in the North are headed by women, compared to more than 20% in the south (NDHS, 1990). A major reason for this is the way by which local communities in the North identify household head (Nyong *et al*., 2001). In survey of pigeon pea production systems utilization and marketing in semi-arid lands of Kenya found that the average family size there was 8-6 people (Mergei *et al.*, 2001).

2.6 USAID MARKETS in Nigeria

Since 2005, The United States Agency for International Development (USAID) maximizing agricultural revenues and key enterprises in targeted sites (MARKETS) has been expanding economic opportunities in the agricultural sector by increasing jobs, sales, and investment for farm and non-farm agricultural businesses in Nigeria. By promoting commercial agriculture, improved productivity, value-added processing and expanding final product markets, MARKETS is having an impact on improving rural household livelihoods and reducing poverty (USAID, 2008).

2.6.1 MARKETS conceptualization

Maximizing Agricultural Revenue and Key Enterprises in Targeted Sites (MARKETS) was a multi-faceted six and a half-year pilot program designed by United States Agency for International Development (USAID) to strengthen agricultural competitiveness and food security in Nigeria. The program began in 2005 with a budget of $24 million which later increased to $51.6 million by the time the project closed in December 2010 to mark the end of MARKETS I; after which the project was extended for 16 months (January 2011 through April 2012) with an additional $9.5 million through the Bridge to MARKETS II project (TMG, 2012).

2.6.2 Aims and objectives of MARKETS

The primary aim of MARKETS is to assist USAID/Nigeria in achieving its Strategic Objective (SO) 12 which is to improve livelihoods in selected areas. This objective consists of four intermediate results (IRs) aimed to improving productivity, increase value-addition, increase commercialization of selected commodities and products, and improve the policy environment. While a number of USAID/Nigeria activities and programs work together to achieve SO 12 results, MARKETS focuses on the first three IRs that together aim to expand economic opportunities for Nigerians in the agricultural sector, by lifting a significant number of small producers out of subsistence farming and transforming them into entrepreneurs engaged in commercial farming (TMG, 2012).

2.6.3 Mode of operation of USAID/ MARKETS

USAID/ MARKETS mode of operation involved training and extension which is collaborated with the Nigerian Agricultural Enterprise Curriculum (NAEC). MARKETS original target was to train 500,000 trainers in the NAEC at the inception in 2005. The target was subsequently reduced to 200,000, and in fact only 33,195 were trained (TMG, 2012). MARKETS signed a Memorandum of Understanding (MoU) with Fadama which laid out each project's commitments. MARKETS moved quickly to provide the capacity building services; however, there were significant delays in approving and moving forward with the implementation under Fadama. The World Bank did not issue approval for funding beyond the original ten states, although MARKETS had delivered its commitment to train trainers in all states.

Furthermore, MARKETS had little input into the selection of trainers because the project was requested to train currently engaged Agricultural Development Program (ADP) extension agents. MARKETS also collaborated with the public sector ADP

extension services as a means to build capacity and sustainability. Beginning in 2007 MARKETS, through a MoU, has trained 258 extension agents in 11 states from the public sector ADP (TMG, 2012).

MARKETS through these various collaborators, engaged in the provision of technical assistance to producers through the adoption of improved agronomical practices (recommended varieties, seed treatment, sowing date, seed rate, spacing, fertilizer application, weed control, pest control, harvesting and storage), leadership training and group dynamics (1.record keeping 2.handling cases of misconduct by members of cooperative society such as quarrelling, fighting and stealing 3. organize educational talks 4. on field farm demonstration); facilitation of access to credit and inputs, improvement in value addition and linkages to markets (USAID, 2008). MARKETS approach is focused on developing a competitive, market-led and sustainable sorghum value chain. Specifically, the sorghum Improvement programme combines the strengths of participating institutions to: Identify markets for sorghum varieties at a competitive price; organize farmers to meet the requirements of established markets; facilitate access of the producers to inputs, such as seeds, fertilizers and credit; facilitates the delivery of required quantities and qualities of sorghum to the buyers; build the technical capacity of producers, processors and marketers to maintain an efficient supply chain; establish sustainable and credible business relationships that are purely privates sector driven (USAID, 2008).

2.6.4 USAID/ MARKETS beneficiaries

The USAID-funded MARKETS project focuses on the large population of smallholder farmers with between 1 to 5 hectares of land under cultivation. An estimated 80% and 90% of all agricultural plots in Nigeria are less than 2 hectares in size. Given that about 60% to 80% of the workforce on such smallholdings may be women (depending on

crop and region); MARKETS seek to benefit them especially. The project makes agro-processors central to the value chain and sector development to increase rural incomes and jobs. The program privileges women, youth, and the very poor by systematically seeking to incorporate these groups into all project activities. The project is also designed to be financially, economically and environmentally sustainable. MARKETS work with local banks and other lenders, to update their systems, staff, evaluation procedures, collateral requirements and the like to facilitate lending to smallholders (USAID Nigeria, 2012).

2.7 The Concept of Livelihood

The term livelihood attempts to capture not just what people do in order to make living, but the resources that provide them with capability to build a satisfactory living, the factor they must consider in managing their resources, the institutional and policy context that either helps or hinders their pursuit of an improved living. Ellis (2000) defined livelihood as a set of economic activities involving self-employment, and or wage employment by using one's endowments (both human and material) to generate adequate resources for meeting the requirements of the self and household on a sustainable basis with dignity. The activity is usually carried out repeatedly for instance; a fisherman's livelihood depends on the availability and accessibility of fish.

The livelihood concept according to Chambers and Conway (1992) , is based on the premise that a rural household has access to (or has an endowment of) a minimum amount of resource base (capitals or assets),which can be utilized to fashion out set of livelihood strategies crop farming, livestock rearing, off farm employment, etc. to improve its welfare. A holistic attempt to identify the various livelihood strategies rural poor people adopt across ethnic groups shows that, Households and individual are in pursuit of different strategies based on normative standards (e.g. nutritional status)

disaggregated across groups, households and individuals under social, economic, political, historical and demographic trends that influence these livelihood options (Chambers and Conway ,1992).

2.7.1 Strategies of livelihood enhancement

Rural livelihood is composed of the activities that generate the means of household survival and longer-term well-being. Livelihood strategies (LS) may be divided into natural resources based activities (e.g. collection and gathering, cultivation, livestock-keeping, weaving) and non-natural resource based activities (e.g. trade, services, remittances) (Ellis, 2000). Means of livelihood referred to as production strategies which include income-earning activities, remittance, gift and loans. But LS are dynamic and widespread from which rural poor people are able to respond based on changing pressures and local opportunities that could be adapted accordingly (Ellis, 2000).

However , livelihood outcomes and goals vary and they are subject to changes: for example, in peaceful and politically stable situations, livelihood goals might include increased well-being or more income; whereas in times of crisis , people s goals might become focused on such short-term objectives as personal safety, food security, reduced vulnerability and survival (UNDP,1998).

2.7.2 Determinants of livelihood

According to Chambers and Conway (1992), there are numerous initial determinants of livelihood strategies (LS).Many livelihood are largely predetermined by accident of birth. Livelihood of this sort may be ascriptive: for instance in a village India, children may be born into caste with an assigned role as potters, shepherds, or washer people. Gender as socially defined is also a pervasive ascriptive determinants of livelihood activities or not necessarily ascriptively, a person may be born, socialized and

apprenticed into inherited livelihood as a cultivator With land and tools, a pastoralist with animals, a forest dweller with trees, a fisherperson with boat and tackle, or a shopkeeper with shop and stock; and each of these may in turn create a new household or households in the same occupation (Chambers and Conway, 1992).

Many livelihoods are also less singular or predetermined. Some people improvise livelihoods with degree of desperation, what they do being largely determined by the social, economic and ecological environment in which they find themselves. A person or household may also choose a livelihood, especially through education and migration. Those who are better off usually have a wider choice than those who are worse off, and a wider choice is usually generated by economic growth. In a future of accelerating change, adaptable capabilities to exploit new opportunities may be both more needed and more prevalent (Chambers and Conway 1992).

2.7.3 Household livelihood security concept

Robert Chambers and Gordon Conway (1992) proposed the following composite definition of a household rural livelihood (HLS), which is applied most commonly at the household level. A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term. Of the various components of a livelihood, the most complex is the portfolio of assets out of which people construct their living, which includes both tangible assets and resources, and intangible assets such as claims and access.

Any definition of livelihood security, Robert Chambers and Gordon Conway (1992) argued, has to include the ability to avoid or more usually to withstand and recover from, such stresses and shocks. More recently the Institute for Development Studies (IDS) and the British Department for International Development (DFID) have been putting into operation the SL concept and approach. Leading proponent Ian Scoones (1998), of IDS proposed a modified definition of HLS: A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A household livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets, while not undermining the natural resource base.

This new definition does not include the requirement that for household livelihoods to be considered sustainable they should also '…contribute net benefits to their livelihoods'. With some minor changes this is also the definition adopted by DFID. The IDS team also outlined a tentative framework to analyse sustainable household rural livelihoods. It has three elements: Livelihood resources, Livelihood strategies, and Institutional processes and Organizational structures. To understand the complex and differentiated processes through which livelihoods are constructed, Scoones (1998), points out, it is insufficient just to analyze the different aspects; one must also analyze the institutional processes and organizational structures that link these various elements together.

To do this, it is essential that HLS analyses fully involve the local people to let their knowledge, perceptions, and interests be heard. The household livelihood security approach there is three insights into poverty which underpin this new approach. The first is the realization that while economic growth may be essential for poverty reduction, there is not an automatic relationship between the two since it all depends on

the capabilities of the poor to take advantage of expanding economic opportunities. Secondly, there is the realization that poverty — as conceived by the poor themselves — is not just a question of low income, but also includes other dimensions such as bad health, illiteracy, lack of social services, etc., as well as state of vulnerability and feelings of powerlessness in general.

Finally, it is now recognized that the poor themselves often know their situation and needs best and must therefore be involved in the design of policies and project intended to better their lot.

2.7.4 Challenges of livelihood enhancement

The present agrarian crisis has trapped the marginal and small farmers in a cycle of disadvantages. One disadvantage inevitably leads them to other disadvantages and the farmers become the silence victims of this "clusters of disadvantage" (Chambers, 1983). According to Chambers the poor households were caught up with 'five clusters of disadvantages, i.e. poverty, physical weakness, vulnerability, isolation and powerlessness'. He has also explained as to how these clusters were interlocked among themselves. This interlocking was termed as 'deprivation traps' (Chambers, 1983), this livelihood insecurity reduces their bargaining power in all spheres of their life especially in the sphere of financial institutions and markets. This reduced bargaining power exposes them to vulnerabilities like poverty, malnutrition, increased debt etc. This, in turn leads to loss of entitlements creating increased livelihood insecurity and heightened powerlessness.

2.8 Constraints Associated with Farmers' Participation in Agricultural Developmental Programmes

Research finding on the constraints to the effective performance of agricultural and rural development project revealed that, most past policies, strategies and interventions

failed to achieve their objectives as a result of poor design (Tomori *et al*., 2005) In Nigeria, most of those policies were not successful due to "top down" policy in which development are forced on people regardless of their felt needs (Ijere, 1992).

Other factors that militate against project implementation (Wallace, 1979) included lack of understanding the socio-economic and socio cultural and religious factors of the beneficiary's communities. Arokoyo (1995) opined that lack of understanding of the socio-economic and socio-cultural elements of the communities or participants by the programme implementers which are lack of appropriate institutional framework and linkages between the government agencies and research institutes charged with the responsibilities. Morardet *et al.* (2005) identified inappropriate technology as hindrance in the transfer of many technologies to farmers practicing irrigation. These factors according to them; land possession, village-family structure and income were the most important.

Independent Evaluation Group (IEG) (2011) analyzed and identifies six primary constraints associated with participation in development program. Though for farmers to farm effectively, produce efficiently, and gain a profit; every intervention seeks to ease at least one of these. The six constraints are: low quality of inputs, limited knowledge, low quality of land or physical farm resources, non conducive policy environment, limited outputs or post-production promotion assistance, and limited access to loans or insurance. Each intervention seeks to address one or more of these constraints, depending on it design and overall objectives.

Farmers often face several problems when implementing technological innovation recommended by a programmed. Ekong (2003) reported barriers to implementation of diffused innovation as relative advantage, cost, complexity, visibility, divisibility and

compatibility. On the other hand, socio-economic and cultural factors of farmers could be responsible for poor or non–implementation of implementation of programme recommendation: social structure (Awogbade, 1987).

Moreover, Beyen (1987) reported that among the problems that hinder participation is political turmoil that culminate in a change of government compounds problems by causing a temporary closure of projects and research centers, which hinders project implementation by reducing the period of the project .Lack of keeping records (Data) thus when the research centers are closed due to political instability, they stop collecting data. These generally undermine data analysis.

The process of increasing the efficiency of agricultural programme through agricultural modernization depends mainly on the extent to which farmers can incorporate project intervention activities –i.e. improved agricultural practices into their farming operations (Ani and Undiandeye, 2001). However, there are many problems facing sorghum intervention programme-i.e. production in Nigeria; Muhammad *et al*. (2011) found that constraints to sorghum production include inadequate access to improved seed; which was put at 73.9% of the respondents, then lack of adequate fund was also very severe, put at 71.4% by respondents. The result also revealed that lack of access to extension services was another very severe constraint to sorghum production intervention projects reported by the respondents.

Another problem considered as being severe by respondents was the high cost of transportation at 44.6% followed by high cost of labour at 43.8% as perceived by the respondents. According to Ani (1998) acceptance of new farming practices usually take some time. Among the constraint face by project intervention was non –adapting of improved technology due to in adequate knowledge of the technologies on cultural

practices such as seed dressing, planting dates, seed rate, plant spacing, and use of herbicides. This view is supported by Adeniji (2007) whose submission stated farmers were faced with so many constraints that prevent them from rewarding cotton production, such as competition with food crops for farmer's attention, insect pest infestation and inadequate recommended seed varieties suited to farmers region. Ajala *et al.* (2004), found that difficulty in producing feeds, high incidence of diseases, lack of adequate information on improved small ruminants management were the constraints to small ruminant production technology in Giwa Local Government Area of Kaduna State.

2.9 Theoretical Framework

A theory is a proposition or set of inter- related propositions that purports to explain a given phenomenon. Alamu and Olukosi (2008) defined theory as a set of concepts, definitions, and propositions that represent a systematic view of phenomena by specifying relations among, variables, with the purpose of explaining and predicting the phenomena and framework as a model of how one theorizes the relationships among the several factors that have been identified as important to the problem. The theoretical/conceptual framework flows logically from the documentation of previous research in the problem area. Integrating ones logical beliefs with published research is of great importance in developing a scientific basis for investigating the research problem.

This study will be guided by the theory of social change.

2.9.1 The theory of social change

One inevitable thing in the life of all living creatures is change. When such alteration takes place in interaction it is termed a ''social change'' (Jibowo, 2000). Chambers

(1983), define social change as the process by which change occurs in the structure and function of social system. In this regard, social change denotes a planned change that occurs either as ideas, norms, values roles and social habits of the people or in composition or organization of their society. The interventions such as USAID/MARKETS programme aimed at changing the sorghum production practices by adoption of good farming skills and improved practices, facilitates access to credits from banks, farm input materials such as fertilizers and mechanized equipment supplies and linking them to ready target market. Through this intervention programme, the participants' household incomes are expected to continue improving and so is their standard of living.

The theory of social change is paramount among social scientist. Ekong (2003), describe Social change specifically as the process by which alteration occur in the structure and function of a social system. Where as a social system is a viable interactive human group. Social change pervades all aspect of social life and may manifest as economic, political, technological, culture and behaviour changes (Ekong, 2003). 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 no chance to plane before it happens. Indeed, theories of social change have a general concern with the explanations of sources of social change. It is the time span of change and the effect of change on the changing unit. Base on these perspectives therefore, the planned change resulting from the project intervention in terms of increase in yield, income and livelihoods will be analyzed.

Long (1977) opined that an account of sociological and anthropological perspectives on development would not be complete without some discussion of planned change, for an

understanding of the patterns of development and change necessarily involves understanding something about the types of approach used by government and their agencies for initiating economic development and social change. Furthermore, this is especially the case with third world countries where governments often play a dominant part in attempting to re-structure society in conformity with particular politico-economic goals.

2.10 Conceptual Framework

Conceptual framework discusses the inter relationships among the variables that are deemed to be integral to the dynamics of the situation being investigated. Developing such a conceptual framework helps us to postulate and test certain relationships so as to improve our understanding of dynamics of the situation being investigated (Shrag, 1967)

2.10.1 Concept of participation

Most theorists consider the development of participation as essential component of development. Rogers (1960) believed that participation is a mental and emotional involvement of individuals in the group situations that raise them up to help each other to achieve group goals. It could also involve private multinational companies, agro-allied and agro-based companies who participate in rural and community development projects. The idea is therefore that participation involves the active commitment of the people either financially or through their service to the development of the community or group. Mahmoodian (1992) in his research mentioned the factors affecting the participation of the rural people , such as knowledge, the dependence or independence, mutual trust, mutual communication and economic status. Farmers are here viewed as co- researchers, developers and extensions' colleague who can provide crucial input in determining what problem to address and how to proceed. Rienstra (2004) in a

research, mentioned education, motivation, occupation, use of mass media, economic status, the amount of travel to other areas, the tendency to group work, social cohesion, and state dependence of the factors affecting the participation of rural farmers' in the rural development programmes. Hossein Purr (1993) shows that people's awareness of the content and objectives of the program variables and extension courses have a significant relationship with the people participating in any developmental programme.

According to Bopp and Bopp (2006) participation is the active engagement of the minds, hearts and energy of people in the process of their own healing and development. Because of the nature of what development really is, unless there is meaningful and effective participation, there is no development. In the past, participation was used to describe an outsider's engagement with a community. However, with an understanding of participation, it becomes a term infused with community empowerment rather than with community need and concession. Adopting this view, along with the teachings of Freire (2006), participation becomes a theory driven mechanism in which local communities and outsiders come together, as participants, to achieve community defined goals. Participatory development provides a mechanism in which genuine dialogue and action within a local community and between local community and outsider researchers/interventionist can occur. The relationship between local community members and outsiders is important to human development in general as Freire (2006) professed.

Therefore, the rural people should be consulted as they, more than anyone, know the extent of their situation. Consequently, decision-making should be decentralized allowing the community to decide the best strategy for local development (Narayan *et al.*, 2000).

This implies that if farmers participating under USAID/MARKETS programme are appropriately empowered, they can often manage how to secure unadulterated inputs supply, production efficiency and sustained their market linkages which is assumed to lead to livelihood improvement.

2.10.2 Concept of impact evaluation

The International Initiative for Impact Evaluation (2008) defined rigorous impact evaluations as: "analyses that measure the change in outcomes for a particular group of people that can be attributed to a specific program using the best methodology available, feasible and appropriate to the evaluation question that is being investigated and to the specific context". According to the world Bank Independent Evaluation Group (2008) impact evaluation is the systematic identification of the effects positive or negative, intended or not on individual households, institutions, and the environment caused by a given development activity such as a program or project.

The term impact, assessment or evaluation is used in many different ways by different people. Impact refers to the broad, long-term economic, social and environmental effects resulting from research while evaluation/assessment is judging, appraising or determining the worth, value or quality of research, in terms of its relevance, effectiveness, efficiency and impact. It refers also to the broad, long-term socio-economic and environmental effects of the programme on the beneficiaries and the general eco-system (IAEG, 1999).

Impact of the programme can be manifested in relation to whether the services actually resulted positively on the people who receive them. Impact studies are of paramount importance in agricultural programmes as it shows the benefits derived by the participants as a result of their involvement in the programme as well as show their

preference to the programme. Similarly, 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 programme. It is a special form of evaluation that deals with the effect of intervention programme output on the targeted beneficiaries. Hence, impact of a programme can be seen in relation to what services actually do to people who receive them.

In conducting impact assessment, researchers often use "with and without" impact method, while others use the "before" and "after" method. Manyong *et al*. (2001) opined that, impact assessment of agricultural development projects is a continuous process and therefore being a process, it is better conceptualized to use the before and after impact assessment approach.

According to Alene *et al*. (2006) impact assessment of agricultural research is viewed as an important activity to ensure accountability, maintain and improve internal decision making process and the capability to learn from the past experience. Impact study is seen 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 benefit from the research products (Manyong, 2001).The combination of these concepts was used in this study in order to help us realize the intricacies and bearing of development project implementation on beneficiaries' participation for ultimate change in their livelihood

2.11 Conceptual Model

Conceptual model is a diagram which shows a set of relationships between factors that is believed to impact or lead to a target condition; a diagram that defines theoretical entities, objects, or condition of a system and the relationships between them. Ekong (2003) views conceptual model as a broad system of explanation which is founded not so much on prior research findings but largely on untested and unproved assumptions about social realities. Furthermore, Asika (2001) reported that these relationships and functions can be represented schematically or mathematically classifying the major element of an entity or phenomena with regards to their functions and inter-relationship in order to observe more closely causal relationship.

The model for this study (figure 1) shows the presumed cause of farmers participation in the USAID/MARKETS programme such as: age, household size, educational status, farming experience, marital status, amount of credit received, extension visit, membership of cooperative association and farm size constitute the independent variables which is the first box. The first arrow explains the relationship between independent variables (socio-economic and institutional factors) and the dependent variables (participation in USAID/MARKETS programme while the second arrow shows the likely outcome of the relationship between independent and dependent variables. Existence of socio-economic and institutional factors such as education, access to extension services is expected to influence participation which constitutes the dependent/intervening variables. These are expected to cause change in yield, income, and living standard of the participants.

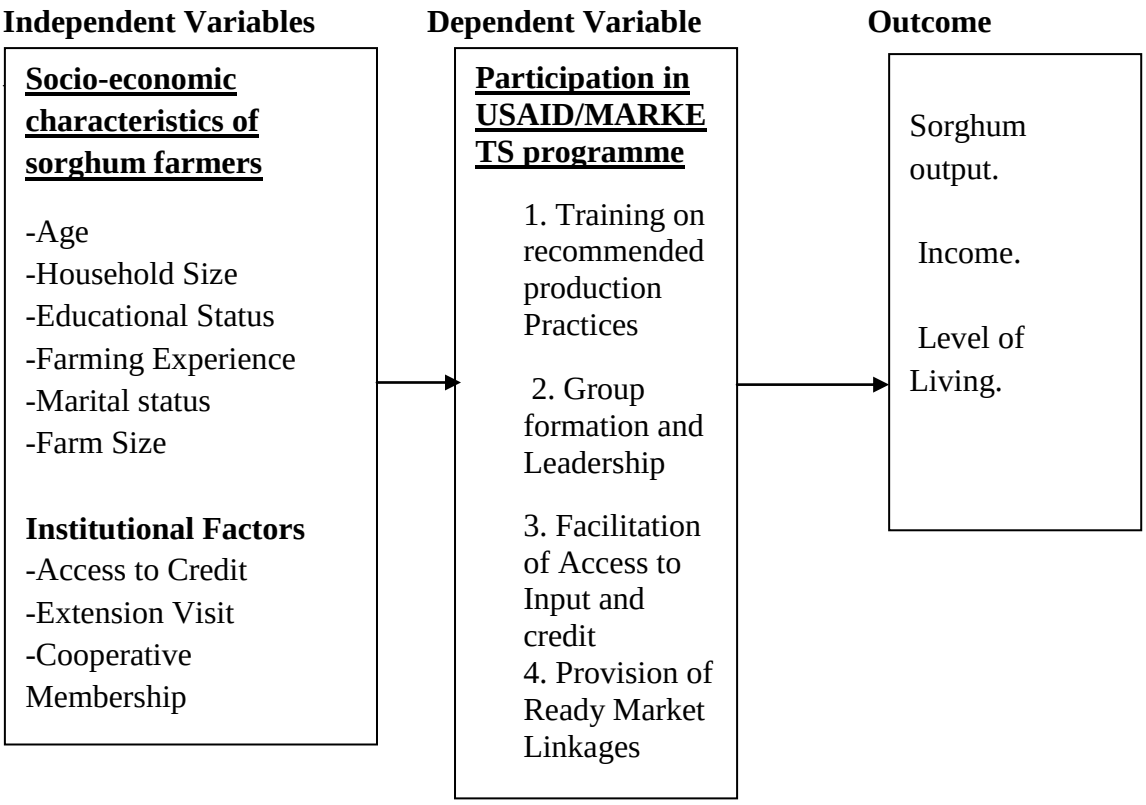


Figure 1: A conceptual model showing causal relationship of USAID/MARKETS intervention programme impact on sorghum farmers' livelihood.

CHAPTER THREE

METHODOLOGY

3.1 The Study Area

Kaduna State lies in the north western part of country's agro-ecological zones, about 200 km away from Abuja the federal capital. The State lies between latitudes 90^{o}N and 12^{o}N of the equator and between longitudes 6^{o}E and 9^{o}E of the prime meridian. Kaduna State shares boundaries with Katsina and Kano State to the north. Plateau to the north east, Nasarawa and Abuja to the south and Niger and Zamfara State to the west (http;\\www.kaduna state.gov.ng). The state occupies an area of approximately 68,000 square kilometers or 7% of Nigeria's land mass. The state has 23 Local Government Areas (NPC, 2006).

The mean annual rainfall shows a marked decrease from South to North (1,524mm to 635mm). Two distinct seasons, rainy and dry witnessed in the state. The relative humidity is constantly below 40 degrees except in few wet months when it goes up to an average of 60 degrees. The duration of dry season is 5-7 months which normally starts from October; the state is agrarian and well suited for the production of arable crops such as maize, yam, millet, and sorghum because of a favourable climatic conditions. Livestock production is also practiced in the state. Rearing of goats, sheep, cattle and different classes of poultry as well as marketing of their products is practiced in the State. The people of the state live mostly in organized towns and cities (KADP, 2012). A large variety of non-agricultural occupations also exit.

The total population of the state is 6.11 million (NPC, 2006). Based on annual population growth rate of 3.2%, the projected population of the state is about 7474,369 million people in 2014. Within the state there are a number of establishments ranging from companies, research institutes, higher institutions and colleges.

Kaduna State is a multi –cultural and multi ethnic State and the main ethnic groups include: Fulani, Hausa, Bajju, Atyab, Jaba , Adara, Gwong, Gbagyi, Kurama, Ninzo, Ham, Koro, Kagoro, Kagoma, Kadara, etc. Other ethnic group from other part of the country reside in the state such as Yoruba.Igbo etc. As culturally diverse people, Kaduna State has rich cultural heritage evidence in her diverse religious practices-i.e. Islam, Christianity, Traditional, cultural festivals –i.e. Durbar, music and dances, cuisines and culinary among others. Hausa is a major language spoken by a majority of the people due to the influence of Hausa people. Kaduna State provides the meeting point of the earliest histories of Northern Nigeria. It is the home of Nok which gave its name to the oldest culture of Nigeria-the Nok culture (KADP, 2012).

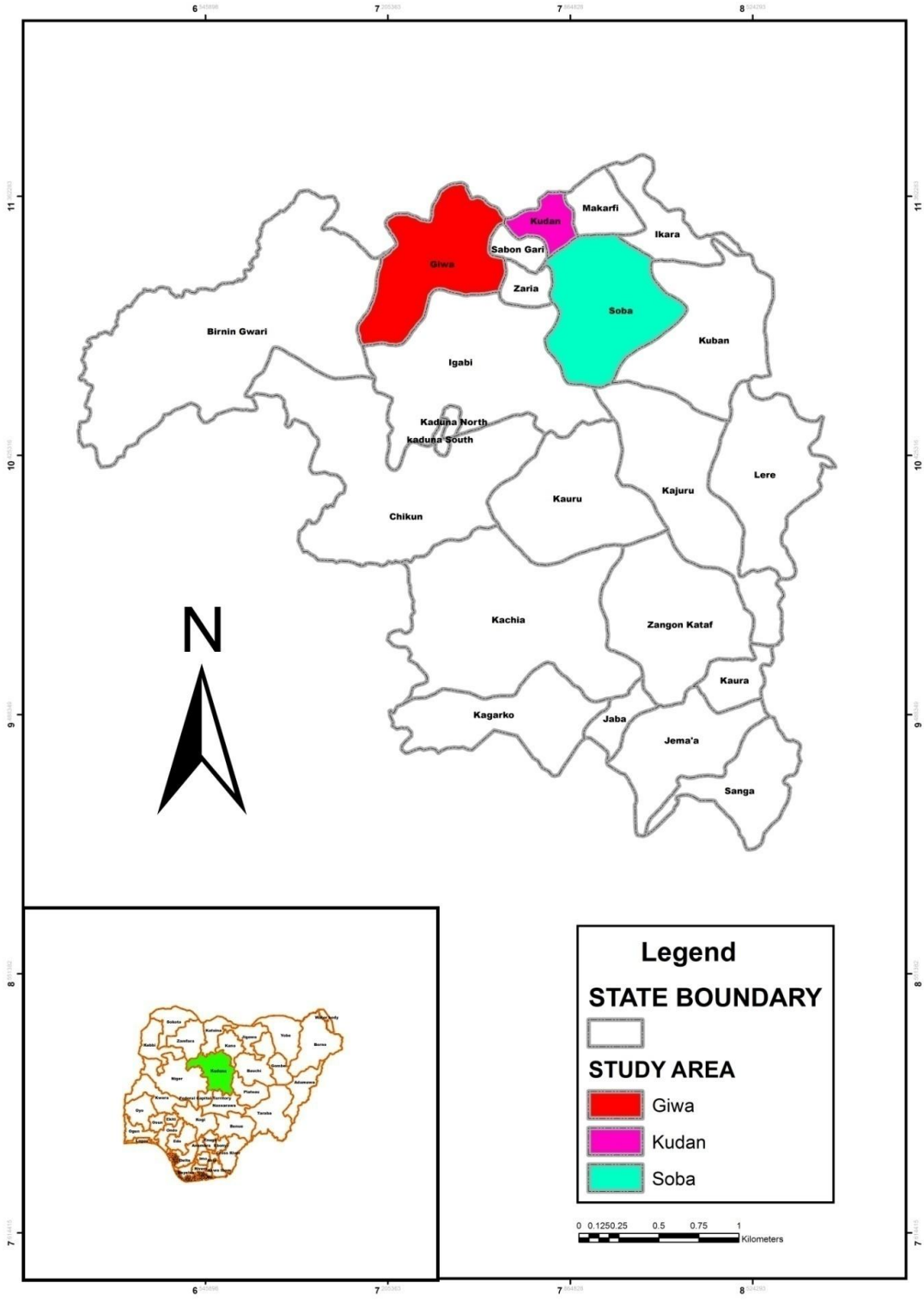


Figure 2: Kaduna State map showing the study areas

3.2 Sampling Procedure and Sample Size

A multi-stage sampling technique was used for this study. The first stage was a purposive selection of Soba, Giwa and Kudan Local Government Areas, selected based on the fact that they were the most prominent sorghum producing areas in the State, and also with the highest level of sorghum outlet market concentration (KADP, 2012). The Second stage, 9 villages out of 27 villages were randomly selected, three (3) from each Local Government Area selected. That is, Yakasai, Maigana, Turawa from Soba Local Government Area, Shika, Yakawada, Kaya from Giwa Local Government Area, Doka, Hunkuyi, Likoro from Kudan Local Government Area. In order to effectively study the impact of the programme and comparative analysis, another 9 villages were chosen where the programme was not introduced as control group, three from each of those local Government Areas selected. The control group villages comprises: Richifa, Awai, Wanka, from Soba local Gvenment Area, Gangara, Kudandan, Danmahawayi from Giwa local Government Area, Taba, Kauran Wali, Zabi, from Kudan local Government Area. Finally, a random sampling technique was employed in selecting farmers from each of the villages from the list of sample frame obtained from Kaduna State USAID/MARKETS office (2013). Ten percent of the sample frame (1530) for participants and (920) for non-participants farmers was used as the sample size. In all, 245 farmers were randomly selected.

Table 3.1: Distribution of respondents in the study area

LGA	Villages	Population of the participating farmers*	Number of the participant farmers' selected	Villages	Population of non participating farmers*	Number of non participant farmers' selected
Soba	Yakasai	320	32	Richifa	120	12
	Maigana	190	19	Awai	100	10
	Turawa	180	18	Wanka	120	12
Giwa	Shika	200	20	Gangara	80	8
	Yakawada	120	12	Kudandan	100	10
	Kaya	110	11	Danmahawayi	120	12
Kudan	Doka	170	17	Taba	110	11
	Hunkuyi	90	9	Kauran Wali	100	10
	Likoro	150	15	Zabi	70	7
Total		**1530**	**153**		**920**	**92**

Source: Kaduna State USAID/MARKETS office (2013)

3.3 Method of Data Collection

Primary data were used for this study. The main instruments for primary data collection were structured questionnaire which was prepared and pre-tested before it was administered to participants and non-participants of USAID programme between March and April, 2014 with the assistance of Agricultural Development Program (ADP) extension agents. Data collected were centred on respondents socio-economic characteristics such as age, marital status, educational level, household size, sex, farming experience, farm size, support services introduced to sorghum farmers, Also data on types of crop grown, access to credit, extension visits, membership of cooperative, total output and income obtained by respondents and the constraints faced by sorghum farmers under USAID/ MARKETS programme were also collected. Relevant information from textbooks, journals, seminars, and annual reports, was then source of secondary data.

3.4 Analytical Tools

The following analytical tools were employed to achieve the stated objectives of the study.

i. Descriptive statistics

ii. Logit regression model

iii. Chow test statistics

3.4.1 Descriptive statistics:

This involves the use of average (mean), percentages, frequency distribution, to summarise, classify and tabulate data on respondents' characteristics. It was used to achieve objectives i, iii, and v of the study.

3.4.2 Logit Regression Model

Logit regression model was used to achieve objective (ii). This is one of the binary choice models with a dichotomous dependent variable and this dichotomous variable is related to a set of independent variables that are hypothesis to influence the outcome. Hence, the model allows one to predict outcome from a set of paired variables. In this study, the outcome variable i.e participation is binary (i.e. participant and non-participant) hence will be assigned 1 for participant of the programme and 0 for non-participant.

The logit model characterizing the influence of socio-economic and institutional factors is specified as follows:

$$Prob(y* = 1) = 1 - F * \left(\Sigma X_i \beta_j\right) = \frac{e^{\Sigma X_i \beta_j}}{1 + e^{\Sigma X_i \beta_j}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .. (1)$$

$$Prob(y*=0) = F*\left(\Sigma X_i\beta_j\right) = \frac{e^{\Sigma xi\beta j}}{1+e^{\Sigma xi\beta j}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where:

F = The cumulative distribution function for $\mu_{i,\ldots}$

The explicit logit model is expressed as:

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \beta_9 X_9 + u \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The likelihood function is given by:

$$L = \pi\{F(\sum xi\,\beta j)\}\{1 - F(-\sum xi\,\beta j)\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

yi=0 yi=1

While the log likelihood function for the expression is:

$$H(\beta) = \log L(\beta) = \sum_{i=0}^{n} yi \log 1\text{-}F\{(-\sum xi\,\beta i) + (1-y)\log F(-\sum xi\,\beta i)\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

The explicit form of logit regression is given as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + U$$

Where:

Y=Likelihood of participation in USAIDMARKETS (Dummy variable 1 If respondent participated and 0 if respondent did not participate)

β_i= The coefficients for the respective variables in the logit function

μi = a logistic cumulative distribution in F

x_1= Age (years)

x_2= marital status (0=unmarried,1=married)

x_3= Household size (numbers)

x_4= Educational level (years)

x_5= Farming experience (years)

x_6= Extension visit (number of visit/year)

x_7= membership of cooperative association (years)

x_8= Farm size (ha)

$x_{9=}$ Access of credit received (₦)

3.4.3 Chow test statistics

Impact of the United State Agency for International Development (USAID) in its programme Maximizing Agricultural Revenues and Key Enterprises in Targeted Sites (MARKETS) on sorghum farmers' livelihoods of the participant and non-participants was achieved using Chow-test statistic. In this study livelihood was determine in terms of output, income from sorghum and level of living. A chow test is a particular test for structural change; an econometric test to determine whether the coefficients in a regression model are the same in separate sub-samples. According to Chow (1960) "the standard F test for the equality of two sets of coefficients in linear regression models" is called a Chow test. Dougherty (2007) stated that chow-test statistics is often used in programme evaluation to determine whether the programme has impacts on different sub-group of the population. It requires the sum of squared residuals from three regressions, one from each sample group and one for the pooled data. If the F-chow is greater than the F-table, then there was programme impact on the participants otherwise no impact.

This is expressed mathematically as:

$$F = \frac{(RSSR - SSR1 - SSR2)/\ k}{(SSR1 + SSR2)/\ n - 2k} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (6)$$

Where;

RSSR = the sum of squared residuals from a linear regression in which b_1 and b_2 are assumed to be the same, b has dimension k, and there are n observations in total.

SSR_1 = the sum of squared residuals from a linear regression of sample 1.

SSR_2 = the sum of squared residuals from a linear regression of sample 2.

The total number of observation is $n = n_1 + n_2$ and the number of parameters is k. However, three different linear regressions were carried out comprising of the pooled samples of participants and non-participants, and separate linear regression for participants and non-participants 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 is impact of USAID/MARKETS programme on sorghum production and structural differences between the participants and non-participants in terms of sorghum output, if otherwise there is no impact of USAID/MARKETS programme in the study area.

3.5 Definition and Measurement of Variables

3.5.1 Independent variables

i. **Age:** This refers to the number of years of an individual attained from birth and it is believed to be positively influencing the perception, view, interest, and conduct of a person. It is a continuous variable and was measured in years

ii. **Marital Status:** It is the state of being unmarried (single / divorced / widowed / widowered) or married. It is believed to have positive influence in participating in intervention program. It was measured with binary variables choice model (unmarried = 0, married = 1)

iii. **Household Size:** This is the total number of persons in the family sharing the same catering arrangement. According to literature, in most societies the size of family is related to the socio-economic status of the family head and it may have positive or

negative influence in participation or not. It was measured by the number of dependents given by the household head during the study.

iv. **Educational level:** This refers to respondents' level of formal or informal education. The role of education is considered very important in the perception of new farm practice/technologies. This was measured by the level of education of the respondents in years. Thus farmers scored 0 with no formal education, while those with adult education scored 1, those with primary education scored 2, and those with secondary education scored 3, and finally those with tertiary education scored 4.

v. **Farming experience:** This variable was used to measure the farmers experience based on the particular involvement in sorghum production activities. It is expected that farmers will gain more experience as they spend more years in farming activities. It was measured in years.

vi. **Access to extension visit:** The total number of times a farmer was visited in connection with USAID/MARKETS programme intervention by extension officer as reported by the farmers in the year 2013 cropping seasons. It was measured in numbers of visits.

vii. **Cooperative membership:** This variable was used to characterize farmers based on particular involvement in production and/or marketing organization at the time of data collection. Membership of cooperatives is expected to have an influence on the attitude of members towards the project or interventions program. It was measured in years of participation.

viii. **Farm Size:** This is the total land area under cultivation by the respondent. It is included in the model to determine how farm size influence participation in the program. It was measured in hectares (ha.).

ix. **Access to credit obtained:** Access to credit helps in financing new improved farm practicing, and lack of credit may affect farmers' adapting improved agricultural practices. This refers to amount of money received from both formal and informal sources. It was measured as the actual money/credit borrowed.

3.5.2 Dependent variable

Participation in USAID/MARKETS programmes activities: This is the involvement of farmers in USAID/MARKETS various activities which lead to change in their livelihood. The dependent variable (Y) is the Participation of respondents in USAID/MARKETS programme activities under sorghum production. This was measured as dummy variable with "Yes" assigned one (1) for Participation and "No" assigned zero (0) in response to not participating in the programme in the study area.

3.5.3 Outcome Variables (Impact of participation on livelihood)

The impact of USAIDMARKETS in this study was determined in terms of output, income from sorghum production under the programme and level of living and measured as follow:

Output: this was the quantity of sorghum produced in 2013 cropping seasons and was measured in Kg.

Income: this was the total money realized from sales of sorghum products in 2013 cropping seasons which was measured in naira (₦)

Level of living: This encompasses all things as contributing to the quality of life of the respondents hence boosting their social status. Thus, level of living was measured in terms of value of durable goods such as cell phone, motor cycle, car, farm equipment of an individual farmer which was converted to naira (N) value.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Sorghum Farmers

4.1.1 Age distribution of sorghum farmers

Age distribution of sorghum farmers is presented in table 4.1.1. The study revealed that 32% of sorghum farmers in the study area were less than forty years for the participants while non-participants were 28%. Only 30% of sorghum participant farmers were found to be within the age brackets of 40-49 years while non-participant farmers were 33%. About 20% of the respondents were within the age brackets of 50-99 years participants while non-participants were 28% and only 18% participants were within the age greater than 60 years while non-participants were 11% with mean of 44 years for participants and non-participants 45 years. The study reveals, the mean age of participants farmers (44 years) and non-participants farmers (45 years) which indicate that, respondents were in the most productive stage of their life. The result is in line with the finding of Okwoche (2012) who observed that youth constitute the majority of sorghum farmers and younger farmers are more flexible to new ideas and risk; hence they are expected to adopt innovations more readily than older farmers.

4.1.2 Sex of sorghum farmers

As shown in Table 4.1.1 male 98% and females 2% are involved in USAID/MARKETS sorghum intervention programme while the corresponding values for non-particpants sorghum farmers in the study area are 98% male and 2% female . This means that male is more involve in agricultural programme especially in the study area than female.

This finding is in agreement with those of Okwoche and Asogwa (2012) who posited that male dominancy in sorghum production is due to the labourious nature of sorghum farming operations.

4.1.3 Marital status of sorghum farmers

Majority (95%) of the participant farmers and non-participant farmers (98%) Table 4.1.1 were married while 5% of participants and 2% of non-participants were single. The likely implication is that there will be available labour supply in the study area.This is in agreement with Abgamu *et al*. (1996) who found that married farmers adopted new varieties of crops and innovations more than farmers that are single due to struggle to meet the needs of the families.

4.1.4 Household size of sorghum farmers

The study reveals in Table 4.1.1 that 54% of the participant farmers and 51% of the non-participant farmers had household size within the range of 1 – 10 persons. The farmers that had the household size of 11- 20 constituted 33% for participants and 29% for non-participants while those with household size of 21- 30 constituted 11% for participants and 15% for non-participants. Average household sizes as shown by the study, were 11 persons per household for participants and 13 persons per household for non-participants. This large household size depicts common characteristics of rural households particularly in Northern Nigeria where polygamy is mostly practiced and family labour is also utilized for farming activities. According to Okoruwa and Ogundele (2006), there is a positive and significant relationship between household size and farmers' efficiency in production.

4.1.5 Educational level of sorghum farmers

As shown in Table 4.1.1, 16% of sorghum participant farmers and 67% non-participant farmers had no formal education, about 63% of the participants 11% of non-participants had only primary education, and 10% of participants and 17% of non-participants had secondary education while about 11% participants and 4% non-participants had tertiary education. However, altogether about 84% percent of the participating farmers are literate and 32% of non-participating farmers. This indicates that the participants' educational level is high. This is in corroboration with the finding of Amaza (2000), in which he found out, that education has a positive and significant impact on farmers' efficiency in production, thus, literacy level will greatly influence the decision making and adoption and transfer of innovation by farmers, which may bring about increase in productivity.

4.1.6 Farming experience of sorghum farmers

As shown in Table 4.1.1, 52% of the respondents of the participants and 36% of non-participants had experience in farming activities within the range of 11- 20 years in the study area. The farmers that had the farming experience of 1-10 and 21-30 constituted 35% and 10% respectively for the participants, while non-participants were 49% and 10% respectively. The average for both participants and non-participants were 13years. The farming experience shows that farmers will be able to make sound decisions as regards resources allocation and management of their farms. This findings is in line with Ajani (2000) who revealed that years of farming experience increased agricultural productivity among farming households in Nigeria.

4.1.7 Farm size by sorghum farmers

In Table 4.1.1, the study revealed that only 1% of participant farmers and 2% of non-participant farmers had farm sizes greater than 11 hectares while 2% had farm size wthin the range of 6-10 hectares (scattered in different location) for both participants and non-participants. Majority (97%) for participants and (96%) for non-participants have farm size within the range of 1-5 hectares and the average farm sizes was 2 hectares. This implies that sorghum production in the study area falls within small and medium scale and they will not be able to expand production. Similarly, small farm sizes is an impediment to agricultural mechanization because using farm machineries like tractor will be difficuilt which is in agreement with the findings of Chikezie *et al.* (2012). Small farm sizes might be as a result of the fact that most of the farmers got their land through inheritance.

Table 4.1: Socioeconomic characteristic of Sorghum Farmers

Socio-economic	Participants (n=153)		Non-participants (n=92)	
	Frequency	Percentage	Frequency	Percentage
Age (years)				
<40	50	32	25	28
40-49	45	30	30	33
50-59	30	20	26	28
>60	28	18	11	11
Mean	**44**		**45**	
Sex				
Female	3	2	2	2
Male	150	98	90	98
Marital status				
Single	7	5	2	2
Married	146	95	90	98
Household size				
1-10	83	54	47	51
11-20	50	33	27	29
21-30	17	11	14	15
31-40	3	2	4	5
Mean	**11**		**13**	
Education				
No formal education	25	16	62	67
Primary education	97	63	10	11
Secondary education	15	10	16	17
Tertiary education	16	11	4	5
Farming experience				
1-10	54	35	45	49
11-20	80	52	33	36
21-30	15	10	9	10
31-40	4	3	5	5
Mean	**13**		**13**	
Farm size				
1-5	150	97	88	96
6-10	2	2	2	2
>11	1	1	2	2
Mean	**3**		**3**	

4.1.8 Numbers of extension visit received

Table 4.1.2 shows that 6% of participating sorghum farmers and 87% of non-participating sorghum farmers in the study area had no contact with extension service in the study area, while 85% participants and 9% non-participants were visited within the range of 1-3 times per year and 9% participants and 4% non-participants were visited within the range of 4-6 times. Average contact was twice per year for participants and zero for non-participants. This indicates that participants receive more visits than the non-participants which could be attributed to their participation in the USAIDMARKETS programme. According to Obwona (2000), extension service is very essential to the improvement of farm productivity and efficiency among farmers

4.1.9 Membership of cooperative society

The study reveals in Table 4.1.2 that 13% of sorghum participant farmers and 33% non-participant sorghum farmers do not belong to any cooperative association while 30% participants and 38% non-participants had been members of cooperative society within the range of 1-5 years and 34% participants and 3% non-participants were members within the range of 6-10 years. Only 23% participants and 26% non-participants were members of cooperative society within the range of 11-15 years. with the minimum and maximum years of membership of 1 and 15, respectively. The average years of membership of cooperative society was 7 years for participants and 5 years for non-participants. This implies that farmers had opportunity of interacting with other farmers to enhance diffusion of innovations among the farmers. This finding is in line with Odebiyi (2010) that cooperative groups ensure that their members derive benefits from the groups which they could not derive individually. According to Idiong *et al*. (2007), membership of cooperative affords the farmers opportunities of sharing information on modern sorghum practices.

4.1.10 Access to credit for sorghum farmers

The study reveals in Table 4.1.2 that Majority (72%) of participant farmers had no access to credit to finance their sorghum production activities while about 28% had access to credit and 13% of non-participant farmers have access to credit while 87% did not have access. This implies that the farmers were using their personal savings to purchase farm inputs and adopt farm innovation. This low access to credit could be attributed to the fact that government seldom grants financial credit to large numbers of farmers which is highly subsidized and seldom give free. Indeed the study noted that many of the farmers in the study area, both participants and non-participants could not access credit through commercial banks with high interest rate of over 20% since they perceive this higher interest rate affects the overall return to investment. USAID/MARKETS programme does not give loan to participants; it only facilitates access to credits from commercial banks which they apply their rules and regulations guiding giving loan out to customers; which majority of the farmers in the study area cannot afford. Ekong (2003) asserts that credit is a very strong factor that is needed to acquire or develop any enterprise; its availability could determine the extent of production capacity.

Table 4.2: Institutional factors of sorghum farmers

Institutional Factors	Participants (n=153)		Non-participants (n=92)	
	Frequency	Percentage	Frequency	Percentage
Extension				
No visit	9	6	80	87
1-3	130	85	9	9
4-6	14	9	3	4
Mean	**2**		**0.4**	
Cooperative Membership (years)				
Non members	20	13	30	33
1-5	46	30	35	38
6-10	52	34	3	3
11-15	35	23	24	26
Mean	**7**		**5**	
Access to Credit				
No access to credit	110	72	80	87
Access to credit	43	28	12	13

4.2 Logit Regression Estimates of Factors that Influence Participation of Sorghum Farmers in the USAID MARKETS Programme

Logistic Regression model was used to determine the factors influencing participation of sorghum farmers in the USAID MARKETS programme on sorghum production. The result in Table 4.3 reveals that household size is significant ($p < 0.05$) in influencing participation in USAIDMARKETS. The positive coefficient (0-88481) suggests that individual with large household size were likely to participate in the programme as they appeared to have more family burden to contain with, in terms of social and economic services, and therefore need support to meet their family daily

needs. This finding is in line with Muhammad *et al.* (2011) who observed that household size was positive factor that influence participation, on the contrary is at variance with the findings of Ebojei *et al.* (2012) who in their study stated that household had no significant influence on participation. Educational level was also found to be positively significant ($p < 0.05$) in influencing participation. The result reveal positive coefficient (0.47481E-01) and this indicate that, there is a high inclination for farmers who are educated to partake in the programme compared to those that are illiterates. This outcome was likely because those who can read and write are at a lead in perception and deduction of recommended packages, and this educational attainment was likely to assist them in understanding the objectives of the programme and ways of achieving it. This finding is in conformity with both findings of Muhammad *et al.* (2011) and Ebojei *et al.* (2012). They found out that participation in a programme increases with increase in years of schooling, as risk of aversion decreases. Membership of cooperative society has positive coefficient (0.30655) and was significant ($p< 0.05$) in influencing participation in the programme. The positive coefficient reveal that the more an individual participate in cooperative associations the more likely he is to participate in the programme. This result further affirms that individuals that participate in the programme have been members of cooperative societies. This finding is also in line with the findings of Muhammad *et al.* (2011) who stated that membership of cooperative society has positive coefficient and was significant in influencing beneficiaries' participation in fadama II project.

Farm size also has positive coefficient (0.10532) and was highly significant ($p < 0.01$) in influencing participation in the programme. This result affirms that those individual with large size of farm land were more likely to participate in the programme. On the contrary the finding is at variance with the findings of Ebojei *et al.* (2012) who found

that farm size had no significant influence on participation. The result also revealed that likelihood of participation could be motivated by frequent contacts with Extension agents which has positive coefficient (0.41790E-01) and was significant at ($p < 0.05$). Extension agents popularizes innovation by making farmers exchange idea, experiences, and makes it cheaper to source information, knowledge and skills in order to enable farmers to improve their livelihood. This finding is in conformity with Conroy (2005) who found out that farmers that who have frequent contacts with extension agents had a higher probability of participation in the innovation. The amount of credit also has positive coefficient (0.65083E-01) result but it was not significant at any level. Age, marital status, and farming experience had negative coefficients. This implies that they are inversely related to participation in USAID/ MARKETS programme in the study area. This implies that a unit increase of the variables with negative signs will result to a decrease in likelihood of participation in USAID/ MARKETS programme.

The value of pseudo coefficient of determination, R^2 was 0.623. This implies that about 62% of the variation in the participation of USAID/MARKETS programme was explained by the independent variables in the logistic regression model. Hence, we reject the null hypothesis that socio- economic and institutional characteristics of sorghum farmers have no significant influence on their participation in the USAID/ MARKETS programme and accept the alternative hypothesis that socio-economic and institutional characteristics of sorghum farmers have significant influence in the participating in the USAID/MARKETS programme.

Table 4.3 Socio-economic and institutional factors influencing participation of sorghum Farmers in the USAID/MARKETS programme

Variables	Notations	Coefficients	Standard error	T-value
Constant	β_0	23.935	0.256E+06	0.933E-04
Age	X_1	-26.335	0.256E+06	-0.102E-03 NS
Marital status	X_2	-0.19655E-02	0.159E-01	-0.123 NS
Household size	X_3	0.88481	0.3481	2.241**
Educational level	X_4	0.47481E-01	0.211E-01	2.241**
Farming experience	X_5	-0.74813E-04	0.652E-03	-0.115 NS
Extension visit	X_6	0.41790E-01	0.182E-01	2.296**
Cooperative association	X_7	0.30655	0.149	2.064**
Farm size	X_8	0.10532	0.352E-01	2.992***
Amount of credit received	X_9	0.65083E-01	0.136	0.479 NS

**P<0.05
***P<0.01
NS = Not Significant
The choosen level is at **P<0.05

4.3 Support Services Provided by USAID/ MARKETS Programme to Sorghum Farmers

The services rendered by USAID/MARKETS Programme to sorghum farmers in the study area were ranked according to their magnitude as stated by the farmers (Table 4.4). Training of the sorghum farmers rank first with about 99% of the respondents attesting to this facts. Technical assistance was provided directly to group of farmers through the adoption of good farming skills and improved practices, group formation, leadership, organisational and business skills, in order to improve their ability to negotiate effectively with contracting companies.

About 98% of the respondents (sorghum producers) recieves technical assistance such as; input materials such as quality seeds, fertilizers, mechanized equipment supplies and while field visit after training ranked third with 98% .Only 96% of the respondents revealed that USAID/MARKETS programme assisted them by identifying a target markets for sorghum varieties at competitive price, followed by developing strategic partnerships with agribusiness firms that service these market and are committed to local production through backward integration. The result is line with the findings of Tsado *et al.* (2014), who stated that a good number of participants benefited from various services and training activities they were exposed to, by the intervention programme.

Table 4.4 Support/services provided by USAID/MARKETS for sorghum farmers

Support services	***Frequency**	**Percentage**
Training on recommended production practices	151	99
Input: such as seeds, fertilizers and credit	149	98
Field Visit after training	149	98
Market linkage	147	96

* multiple responses allowed

4.4 Impact of USAID/ MARKETS Programme on Livelihood of Sorghum Farmers

The impact of USAID/MARKETS programme intervention was determined in terms of sorghum output, income from sorghum production and level of living of the respondents in the study area

4.4.1 Impact of USAID/ MARKETS programme on output of sorghum farmers in the study area

The impact of USAID/ MARKETS programme on the sorghum output of the participants and non-participants in the study area was achieved using chow test statistics. The result from Table 4.4.1 revealed that the Chow F calculated was 4.61, while F Table value at 7 degree of freedom with sample size of 245 was 2.80 at 5% level of probability implying a significant impact of USAID/MARKETS programme on participants sorghum output in the study area since the F calculated was greater than the F table. Hence, we reject the null hypothesis that there is no significant impact of USAID/MARKETS programme on the output of the participating farmers in the study area and accept the alternative hypothesis. This findings is line with that of Alfred(2000) who pointed out that training and adoption of improved recommended practices had a significant and positive influence on farmers output and consequently income.

Table 4.4.1: Impact of USAID/MARKETS programme on output of sorghum farmers

Group Sample	R^2	Residual sum of square	N	K	F-cal	F-tab
Pooled Samples	0.40	100035.5	245	8	4.61	2.80
Participants	0.31	76959.54	153			
Non-participants	0.79	10824.95	92			

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

4.4.1.1 Distribution of annual output of participants and non- participants in the USAID MARKETS sorghum programme in the study area.

The result on table 4.4.1.1 showed the difference between the mean output of participants and non-participants. A positive mean difference in output of participants

(51) and non participants (42) implies that there was impact of the programme on the participants. Similar results were observed by (Simonyan 2009 and Tsado and Zakari, 2007) who stated that there is significant mean difference in output between participants and non- participants of intervention programmes.

Table: 4.4.1.1 Distribution between the output of participants and non- participants in the USAIDMARKETS sorghum programme.

Variable	Non Participants		Participants	
Output (kg.00)	Frequency	Percentage	Frequency	Percentage
< 20	23	25	22	14
21-40	22	24	42	27
41-60	28	30	27	18
61-80	17	18	50	33
81-100	2	2	7	5
>100	0	0	5	3
Total	92	100	153	100
Mean	**42**		**51**	

4.4.2 Impact of USAID/ MARKETS programme on income of sorghum farmers in the study area

The impact of USAID/MARKETS programme on the income of the participants and non-participants sorghum farmers in the study area was achieved using chow test statistics. The result from Table 4.4.2 revealed that the Chow F calculated was 15.58, while F table value at 7 degree of freedom with sample size of 245 was 2.80 at 5% level of probability implying a significant impact of USAID/MARKETS programme on income of the participants in the study area since the F calculated was greater than the F table. Hence, we reject the null hypothesis that there is no significant impact of USAID/MARKETS programme on income of the participating farmers in the study area and accept the alternative hypothesis.

Table 4.4.2: Impact of USAID/ MARKETS programme on income of sorghum farmers

Group Sample	R^2	Residual sum of square	N	K	F-cal	F-tab
Pooled Samples	0.13	4856141000000	245	8	15.58	2.80
Participants	0.12	2050848000000	153			
Non-participants	0.59	1247981000000	92			

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

4.4.2.1 Distribution of annual income of participants and non-participants in the USAID/ MARKETS sorghum programme in the study area.

The table 4.4.2.1 reveals higher number of participants farmers 83 (55 %) fall within the income bracket of (< ₦20,000) while 63 (68%) of non – participants farmers fall within the same income bracket. Also, 40 (26%) of the participant farmers and 10 (11%) of non-participant farmers fall within income of (₦200,000 - 400,000). This indicate that incomes improved significantly more for participants farmers than for non- participants. Olaniyan (2000) observes that income is an import contributor to the improvement of rural wellbeing, and that non-wage income source is the major contributor to welfare increases (livelihood) in the rural areas than the wage income.

Table 4.4.2.1 Distribution between the annual income of participants and non-participants in the USAIDMARKETS sorghum programme.

Variable	Non-Participants		Participants	
Income (₦'000)	Frequency	Percentage	Frequency	Percentage
< 20	63	68	83	55
201-400	10	11	40	26
401-600	8	9	10	7
601-800	7	8	8	5
801-1000	3	3	7	4
>1000	1	1	5	3
Total	92	100	153	100
Mean	**152826**		**189935**	

4.4.3 Impact of USAID/ MARKETS programme on level of living of sorghum farmers

The result from Table 4.4.3, revealed that the Chow F calculated was 3.94, while F table value at 7 degree of freedom with sample size of 245 was 2.80 at 5% level of probability implying a significant impact of USAID/MARKETS programme on level of living of the participants in the study area since the F calculated was greater than the F table. Hence, we reject the null hypothesis that there is no significant impact of USAID/MARKETS programme on level of living of the participating farmers in the study area and accept the alternative hypothesis.

Table 4.4.3 Impact of USAID/MARKETS programme on level of living of sorghum farmers

Group Sample	R^2	Residual sum of square	N	K	F-cal	F-tab
Pooled Samples	0.17	23459090000000	245	8	3.94	2.80
Participants	0.14	15762670000000	153			
Non-participant	0.43	5194023000000	92			

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

4.4.3.1 Distribution of level of living (assets) of participants and non- participants in the USAID MARKETS sorghum programme.

Table 4.4.3.1 reveals that participation in USAIDMARKETS programme has made concerted effort at providing productive goods among the participants. The difference in the value of productive goods was large and significant among the participant compared to their counterparts of the non-participants. A positive mean value in level of living of participants (₦389160.6) indicating large increases in the value of productive goods among the programme participants as compared to non participants (₦311667.4) implies that there was impact of the programme on the participants' farmers' level of living. This result demonstrates that the programme has helped the participants to acquire more productive goods to facilitate their economic activities. It is expected that these goods contribute immensely to increase in productivity and consequently increase in income which would lead to change in their livelihood. We operationalise level of living through all things contributing to the quality of life of the respondents hence boasting their social status. Thus, level of living was measured in terms of value of durable goods such as cell phone, motor cycle, car, farm equipment of an individual farmer which was converted to naira (₦) value

Table 4.4.3.1 Distribution between level of living of participants and non- participants in the USAIDMARKETS programme.

Variable	Non-Participant		Participant	
(₦ '000)	Frequency	Percentage	Frequency	Percentage
< 20	48	52	72	47
201-400	4	4	15	10
401-600	24	26	13	8
601-800	14	15	26	17
801-1000	0	0	24	16
1001-1200	2	2	0	0
Total	92	100	153	100
Mean	**311667.4**		**389160.6**	

4.5 Constraints Faced by Sorghum Farmers in the Study Area

The problems faced by sorghum farmers in the study area were ranked according to their magnitude as stated by the farmers (Table 4.5). The problem of pest and disease was the most severe constraint of sorghum producers with about 53% of the respondent attesting to this fact. Pest and disease were responsible for pre-harvest and post-harvest losses by sorghum producers. About 36% of the sorghum farmers indicated inadequacy of capital and credit facilities which rank second. This affects sorghum production in the study area, because the meager savings the farmers might have made or the funds generated from relatives is not sufficient to satisfy various activities in sorghum production. Most of the farmers also complained of not having enough money to purchase chemicals to combat these diseases, although the economic advantage of spraying could lead to increase yield thereby justify the costs they invested.

This is in line with findings of Usman and Bakari (2013) who in their study of profitability of small scale dry season Tomato production in Adamawa asserted that, pest and diseases were ranked first as major constrained faced by the farmers while

inadequate farm credit ranked second. About 31% of the sorghum farmer indicate short of labour as constraints in the study area. According to the farmers, during active period of production-every household would have been engaged in his family farm work. The demand for labour is normally very high and expensive during the peak period of land clearing, ridging, harvesting, processing and weeding, these led to labour shortage in sorghum farming in the study area .

High cost of fertilizer rank fourth as perceived to be least serious constraint with about 13% of the farmers attesting to this fact. According to the respondent fertilizer from Government source was usually made available when farmers are far into the production period, sometimes at the middle of the raining season. This finding is in conformity with Akangbe, *et al.* (2012), who reported that fertilizer shortage is the least constraints faced by fadama II project farmers in their study area.

Table 4.5 Constraints associated with USAID/MARKETS programme sorghum production

Variable	***Frequency**	**Percentage**
Pest and disease	129	53
Inadequate capital/credit	89	36
Labour shortage	75	31
Hight cost of fertilizer	32	13

* Multiple responses allowed

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

This study carried out impact of USAID/ MARKETS programme on sorghum farmers' livelihood in three local governments of Kaduna state, Nigeria. The study came up with five specific objectives. These were to: describe the socio-economic characteristics of sorghum farmers under USAID/MARKETS programme in the study area, determine the socio-economic and institutional factors influencing participation of sorghum farmers in the USAID/MARKETS programme in the study area, assess the level of support services provided by USAID/MARKETS for sorghum farmers in the study area, determine the impact of USAID/MARKETS programme on livelihood of sorghum farmers and to identify the constraints faced by sorghum farmers under USAID/MARKETS programme.

A multi-Stage sampling technique was used to select respondents for the study. A total of two hundred and forty five respondents comprising of one hundred and fifty three (153) participants and ninety two (92) non-participants were interviewed with aid of structured questionnaire to obtained vital information. Analytical tools used were both descriptive (frequency distribution, tables, percentages and mean) and inferential statistics (logistic regression and chow test statistical tool). The results of the analysis obtained shows that Majority (62%) of the respondents participants and (61%) of the non-participants were within the age range of 40-49 years. Almost all the respondents are married with just few singled. More also, about (16%) of the participants and (67%) of the non- participants had no formal education, while (73%), (28%) of the participants non- participants attended primary and secondary schools with only (11%)

and (4%) of the participants and non- participants who attended tertiary institutions. Majority (88%) of the farmers had farming experience range from 1-20 years. About 72% of the farmers finance their production through personal savings; majority of the farmers 97% had land size ranging from 1-5 hectares. However, 87% of the farmers belong to one cooperative association or more while majority 85% of the participants' sorghum farmers had extension visit.

The study revealed that participants benefited from support services rendered by the programme: such like training on improve sorghum production practices, technical assistance on quality input/field visit, and market linkages ranked 1^{st}, 2^{nd}, 3^{rd}, respectively, among the participants' farmers. From the logit regression on factors influencing participation, the value of pseudo coefficient of determination, R^2 was 0.623 meaning that about 62% of the variation in the participation of USAID/MARKETS programme is explained by the independent variables in the logistic regression model. Chow test statistics was used to assess the impact of USAID/MARKETS programme on the output, income and level of living. Chow F calculated was 4.61, while F table value at 7 degree of freedom with sample size of 245 was 2.80 at 5% level of probability while for income the Chow F calculated was 15.58, while F table value at 7 degree of freedom with sample size of 245 was 2.80 at 5% level of probability and for level of living the Chow F calculated was 3.94, while F table value at 7 degree of freedom with sample size of 245 was 2.80 at 5% level of probability implying a significant impact of USAID/MARKETS programme on the sorghum output, income and level of living in the study area.

Finally, among the constraints identified in the study area, the Majority (53%) of the respondent attested to the fact that pest and diseases ranked first followed by inadequate capital (36%) were the major constraints faced.

5.2 Conclusions

Based on the findings of this study, it concluded that participating in USAID/ MARKETS programme had broadened the knowledge base of the participants through training, market linkage, advisory services of the programme, enhanced the output, increased the income and living conditions of the participants more than that of the non-participants in the study area. In overall, there was significant impact of USAID/MARKETS programme on sorghum output, income from sorghum and level of living of the participants compared to the non-participants in the study area. However, some of the major constraints identified were pest and diseases and inadequate capital. It is evident that no study have been conducted to assess the impact of USAID/MARKETS from an external source in the study area, hence the results emanating from this study will assist in future programme designs and evaluation.

5.3 Recommendations

In light of the findings of the study, the following recommendations are proffered:

i. Sorghum farmers in the study area should be encouraged and persuaded by extension agents to take advantage and participate actively in such intervention programmes in order to increase their productivity and gain access to inputs and linkages to markets which would increase their income for better change of level of living standard.

ii. Cooperative membership was found to be positive and significantly influenced participation. It is recommended that farmers should join cooperative societies as this would facilitate access to vital information and credit provided mostly by financial institutions for large scale sorghum farming and also for bulk purchase of farm inputs which could in turn increase sorghum output, income and improve the level of living of the farmers, which is usually the ultimate aim of all the intervention programmes.

iii. The study had identified some constraints such as pest and disease, inadequate capital, labour shortage and high cost of fertilizer that may affect the sustainability of the programme. It is recommended that USAID/ MARKETS and other intervening agencies on agriculture should ensure that strong institutional linkages and facilitation are created among farmers, input suppliers, credit institutions and market for effective service delivery.

iv. The study show that USAID/MARKETS intervention approach had impacted significantly on the participants. It is thus recommended that the programme be sustained and replicated in other states.

5.4 Contribution of the Study to Knowledge

i. Findings from this study revealed that, the value of pseudo coefficient of determination, R^2 was 0.623. This implies that about 62% of the variation in the participation of USAID/MARKETS programme was explained by the independent variables in the logistic regression model.

ii. It also indicates that individuals with large household size stood better chance of participating in the programme than small households. Educational level, farm size and membership of cooperative were also important factors influencing participation in the programme.

iii. The results of this study revealed impact of USAID/MARKETS programme on sorghum output, income and level of living of the participants as shown by the Chow- test F calculated 4.61, 15.58 and 3.91 respectively.

iv. The study identified some major constraint such as pest and disease with 53% of respondents attesting to it, followed by inadequate capital with 36% , which sorghum farmers faced in study areas and affecting the sustainability of the programme

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APPENDIX I: Farmers' Research Questionnaire for participants

IMPACT OF USAID MARKETS PROGRAMME ON SORGHUM FARMERS LIVELIHOOD IN THREE LOCAL GORVERNMENTS OF KADUNA STATE, NIGERIA

Dear Respondent**,**

This questionnaire will be used by a student of Department of Agricultural Economics and Rural Sociology, Faculty of Agriculture, Ahmadu Bello University, Zaria. Please, respond or tick where necessary. All information will be treated with utmost confidentiality and will strictly be used for the purpose of research only. Thanks for your cooperation.

SECTION A: BACKGROUND INFORMATION OF THE FARMER

Questionnaire No……..….. Name of Respondent……

Village…… L.G.A…… Date……../……../2013.

SECTION B: SOCIO-ECONOMIC CHARACTERISTICS OF THE FARMER

1. Sex: Male ( ) Female ( )
2. Age of respondent (years): ……
3. Marital status: (a)Single ( ) (b) Married ( ) (c) Widow ( ) (d) Widower ( ) (e) Divorce ( )
4. Household size: ……
5. Level of education……..……..

(a) No formal education: ( ), (b) Adult-education…….years, (c) Primary education….years

(d)Secondary education: ……..Years, (e) Post-secondary education: …years

6. How long have you been in sorghum production?……..years
7. Estimated annual income: …….Naira.

8. Extension visit in 2013 :……(Times)

9. Are you a member of any cooperative group? Yes ( ), No ( )

10. If yes, give number of years of participation: ……..

11. Total farm size cultivated in 2013: ……..ha

12. Amount of formal credit received in 2013: …….Naira.

SECTION C. EXTENT OF PARTICIPATION

13. When did you get to know about USAID MARKETS?.....

14. How did you get to know about USAID MARKETS?.....

(a) Radio, (b) Friends, (c) Television, (d) News paper, (e) Fliers, (f) Awareness campaign.
(g) Kaduna ADP, (h) USAID MARKETS officials, (i) other (specify) ……

15. Which year did you start participating in USAID MARKETS activities?.....

16. In what ways have you benefitted from USAID MARKETS? (Tick as many as applicable)

(a) Loan, (b)Training (leadership, agronomic practices and group formation),(c) Input
(b) Supply, (d) Market linkages, (e) others (specify) ……..

17. If you have benefited from cash loan from USAID MARKETS, please give total amount:…….Naira.

18. If you have benefited from loan in kind, please give monetary value of such kind loan(s):……Naira.

Kind 1 …….value: ₦……

Kind 2 ……. Value: ₦……..

19. After the training, have you ever had any of the USAID MARKETS trainers visiting you to monitor your progress? Yes ( ), No ( ).

20. If yes, give number of visits: ……..time(s)

21. If no, give reason(s) if any: …….....

……..……..

…….

SECTION D: IMPACT

22. Give a list of your household items and/or properties……

(a)Household Assets

Assets	**Total number owned after joining** USAID MARKETS **(2013)**	**Estimated monetary value(₦) (2013)**
Cell phone		
Video		
Radio		
Television		
Car		
Motor cycle		
Bicycle		
Wheel barrow		
Hoes		
Machets'/cutlasses		
Refrigerator		
House purchased		
Sprayers		

(C) What type of dwelling house does the household live in?

(a).Roofing materials of household's main residents	Thatch, wood, zinc, concrete, tiles.
(b).Walls materials of the household's main residents.	Mud, cement, bricks, stone.
(c). Floor materials of household's main resident	Mud, concrete, cement, tiles.
(d).Number of rooms excluding Kitchen and bathrooms	
Estimated value of household residential buildings as at 2012.	Naira……

(D). Give sorghum output realized, estimated area cultivated and income in 2012.

Crop	**Area (ha)cultivated**	**Output**	**Unit price (N)**	**Estimated total value (N)**
(i)…….				

Grain = 100kg bag.

CONSTRAINTS

23. What are your constraints as a participant in the USAID MARKETS in Kaduna State?

(i) …….

(ii)……..

(iii) …….

(iv)…….

24. Suggest ways in which the above constraints can be reduced for participants in the USAID/MARKETS in Kaduna State

(i) ……

(ii)……

(iii)……

(iv)……

(v)……

Thank you.

APPENDIX II: Farmers' Research Questionnaire, for non-participants

IMPACT OF USAID MARKETS PROGRAMME ON SORGHUM FARMERS LIVELIHOOD IN THREE LOCAL GORVERNMENTS OF KADUNA STATE, NIGERIA

Dear Respondent**,**

This questionnaire will be used by a student of Department of Agricultural Economics and Rural Sociology, Faculty of Agriculture, Ahmadu Bello University, Zaria. Please, respond or tick where necessary. All information will be treated with utmost confidentiality and will strictly be used for the purpose of research only. Thanks for your cooperation.

SECTION A: BACKGROUND INFORMATION OF THE FARMER

Questionnaire No……..….. Name of Respondent……

Village…… L.G.A…….
Date……../……../2013.

SECTION B: SOCIO-ECONOMIC CHARACTERISTICS OF THE FARMER

1. Sex: Male ( ) Female ( )
2. Age of respondent (years): ……
3. Marital status: (a)Single ( ) (b) Married ( ) (c) Widow ( ) (d) Widower ( ) (e) Divorce ( )
4. Household size: ……
5. Level of education……..……..

(a) No formal education: ( ), (b) Adult-education…….years, (c) Primary education….years
(d)Secondary education: ……..Years, (e) Post-secondary education: …years

6. How long have you been in sorghum production?……..years
7. Estimated annual income: …….Naira.

8. Extension visit in 2013 :……(Times)

9. Are you a member of any cooperative groups? Yes ( ), No ( )

10. If yes, give number of years of participation: ……..

11. Total farm size cultivated in 2013: ……..ha

12. Amount of formal credit received in 2013: …….Naira.

SECTION C: IMPACT

22. Give a list of your household items and/or properties……

(a)Household Assets

Assets	**Total number owned (2013)**	**Estimated monetary value(₦) (2013)**
Cell phone		
Video		
Radio		
Television		
Car		
Motor cycle		
Bicycle		
Wheel barrow		
Hoes		
Machetes'/cutlasses		
Refrigerator		
House purchased		
Sprayers		

(C) What type of dwelling house does the household live in?

(a).Roofing materials of household's main residents	Thatch, wood, zinc, concrete, tiles.
(b).Walls materials of the household's main residents.	Mud, cement, bricks, stone.
(c). Floor materials of household's main resident	Mud, concrete, cement, tiles.
(d).Number of rooms excluding Kitchen and bathrooms	
Estimated value of household residential buildings as at 2012.	Naira……

(D). Give sorghum output realized, estimated area cultivated and income in 2012.

Crop	**Area (ha)cultivated**	**Output**	**Unit price (N)**	**Estimated total value (N)**
(i)…….				

Grain = 100kg bag.

CONSTRAINTS

23. What are the constraints you encountered during this production?

(i) …….

(ii)……..

(iii) …….

(iv)…….

24. Suggest ways in which the above constraints can be reduced

(i) ……

(ii)……

(iii)……

(iv)……

(v)……

Thank you.