

**ADOPTION OF IMPROVED CASSAVA PROCESSING TECHNOLOGIES
AMONG RURAL WOMEN PROCESSORS IN ZONE I OF JIGAWA STATE,
NIGERIA.**

BY

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DECLARATION

I hereby declare that this work is the product of my own research efforts; undertaken under the supervision of Prof. M.I. Daneji and Dr. I. Tafida and has not been presented anywhere for the award of a degree or certificate. All sources have been duly acknowledged.

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CERTIFICATION

This is to certify that the research work titled Adoption of Improve Cassava Processing Technologies Among Rural Women Processors in Zone I Jigawa State, Nigeria and the subsequent write-up by ‘‘Mustapha Musa Kundiri with the Registration number SPS/14/MEX/00028’’ were carried out under our supervision and meets the regulations governing the award of Master’s Degree in Bayero University, Kano and approved its contribution to knowledge and literary presentation.

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LIST OF ACRONYMS

GDP	Gross Domestic Product
FAO	Foods and Agricultural Organization
IITA	International Institutes of Tropical Agriculture
HCN	Hydrogen Cyanide
CMD	Cassava Mosaic Disease
JARDA	Jigawa State Agricultural and Rural Development Authority
NRCRI	National Root Crops Research Institutes
AMRP	Agricultural Mechanization Research Programme
IAR	Institute for Agricultural Research
PRODA	Project Development Authority
NCAM	National Centre for Agricultural Mechanization
ARCEDEM	African Regional centre for Engineering design Manufacturing
FIIR	Federal Institute for Industrial Research
RAIDS	Rural Agro- Industrial Development Scheme
WIA	Women in Agriculture
NSADP	Niger State Agricultural Development Project
MLE	Maximum Livelihood Estimation
OLS	Ordinary least Square
IFAD	International Fund for Agricultural Development
NIG	National Information Guide
NPC	National population commission
ADP	Agricultural Development Program me

ABSTRACT

This study examined the adoption of improved cassava processing technologies among rural women processors in Zone I Jigawa State, Nigeria. Three Cooperatives from Birnin-kudu Local Government Area, Five Cooperatives from Gwaram Local Government Area and Four Cooperatives from Miga Local Government Area were purposively selected. Simple random sampling technique was employed for the drawing of 50% of the members from each cooperative, making a total sample of 150 women drawn from a sampling frame of 300 processors. Primary data were collected through the use of structured questionnaire. Data collected were analyzed using descriptive and inferential statistics. Results revealed that processors in the area were young, married with little or no formal education having processing experience of 6-10years. Also, majority (98.7%) were registered members of association with having frequent contact with extension agents and house hold size of 12 persons. Also, had annual income of ₦ 77,500 which could have been one of the reasons why adoption of improved cassava processing technologies was low in the area. The Logit regression equation recorded a chi-square of 4.328; about 75% of the independent explanatory variables were statistically significant at 0.05 level of probability. The variable of marital status, house hold size, level of education, access to credit, contact with extension agents and cooperative membership revealed positively significant relationship with women's or use of the improved cassava processing technologies. While the level of acceptance of the technologies was estimated at 65.32%; Major constraint identified were inadequate income/capital, shortage of processing machines, complexities of technology, high cost of machines, inadequate improved varieties, poor road network and unsteady power supply. Based on the research findings, the study recommends the need for putting more efforts towards diffusing the technologies to other parts in the study area.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

In Nigeria, agriculture plays a vital role in economic development. This is because it contributes about 37.2% of the country's Gross Domestic Product (GDP). Provides direct employment to about 75% of the population (Nwakor *et al.*, 2007) accounts for only 44% of Nigeria's total exports and 56% of total non-oil export, provides over 90% of the food requirement of the Nigerian population. Agriculture also provides raw materials for 60% of industries in the country. Cassava (*Manihot esculentus*; *syn. Utilissima* Pohl) originates from North-East Brazil in the Amazonian region of South America. It was introduced to Africa in Zambia around 1700century by Portuguese traders and explorers. Cassava is one of the most important staple food crops available in Nigeria and the whole of West Africa. It is a popular product because it is cheap and easy to produce in all tropical regions. It is found to be extremely tolerant to environmental stress which makes it suitable for present farming and food system in Africa. Research has shown that cassava is a leading root crop in developing countries (Bunmade1990). According to him, major aims of processing cassava are to check subsequent losses and enhance palatability and other sensory attributes.

FAO (2004), described cassava processing in Nigeria at five levels. Common terms used to describe these capacity levels were house hold (or cottage), Micro, Small, Medium and Large. House-hold level processing typically did not employ any outside labour. The house hold consumed virtually all the processed products and sold a small amount to raise income for additional house hold needs. According to FAO (2004), most Nigerian processors fell within this category. At micro processing capacity the employment of one or two units of labour might take place while processing a variety

of products. Batch processing might take four hours per- day and this would be sufficient for the owner/operator. Nigeria had a few processors in this category. The small and medium processing operations typically employ three to ten workers and were very sparse in Nigeria at present. Large scale processing was virtually non-existent in Nigeria. Household or traditional cassava processing according to IITA (2004) had a number of undesirable attributes. It was time consuming, provided low yields, and lacked storage capabilities. Kwaitia (1986) indicated that drying of fresh cassava roots shape varied among cultivars. He believed that roots with irregular shapes were difficult to harvest and peel by hand resulting in great losses of useable root materials. He further believed that varietal differences in dry matter content and starch content and quality influenced the output and quality of the processed products. Both the roots and leaves contain cyanide (HCN) and are therefore not eaten without processing except the sweet cassava variety.

Oti *et al.*(1987) maintained that agronomical factors could affect crop yield and processing qualities. As part of IITA (2004) cassava mosaic disease (CMD) project, initiative was put forward for the collection of needed data on processing technologies and equipment. Bench-marks were needed to measure the progress of the cassava industry. It was known that small-scale operators using low level technologies did process, but their needs, capacity or the intended benefit from moving to higher levels of technology were not known. Oti *et al.* (1987) agreed that the quality of certain cassava products could be compromised through traditional processing methods, based on the crude and unhygienic ways they were replaced. Such values, according to him included elimination of HCN through extended fermentation or water expression methods. If these processes were replaced he observed, through the introduction of new technologies, there might be a need for research on how to

improve the taste of cassava products without necessarily changing the desired quality or increasing the cost of the products.

According to IITA (2004), engineering research in Nigeria and other African countries resulted in successful mechanization of some of the laborious and time consuming cassava processing operations. Current research efforts was still on the universities in Africa aimed in improving the material and sensoric qualities of cassava, produced. In spite of the foregoing efforts, Bun made (1990) maintained that although research work was going on to improve cassava storage, it would still appear that traditional processing was best alternative as of that time. Also Jigawa State agricultural and rural development authority (JARDA, 2006) reported that manual processing rudimentary tools or traditional method was still the order of the day in the study area. Women farmers in the study area were known for the production, processing and marketing of cassava root. Through traditional method, cassava roots were processed into various products for both human consumption and industrial requirements There were increased demand for processed cassava products such as chips/chunks, flour, gari, starch and others. Nigeria was recognized as one of the leading producers of cassava in the world, since 2002 (FAO, 2004). Furthermore, Nigerian Cassava Yield of 9.8 tonnes per hectare is still lower than the world average Yield of 10.76 tonnes/ha irrespective of her being ranked highest cassava producer in the whole world. The main solution to this problem is adoption of improved cassava varieties and production technologies by the farmers (Imo, 2006).

In order to relieve farmers from this problem of poor yield during harvesting, the International Institute of Tropical Agriculture (IITA) Ibadan and National Root Crops Research Institute (NRCRI) Umudike collaborated to develop some improved cassava

varieties capable of adapting to a wider range of ecological conditions and farming system.

Among these varieties are TME419, NR8082, NR8083, TMS96/0002 and TMS92/0057 (Imo and Essien, 2005). NRCRI Umudike has developed about 27 hybrid cassava varieties through selective breeding. TME419, NR8082, NR8083, TMS96/0002 and TMS92/0057 are current improved cassava varieties being transferred by NRCRI, IITA (2004, 2005 and 2006). National Root crops research institute And International Institute of Tropical Agriculture to farmers in Jigawa State and other States in the south east agro ecological Zone of Nigeria. Up till now, many farmers are still planting non-improved varieties in the study area as reported by (JARDA, 2006). However, in spite of the various uses of cassava products for industrial, animal and human consumption occasioned by fluctuation in production, poor producer's prices and inadequate storage facilities became permanent features of this sector of Nigeria's agriculture. Furthermore, inadequate affordable modern equipment for poor rural women for the processing technologies constituted major constraints to cassava processing in the study area. Cassava processing technology is the technology involve in processing cassava to make it value addition.

The cassava technology in the IITA package includes sieving machine for garri processing. Slicing machine for cutting cassava into pieces, Grating machine for grating cassava to be in mash form, Cassava Sifter this is also a simple machine which is electrically operated. It has a shallow flat rectangular funnel-likesieve. The machine has connecting rods which make the funnel oscillate to sieve garri for frying, Hammer milling machine for grinding dry cassava into flour form, frying pan use for cooling roasted garri, Hydraulic press/jack use for compressing the grounded garri to remove water, Chimney a vertical tube or hollow column used for emitting gaseous substance,

Chimney covers the side of an open fire place, Conveyor belt-belt, mobile grater, Weighing and Hanging scale etc. The Jigawa State Ministry of Economic and youth Empowerment in collaboration with IITA and Agricultural transformation agenda support programme (ATASP) of the Federal Government of Nigeria have provided this technology on the 21-06-2016, targeting women cassava processors cooperatives and Extension agents for the purpose of technology demonstration and training in Zone I of the study area.

The processing of Cassava therefore requires modern technologies such as (motorized graters, motorized flakers, hammer mill, motorized chippers and mechanical sifters) as against the indigenous technologies in the rural areas as supported by E.P. Ejembi (2016). These necessitated the research adoption of improve cassava processing technologies among rural women processors in zone I Jigawa state Nigeria.

1.2 STATEMENT OF PROBLEM

Many of the small scale farmers who live in the rural areas of Nigeria are women who engage not only in on-farm production activities, but also post-harvest activities such as processing (Shiva, 1991). The processing sector has a number of weaknesses. Any large expansion in production which is technically feasible, could lead to market instability and price drops unless the mechanism for processing (to ensure that cassava is available in the most appropriate form) is developed and improved. Although improved technologies such as mechanical grater, hammer mills, mechanical sifter have been promoted among processors, there is still the need to conduct comprehensive study to obtain information that could facilitate adoption of improved cassava technologies for better agricultural processing in Nigeria. (Nweze, 2002). For instance, the earlier neglect of women's role in agricultural production was reflected in the design and dissemination of agricultural technologies by development agencies

and research institutes. Most of the technologies were designed based on their assumption that farmers are male (Nweke *et al.*, 2004).

However, the growing awareness on the role of women and the need to alleviate their burden has motivated the Agricultural Mechanization Research Programme (AMRP) of the Institute for Agricultural Research (IAR) in Ahmadu Bello University, Zaria to develop machines especially for agricultural operations of women. Among the machines produced are the multi crop thresher, motorized maize Sheller and groundnut oil extraction tools. The machine for cassava processing (motorized graters, motorized flakers, hammer mill, motorized chippers and mechanical sifters) have also been developed by the University of Nigeria, Nsukka, Project Development Authority (PRODA), Enugu National Centre for Agricultural mechanization (NCAM), Ilorin, Federal Institute for Industrial Research, Oshodi, Nigeria (Nweke *et al.*, 2004). In addition, high cost of protein sourced from animals had made it economically imperative that improved cassava processing technologies should be promoted. Its economic and nutritive values should be developed in Nigeria and Africa at large. Gender related factors such as ability to operate the machines by the women have not been in proper focus. Technologies are thus developed without reference to who traditionally performs the task, why and how they wish to perform the task and the desired products and by-products in case of processing. These have led to majority of the equipment developed not being used or adopted by the end users and in certain cases creating a misplacement of priorities. However, it is most unfortunate that the use of these technologies which is a radical approach to step up production and processing techniques, has not been properly addressed to the women (Davies and Davies,2009).

Nevertheless, previous studies gave emphasis on methods of cassava processing such as cassava roots, peeled, washed, soaked (3-4 days), washed and dewatered, pounded to dry, spread to dry, pound chips, sieved, flour, packaged also the knowledge gap relating to the use of improved technology such as mechanical grater, hammer mill, screw press, mechanical sifter, fryer toaster and hydraulic press for women in cassava processing has not been addressed. It is in light of this, that this study was conducted to assess the extent to which women cassava processors in Jigawa State have adopted the improved cassava processing technologies being promoted by the Institute for Agricultural Research Samaru Zaria. Accordingly, this study is therefore designed to answer the following research questions;

- i. What are the socio-economic characteristics of the rural women in cassava processing?
- ii. What are the available technologies used by the rural women cassava processors in the study area?
- iii. What are the awareness and use of improved cassava processing technologies by women processors?
- iv. What are the socio-economic factors that influence the women's use of the improved cassava processing technologies?
- v. What are the constraints encountered by the women using the improved cassava processing technologies?

1.3 OBJECTIVE OF THE STUDY

The broad objective of this study is to analyze the adoption of improved cassava processing technologies among rural women in Jigawa State.

The specific objectives of the study are to:

- i. describe the socio-economic characteristics of the rural women cassava processors in the study area.
- ii. identify the available technology used by the rural women cassava processors.
- iii. describe the awareness and use of improved cassava processing technologies by women processors.
- iv. determine the socio-economic factors that influence the women's use of the improved cassava processing technologies and
- v. identify the constraints encountered by the women using the improved cassava processing technologies.

1.4 RESEARCH HYPOTHESIS

Below is the research hypothesis of this study;

H₀: There is significant relationship between women cassava processors socio economic characteristics and socio economic factors affecting adoption of improved cassava processing technologies in the study area.

1.5 JUSTIFICATION OF THE STUDY

The study is aim at strengthening the capacity of stake holders to pilot and support development of improved cassava processing technology through appropriate diagnosis and analysis of the commodity. The information to be generated from the analysis is expected to support decision making on adequate investment, service provisions and policy support cassava processing. Jigawa State is known as one of the major producers of cassava in Northwestern part of Nigeria. However, little is known pertaining its processing. Hence, this study is also expected to identify the major constraints to efficient performance of cassava processing which will assist in the formulation of appropriate strategies that could be used by Government and private sector to promote further development of the market oriented food system. The study

will further provide relevant information for policies to improve cassava production, processing, marketing and consumption in the study area. Furthermore, the result of this research will be a useful guide to cassava farmers, processors, marketers, policy makers, extension workers and researchers.

CHAPTER TWO

LITERATURE REVIEW

2.1 CASSAVA PRODUCTION IN NIGERIA

This component presents review of cassava production in Nigeria, importance of cassava, Needs for cassava processing, Women development, cassava processing Technologies, Adoption of improved Agricultural Technologies, Factors influencing Adoption of improved Agricultural Technologies, concept of Technological changes, Technological attributes as well as constraints to women's use of improved Technologies in Nigeria.

2.1.1 Review of Cassava Production in Nigeria

Cassava (*Manihot Spp*) is a perennial vegetative shrub that is grown throughout the tropics. As a food crop, cassava is the fourth most important staple in the world after rice, sugarcane and maize. (IFAD/FAO 2000). Cassava is a very important food crop in the tropics where an estimated half a billion people depend on it as a staple (Cock1985, IFAD/FAO 2000). Cassava was introduced in Nigeria by returnee slaves from America. It performs so well in the country that Nigeria has become the World largest producer having overtaken Brazil and Thailand (FAO, 2006). Furthermore, Nigerian Cassava Yield of 9.8 tonnes per hectare is still lower than the world average Yield of 10.76 tonnes/ha irrespective of her being ranked highest cassava producer in the whole world. Since 1990, Foods and Agricultural Organization has consistently affirmed that Nigeria has been witnessing a steady increase in the level of Cassava production both locally and internationally (FAO, 2008). Boma (2004) emphasized that Government should come up with favorable policies that will encourage Nigerians to go into Cassava production and assist in overall pricing of the product so as to make it worth the labour put into its production. The main solution to this

problem is adoption of improved cassava varieties and production technologies by the farmers (Imo, 2006).

2.1.2 Importance of Cassava

Cassava, just like Yam, is a root and tuber crop. It has underground roots which can be consumed by Man and Livestock animals after processing. It has other advantages over yam. In that it can grow in relatively poor soil and low rainfall area. The root is also rich in carbon hydrates. It is propagated by stem cuttings which are planted from March to September (Sasore, 2005). In spite of the fact that there are about 8000 plant species of Cassava of which about 300 have been domesticated for use in food by man, we in the tropics decided to adopt the most toxic of Cassava as staple Food crop due to tradition. Because of our tradition of eating starchy roots and tubers of various kinds, it has been necessary to eat even the toxic ones particularly during the hungry season (Bruijn, 1973) Gari is the most popular of the Cassava products and the sequential processing takes place from one to seven days (Sani,1994). The importance of Cassava in the Food basket of many Families in Africa has significantly increased due to several factors. Some of these factors include declining purchasing power, poor yield of other crops due to depletion of soil nutrients (FAO, 2006). Cassava appears to be the major staple Food that matches population growth. It has untapped genetic potentials which can be exploited through adoption of new improved processing technologies. Cassava potential supplements can be substitute for coarse grains in developing countries (Sani, 1994). Cassava has market potentials in pharmaceutical wood, textile and paper industries. It has been reported that Cassava root meal can replace Maize completely in the diet of pullets, Cockerels and Pigs (Nestle, 1973).

2.1.3 Need for Cassava Processing

Several root crops contain toxic substances example cyanide in Cassava and in some varieties of Potato. The presence of such toxic factors demands special processing procedures to make the product safe for human consumption. Before Cassava can be used for human consumption, it must be processed properly because of the presence of toxic substance (cyanide) in the roots. Different varieties of Cassava contain varying amounts of cyanide ranging from 15mg to 40mg/kg fresh weight (Coursey, 1973). Improvement of Cassava processing and utilization techniques would greatly increase labour efficiency, productivity and income of Cassava Farmers. Improved processing techniques will also make transportation easier, raise marketing opportunities and upgrade nutrition (Nweke *et al.*, 2004). The raw Cassava root and leaf are not palatable. Thus, there is need to process Cassava into various products that will increase easy transportation, marketing and have improved palatability. The processing of Cassava into a dried product is also a way of dealing with the perish ability of Cassava because, once harvested fresh Cassava roots show deterioration within 24hours (James, 1985).

2.1.4 Traditional Cassava processing method

Traditionally, the bulk of cassava products are processed by women at village level, working independently or organized into informal groups or cooperatives. These women have developed an empirical knowledge of the physical and chemical characteristics and the functional properties of the cassava starch, the traditional processing techniques are laborious, washing, peeling, resting, fermenting and heat treatments are typical of the processes used in production of gari in Jigawa State, fresh Cassava tubers are mainly processed into gari and flour. Gari is the most popular end product of grated fermented Cassava in Jigawa State. Fresh Cassava tubers are peeled

washed and grated using perforated tin sheets. The pulp is then packaged into bags and the liquid is squeezed out by placing heavy stones on top, or the bays are pressed between wooden boards. This process is done from between 3-5days depending on individual preference. During this period, fermentation and dehydration occur and this eliminates cyanide from the Cassava (Nkonya *et al.*, 1997). After draining water from the grated Cassava, it is then sieved to separate the edible grated Cassava from the fibers for frying. Frying is done using aluminum pan with constant tossing around to avoid burning.

2.1.5 Improved Cassava processing Technologies

In a bid to overcome the inherent problems of the traditional cassava processing giant strides have been made towards mechanizing several labor-intensive operations notably grating, water expression and milling. Various agro-engineering centres such as Rural Agro-industrial Development Scheme (RAIDS), Product Development Agency (PRODA), Federal Institute of Industrial Research (FIIRO), National Root Crop Research Institute (NRCRI) and International Institute for Tropical Agriculture (IITA), as well as the Agricultural Engineering Departments in several universities in the country, have developed many mechanized units designed to remove the constraints that processors face at the household level (FAO, 2005). The application of improved cassava processing technology results in reduced processing time and labour (Nweke, 1997). Under the transformation regime, high yielding cassava varieties have been developed to improve yield while labour saving and improved processing technologies have been put into place thus reducing the cost of producing and processing cassava products (Nweke *et al.*, 2002).

Grating: The grating operation is usually carried out manually, but power operated graters of various makes and models are being more widely used

Mechanical Sifter: This consist an iron mesh attached to iron bars. It is rectangular in shape and raised above the ground level. As the mesh tray moves left and right, it sieves the grated and pressed cassava into a fine and uniform consistency ready for frying. The fryer (toaster): The fryer or toaster takes care of the grated, pressed and sieved cassava. It consists an aluminium pan moulded roundabout with clay and rose above the ground level. Firewood is commonly used to supply heat. There is an iron pipe which serves as exhaust for the smoke. So when frying the gari there is no side effect of smoke and fumes on the people involved.

2.1.6 Adoption of improved Agricultural Technologies

Adoption is the acceptance of continued use of innovation after individuals or groups have gone through certain mental processes (Agbamu, 2006). Adoption is not a sudden event, but a process. Farmers do not accept innovations immediately, the need time to think things over before making a decision. The reluctance of a Farmer to adopt a certain innovation may indicate that the Farmer has not reached the appropriate stage of development and does not see the practice as essential for the continuing development of his enterprise. There are several well-known schemes for explaining development process such as awareness, interest, evaluation, trial and adoption (Ekong, 2003); and other ones include knowledge, persuasion, decision, Implementation and confirmation. These four stages have been elaborated by (Rogers and Shoemaker, 1995) as follows;

Knowledge: According to (Rogers, 1995), it is the stage when the individual learns of the existence of the innovation and gains some understanding of its function.

Persuasion: The persuasion stage is when the individual forms a favourable or unfavourable opinion of the innovation. This involves innovation evaluation where

individuals seek to know the advantages and disadvantages of the innovation and its applicability to their own situation (Mawusi, 2004).

Decision: when an individual engaged in activities that leads them to either adopt or reject the innovation. ‘‘Adoption is a decision to make full use of an innovation as the best course of action available’’, while ‘‘ rejection is a decision not to adopt innovation’’ (Rogers, 1995).

Implementation: When an individual puts an innovation into use. Individuals at this stage want to find answers to questions as, where do I obtain the innovation? How do I use it and how does it work? Moreover, what operational problems am I likely to encounter and how do I solve them? (Rogers, 1995).

Confirmation: is when the individual makes a final decision to accept or abandon the innovation. It is well known that some people are more innovative (responsive to new ideas) than others. (Rogers, 1995).

2.2 THEORETICAL FRAME WORK

By the theoretical Model, it means a broad system of explanations which is founded not so much on prior research findings but largely on untested assumptions about realities (Ekong, 2003). The theoretical frame work that guided this study is the social change theory, using the adoption and diffusion perspectives.

2.2.1 Individual Innovativeness Theory

The Individual innovativeness theory is based on who adopts the innovation and when. A bell-shaped curve is often used to illustrate the percentage of individuals that adopt an innovation. According to Carr (2006), the first category of adapters is innovators (2.5%) these are the risk-takers and pioneers who lead the way. The second group is known as the early adopters (13.5%). They climb on board the train early and help spread the word about the innovation to others. The third and fourth groups are the

early majority and late majority. Each constitutes 34% of the potential adopting population. The innovators and early adopters convince the early majority. The late majority waits to make sure that adoption is in their best interest. The final group is the Laggards (16%). These are the individuals who are highly skeptical and resist adopting until absolutely necessary. In many cases, they never adopt the innovation.

The traditional adoption/diffusion continuum recognizes five categories of adopters:

(1) Innovators (2) early adopters (3) early majority (4) late majority (5) laggards.

a. The Innovators: These are the individuals who are the first to experiment with and adopt new practices. They do not wait for an innovation to be tried, but go ahead to try it. They are usually young, more educated, more widely traveled, comparatively more well-to do, sharper to comprehend and apply complex technical ideas; they are of higher social class and often operate more efficient, specialized and larger farms than others in the community. They form just about 2.5% of the population. This category is deviant for their under conformity to traditional ideas.

b. The early adopters: They are among the first to use though not try out new practices. They are among the first to adopt the tried ideas or practices. People in the community regard them as those with good judgment, hence are usually the community leaders. Potential adopters look up to them for advice and information about the innovations. These categories of people are respected by peers and serve as role- model for other members of the community. They have high level of education and participate in quite a number of formal organizations

c. Early Majority: They are those who adopt new ideas just before the average members of the community do, they are not regarded by neighbors and friends as leaders, although they participate highly in the social life of community. They take

some time to deliberate before adopting and innovation, hence their adoption period is longer than that of innovators and early adopters.

d. The Late Majority: They are usually skeptical about innovations and only adopt when the average members of the society have adopted. Even when convinced of the utility and efficacy of the innovations, these people still require social pressure from peers to motivate them to adopt innovations. They are generally poorly educated, relatively older and poorer than the average.

e. The Laggards: They are normally old in age and are traditionally bound. A greater percentage of them are illiterates and are least economically well-off. Laggards are very last to adopt an innovation. They have no opinion leadership. They are very conservative in outlook, poorly educated and not widely travelled. They have little specialization. They abhor change, are isolates and do not encourage any adoption. They are a lot of reasons why they refuse change but this is usually related to their attachment to social values, norms and mostly risk aversion. They think more of the past instead of present and future, always suspicious of change and agents of change.

Innovativeness generally can be related to other personal characteristics: background, social status, affiliations and attitude (Ogunbameru, 2001).

2.2.2 Social change theory

Rogers (1995), has defined social change more specifically as the process by which alterations occur in the structure and functions of a society. Any change that occurs either in ideas, norms values, role and social habit of a people or in the composition or organization of their society can be referred to as social change. Most of the social changes in many known society developed through diffusion of cultures from other societies. The theory of social change within the frame work of this study helps us to understand the social reality, which demonstrated the changes that have taken place

from the adoption of improved Cassava processing technologies due to socio-Economic factors. Therefore, the occurrence of social change can better be explained by the perspective of adoption and diffusion.

2.2.3 Adoption and diffusion perspectives

Adoption is a decision to continue full use of an innovation (Ekong, 2003). Adoption is not a sudden event, but a process. Farmers do not accept innovations immediately; they need time to think things over before making a decision. The decision to use or adopt an improved technology by a farmer involved a series of stages which include Awareness, Interest, Evaluation, Trial and Adoption (Rogers, 1995). As a result of increased scientific research and improved methods of technology, a great variety of new materials and ideas have been generated and brought to the doors of the farmers and other rural food processors. The rates at which these people learn innovations and adopt them however differ greatly from one place to another. The rate of adoption of technology is important in assessing the effect of technology on the users. The rate of adoption could be seen as the proportion of farmers utilizing a particular innovation within a specified period, (Rogers, 1995). According to Rogers (1995), the term diffusion of innovations as a process by which an innovation spreads. The diffusion involves four essential elements innovation, its communication from one group to another, a social system within which this process occurs and the time period over which the process is affected. The classical diffusion adoption theory is made up of two components; the diffusion process and the adoption process. According to Odoemenem, (2007) the distinction made between adoption and diffusion concepts is that, “adoption is a concept which refers to the acceptance and continuous use of an idea or practice by single unit of a potential audience, while diffusion, on the other hand, is a concept which refers to the spread of idea, or practice through the whole of

the potential audience or social systems”. The perspectives of adoption and diffusion of innovation emphasizes the process of spreading new ideas or innovation within a given society.

2.2.4 Rate of Adoption Theory

The theory of rate of adoption suggests that the adoption of innovations is best represented by an s-curve on a graph. The theory holds that adoption of an innovation grows slowly and gradually in the beginning. It will then have a period of rapid growth that will taper off and become stable and eventually decline. It has been argued that potential adopters’ perceptions of the attributes of the new technology affect the rate with which the technology is adopted (Abera, 2008). Another study by Byerlee and polanco (1986) examined the relationship between rate of adoption of technologies and various economic factors, their study showed that, the adoption of technology is a function of five characteristics; profitability, riskiness, divisibility, complexity and inputs availability.

2.2.5 Technological Attributes

The process of making a decision is not an instantaneous one but rather occurs over a period of time and does not always follow the sequence in practice. It depends on the technology and the individuals in question (Vandan & Hawkins,1996). Literature on adoption (Monu, 1981) has analyzed the relationship between characteristics of technology and its rates of adoption. Abalu *et al.*, (1997) reports that when Women farmers find new technologies not to be technically feasible, economically viable and culturally compatible, they often reject such technologies. Mokonem, (1991) in a similar vein states that Women farmers often reject innovations when innovations are in appropriate or unrelated to their needs and problems. Therefore, the attributes of a technology include compatibility, affordability and complexity in this study.

COMPATIBILITY: compatibility is the degree to which the farmers perceives an innovation to be consistent with his values, his management objectives, the level of technology and the stage of farm development, for technology to be adopted, it should be consistent with the existing values, norms and past experience of the adopters. Incompatibility may result to acceptance or rejection of the technology.

AFFORDABILITY: This is the extent to which an innovation is affordable by the adopters. A technology may be perceived as having advantages over the ones being used, but may not be adopted because of its high cost. If the cost of the technology is high, there will be a possible slowing down of its adoption rate. Cost may not always be in terms of money or financial benefit but may also be in terms of what he/she is to gain from the technology (Okosi, 1999).

COMPLEXITY: This is the degree to which an innovation is relatively difficult to understand or use. Technologies that are relatively simple to understand and use tend to be readily adopted than those that are complex. In the case of an improved Cassava processing technology, complexity can be a barrier to adoption if servicing and spare parts are not available locally.

2.3 CONCEPT OF TECHNOLOGICAL CHANGE

According to Olayinde (1980), technological change is a continuous process of change within technical, material and physical practices in a culture. Technological changes are evident in our society in the areas of processing, transportation, communication, health, education and housing. Technological change can therefore be defined as an alteration in the existing traditional technology of a society to bring about improvement in her social and economic status. This usually results from years of research with the aim of increasing food production and the level of living of farmers and the entire population (Suleiman, 2012).

2.3.1 The Concept of Adoption of agricultural innovations

Various authors define technology in different ways. Loevinsohn *et al.*, (2013) define technology as the means and methods of producing goods and services, including methods of organization as well as physical technique. According to these authors new technology is new to a particular place or group of farmers, or represents a new use of technology that is already in use within a particular place or group of farmers, or represents a new use of technology that is already in use within a particular place or amongst a group of farmers. Technology is the knowledge/information that permits some tasks to be accomplished more easily, some service to be rendered or the manufacture of a product (Lavisson, 2013). Technology itself is aimed at improving a given situation or changing the status quo to a more desirable level. It assists the applicant to do work easier than he would have in the absence of the technology hence it helps save time and labor (Bonabana-Wabbi 2002). Adoption on the other hand is also defined in different ways by various authors. Loevinsohn *et al.* (2013) defines adoption as the integration of new knowledge in to existing practice and is usually proceeded by a period of 'trying' and some degree of adoption. Citing the work of Feder, Just and Zilberman (1985), Bonabana-Wabbi defines adoption as a mental process an individual passes from first hearing about an innovation to final utilization of it. Adoption is in two categories; rate of adoption and intensity of adoption. The former is the relative speed with which farmers adopt and innovation has as one of its pillars, the element of 'time'. On the other hand, intensity of adoption refers to the level of use of a given technology in any time period (Bonabana-Wabbi 2002).

Defining technology adoption is a complicated task since it varies with the technology being adopted. For instance the study by Doss (2003) showed that adoption of improved seed in a survey done by CIMMYT classified farmers as adopters if they

were using seeds that had been recycled for several generations from hybrid ancestors. In other studies adoption was identified with following the extension service recommendations of using only new certified seed (Doss,2003); Bisanda (1998); Ouma (2002).Therefore in defining agricultural adoption by farmers the first thing to consider is whether adoption is a discrete state with binary response variables or not (Doss, 2003).That means definition depends on the fact that the farmer is an adopter of the technologies or non-adopter taking values zero and one or the response is a continuous variable (Challa, 2013). The appropriateness of each approach depends on the particular context (Doss, 2003). Many researchers use a simple dichotomous variable approach in the farmers' decisions of new technology adoption. This approach according to Jain *et al.*, (2009) is necessary but sufficient because the dichotomous response reflects the status of awareness of improved technology rather than the actual adoption. Therefore researchers should clearly state how they are defining this term (technology adoption) so that they can develop appropriate tool to measure it.

2.3.2 Women Development: A paradigm

Women Development is the process whereby concerted effort is made to facilitate significant increase in resource productivity with the overall objectives of enhancing the living standard among Women (Jiggins *et al.* 1998). According to (Egonu, 1997) Women in Nigeria did not enjoy equal development strategies such as provision of credit and use of tractors like their Male counterparts. An adequate concept of Women development in Nigeria today must consider that rural Farm Families Men , Women and Children do not experience rural changes in a uniform manner. Women are rarely given the benefit of Agricultural training. The lack of reliable and comprehensive information for rural Women is a major hindrance to Agricultural development. They

require information on Agricultural inputs, market, transportation systems, new Agricultural technologies, Food processing and preservation. However, most available local information are packaged in a raw form and therefore difficult to access or use. The situation is compounded because Women do not know where to find this information and mostly because they are not educated. To ensure the relevance of rural Women, information on new Agricultural technologies and market information should be repackaged in a format and language appropriate for rural Women (Shiva, 1991). In a shift to realize the contribution of Women to agricultural development, it is now widely demonstrated that rural Women, as well as Men, throughout the world are engaged in a range of productive activities essential to house hold welfare, Agricultural productivity and economic growth (Jiggins *et al.*, 1998). For instance, a recent study of garri processing in Ibadan showed that it is a preferred job for the urban unemployed, poor Women whose labor is augmented by that of Children. Almost all these Women purchase Cassava roots and pay for mechanical grating and dewatering by specially constructed hydraulic jacks, in privately owned, small-size processing centers. Processors, who do not own a sieve or the Calabash used for mixing during roasting, can hire these utensils. In these centers, the Women could also rent a frying pan by the hour for roasting. Each Woman can produce 45-60kg gari per day (Sanni, 1994).

2.3.3 Constraints to Women's use of improved Technologies.

Ngoddy, (1989) argues that most of the technologies were designed without taking proper cognizance of the socio-economic realities in Nigeria such as illiteracy, cultural factors, property rights, lack of access to credit and in appropriate extension packages. He maintains that the technologies are expensive, given the inflationary trend in the country, and they are beyond the means of most small-scale Women farmers.

Nigerian's small-scale Women farmers and food processors also suffer from high rate illiteracy. This makes it even difficult for them to comprehend simple instructions on food processing and preservation. And the situation is not helped by the rather poor extension system that currently exists in the country.

Ekong (2003), is of the opinion that most rural Women do not understand even a display of instructions by line diagrams. Cultural factors have played no less a significant role in constraining the use of improved food production and processing technologies in Nigeria. The attitude of the average Nigerian towards certain improved food processing technologies has been identified as a constraint towards their usage. For instance, it has been reported that most Men rather than embrace the new Yam pounding machine designed to ameliorate the drudgery in Women's domestic chore still insists on the manual and tedious traditional methods of preparing pounded Yam meal (Okoye, 1988). It is the opinion of Sani (2002), that losing land impacts negatively affect Women's ability to meet house hold food needs through own production. There is the wide spread exclusion of Women in developing countries from owning or controlling property as well as limits often dictated by the various customs concerning their access to and use of property such as land. This implies that they are often barred from many resources that would allow them to improve their Agricultural productions capacities. However, many processors experience difficulties with securing credit and it is one of the most common constraints (Akinrele, 1970). The majority of processors, in particular Women, face problems when seeking credit because of Government policies, lack of information, lack of collateral and prejudices against them. Saito, (1990) maintains that an extension system is only as good as the technology it offers. Tools, implements and other inputs suitable for Women should be portable, in expensive, locally produced

and have use compatible with other activities. Many improved technologies have not been useful from the perspective of the farmers, particularly Women. According to Shiva, (1991) rural Women's familiarity with production and processing stages make them excellent judges of innovations. In his study, the Women in Agriculture (WIA) co-coordinator of Niger State Agricultural Development Project (NSADP) stated that a house holds grain threshing equipment was introduced to rural Women to assist them in food preparation. The Women later rejected the technology because they complained that its operation was time consuming and they did not save any time or effort by using it unlike their traditional processing methods. Similarly, an improved Cassava cultivar developed at IITA yielded tubers which were much larger than local varieties. The Women however, complained that the tubers were harder to peel, were difficult to carry, had higher water content and took longer to fry (Asika, 2003).

2.3.4 Factors influencing Adoption of improved Agricultural Technologies

The adoption of improved technology is influenced by many factors, such factors include socio-psychological factors (traditional believes): personal characteristics of the Farmers (age, educational attainment); institutional and socio-economic factors such as access to government services and low farm income (Ukoha, 2003). Ezeilo, (1997) argues that adoption of new technology is best promoted by means of integrated package of farm support measures, availability of credit, marketing, input supply services, improved transportation, price incentives and the establishment of cooperative ventures to overcome constraints due to new technology and to ensure its success. (Oyenwen, 1991) discovered profitability to be the major reasons for adoption while the most limiting factor was lack of awareness of the technology. Yusuf, (2004) found rate of adoption of improved technologies to be relatively higher, because the technologies were easy to operate. (Idrisa, *et al.*, 2008), found higher rate

of adoption of the recommended practices to be due to its affordability to the respondents, other factor associated with adoption as confirmed by other researchers include: gender, age, education of house hold head, family size and other demographic traits that make up the house hold characteristics (Clark & Akinbode,1986), (Nkonya *et al.*, 1997; Ersado *et al.*, 2004).

2.3.5 Importance of improved Cassava processing Technologies

Food processing starts at the point of slaughter or harvest and finished with Food consumption. A process refers to “Food Chain” or collection of activities carried out on Food or crop with the aim of preservation or changing it to other products. Food processing play important role in ensuring Food security by making safe and nutritious Food available to the Consumer and as a source of employment for the processors (Sasore, 2005). The consumption of Cassava in its un processed form is limited by the extreme perish ability of the roots which begin to deteriorate within 24 hours after harvesting. With the present facilities for storage and transport, it is difficult to market fresh Cassava at any distance from the place where it is grown. Processed Cassava on the other hand is usually less bulky to transport and far less perishable than fresh roots (Nweke, 1994). The continued increase in output has raised the need for improved Cassava processing technologies to absorb the increases, produce diversified and high quality Cassava products suitable for industrial use and export. Mechanized processing will increase post-harvest management of Cassava crop output and guarantee effective preservation and utilization of Cassava for Food security. Agricultural contributions to Nigerian’s gross domestic product (GDP) has fallen from 60% in the 1960s to current 40%, while its share of export earning has fallen from 75% to 30% over the same period. The resuscitation of Agriculture to plays its role goes beyond the export traditional raw materials of high quality

intermediate and finished Agricultural products including Foods staples, to achieve this, Nigeria in 2002 launched the Cassava industrial revolution to produce high quality Cassava products suitable for industrial use and export including Cassava flour (FAO,2006). To earn high profit margin required to sustain the nascent mechanized Cassava processing in Nigeria, high technological packages must be adopted to produce large quantities and high quality products at reduced unit cost (Sasore, 2005). For instance, (Nweke, 1990) has shown that Cassava chips dry more rapidly when circulation of air is improved by spacing the chips in mesh trays raised off the ground because chips dried on trays are better cooking and more uniformly dried than those dried on concrete floor. Also, (Oti *et al.* 1987) have shown that a higher reduction in cyanide content of Cassava leaves can be achieved by soaking dipped-up Cassava leaves in fermented Cassava root extract for 24hours than by cooking Cassava leaves in water. (Oti *et al.*, 1987) added that manual gari frying is one of the slowest and time consuming operations in Cassava processing. They however said that the use of tray dryer produced by the Rural Agro- industrial Development scheme (RAIDS) increases the output significantly and protects the operators from smoke and excessive heat.

2.3.5 Concept on Regression Analysis.

Regression analysis is a statistical tool for the investigation of relationships between variables. Usually, the investigator seeks to ascertain the casual effect of one variable upon another. Regression model are classified into simple and multiple regression analysis. The simple regression analysis is a situation in which there is inclusion of only one independent variable in the model while multiple regression is a situation in which there are two or more independent variables.

Logistic regression is a type of regression model where the dependent variable is converted into dichotomous / binary variables coded 0 and 1 (Brian & Sabine 2004).

The model uses maximum likelihood estimation (MLE) procedure. The advantage of this is that, the probabilities are bound between 1 and 0. Logit regression conceptually gives maximum estimates, overcome the short comings associated with linear model of regression and provide estimates that are consistent and efficient (Pindykn, 1998). However, unlike the ordinary least square (OLS), although it can be used to estimate binary or dichotomous natured model, certain assumptions of classical regression model will be violated such as non-normality of the disturbance, heteroscedastic variance of the disturbance and a questionable value of R^2 as measures of goodness of fit (Gujrati, 2004).

2.4 REVIEW OF EMPIRICAL STUDIES

This component present empirical study on processing and adoption of agricultural technology.

2.4.1 Empirical Studies on Agricultural Technology Adoption

The importance of processors adoption of new agricultural technology has long been of interest to agricultural extension because of its importance in increasing productivity and efficiency (Sani, 2010). Several parameters have been identified as influencing the adoption behaviour of processors from qualitative and quantitative models for the exploration of the subject matter. Social scientists investigating processors adoption behaviour has accumulated considerable evidence showing that demographic variables, technology characteristics, information sources, knowledge, awareness, attitude and group influence affect adoption behaviour (Oladele, 2005).

Adoption as indicated by Pannell, *et al.* (2005) is a complex multi-level process, influenced by many personal, social, cultural and economic factors as- we as the components of the change.

2.4.2 Adoption Studies in Africa

(Oladele, 2005), Affirmed that recent adoption studies in Europe, Asia, and in Africa have identified farm and technology-specific factors, institutional, policy variables, and environmental factors to explain the patterns and intensity of adoption.

Bandiera and Rasul (2006) looked at social networks and technology adoption in Northern Mozambique and found that the probability of adoption is higher amongst farmers who reported discussing agriculture with others. Foster and Rosenzweig (1995), found that initial farmers may not adopt a new technology because of imperfect knowledge about management of the new technology; however, adoption eventually occurs due to own experience and neighbours' experience. Similarly, Conley and Udry (2008), looking at cassava cultivation in Ghana, analyze whether and individual farmers' fertilizer use responds to changes in information about the fertilizer productivity of his neighbor. They found that a farmer increases his fertilizer use when a neighbor experienced higher than expected profits using more fertilizer than he did, indicating the importance of social learning. According to (Uaiene *et al.*, 2009) the two most powerful determinants of technology adoption in Mozambique appear to be membership in an association and access to credit. The formal education of the head of the household also has a consistently positive relationship to most technology adoption decisions. However, the result indicates significant effect of extension services on technology adoption. Positive relationship was also recorded by Adekamki *et al.* (2009) between family size and adoption of rice production technology in Benin. Also the result of maximum likelihood analysis by Lwayo and Maritim (2003) in their study on socio-economic factors affecting farmers' decision to adopt farm forestry in Busia district, Kenya indicates a positive and significant relationship between age, education and land size and the decision to adopt the

innovation. However, the result showed that there was a non-significant positive relationship between sex and the decision to adopt farm forestry.

2.4.3 Technology Adoption Studies in Nigeria

A large number of promising agricultural technologies are already available in Nigeria. This includes improved Cassava processing technologies. Recent adoption studies in Europe, Asia and Africa have identified farm and technology specific factors, institutional, policy variables and environmental factors to explain the patterns and intensity of adoption (Oladele, 2005). It was however, established that socio-economic factors are the most commonly considered variables in adoption studies in Nigeria. Rao and Rao (1996) in their study on adoption of cassava production technology however, found a positive and significant association between age, farming experience, training received socio-economic status, cropping intensity, aspiration, economic motivation, innovativeness, information source utilization of small-holder farmer adoption potential and the prediction of extension cost in Nigeria by Arene (1994) have revealed a positive and significant relationship between family size and adoption. On the other hand, Voh, (1982), in his study of factors associated with the adoption of recommended farm practices in a Nigeria Village, established that house hold size is not significantly related to adoption. He also reported that socio-economic status of farmers is positively and strongly related to adoption. This report implied that the higher the socio-economic status, the higher the tendency to adopt innovations. Abdul *et al.* (1993) reported a significant relationship between land holdings (farm size) and adoption in their study on farmers' characteristics affecting adoption of agricultural innovations. They did not however establish any relationship between education and adoption. The analysis of factors associated with adoption of recommended practices for maize production in Kainji Lake Basin in Nigeria by

Igodan *et al.*, (1998) revealed that farmers who are more exposed to formal extension information have a high propensity towards adoption than those with less exposure. Education, size of holdings and cosmopolitanism accounted for significant variation in communication behaviour of farmers. Goswami and Sagar (1994) identified some factors associated with knowledge level of an innovation. They found educational level, family educational status, innovation proneness and utilization of mass media to be positively correlated with knowledge level. The rate of adoption of new technology is subject to its profitability and the degree of risk and uncertainty associated with it, and is highly influenced by the capital requirement, agricultural policies, and the socio-economic characteristics of farmers (IFAD, 2007). It has been observed that although knowledge is a necessary condition for adoption decisions, it is not a sufficient condition in itself. Evidence points to access to land and security of tenure, access to credit and access to inputs such as fertilizer, seeds and water as the most important factors affecting adoption decisions (Yapa & Mayfield, 1978)

2.5 CONCEPTUAL MODEL

According to Akinrele, (1970) a model is simply “an attempt at classifying the major elements of an entity or a phenomenon with regards to their function and inter relationships in order to observe more closely how the elements function within entity”. Furthermore, Asika, (2003) reported that these relationships and functions can be represented schematically or mathematically. In the model (figure I) the adoption of improved cassava processing technologies depends on the factors that influenced the adoption of improved Cassava processing technologies by Women processors. Therefore, the independent variables in the model are the socio-economic characteristics of the Women, the institutional characteristics and technological attributes while the dependent variable is the number of improved Cassava processing

technologies adopted by the Women processors in the study area. The socio-economic characteristics of the Women include age, years of schooling, extension contacts, processing experience and membership of co-operative societies while the attributes of the Cassava processing technologies include affordability, compatibility and complexity. Thus, it is expected that age should have an influence on the Women's adoption of the Cassava processing technologies such that, older Women may adopt more than younger Women because of experience, financial status and responsibilities. It is also possible for younger Women to adopt more than older Women because younger Women are more prone to experimentation than older Women. In other words, the nature of influence of age on adoption is indeterminate (Adesina, 1995).

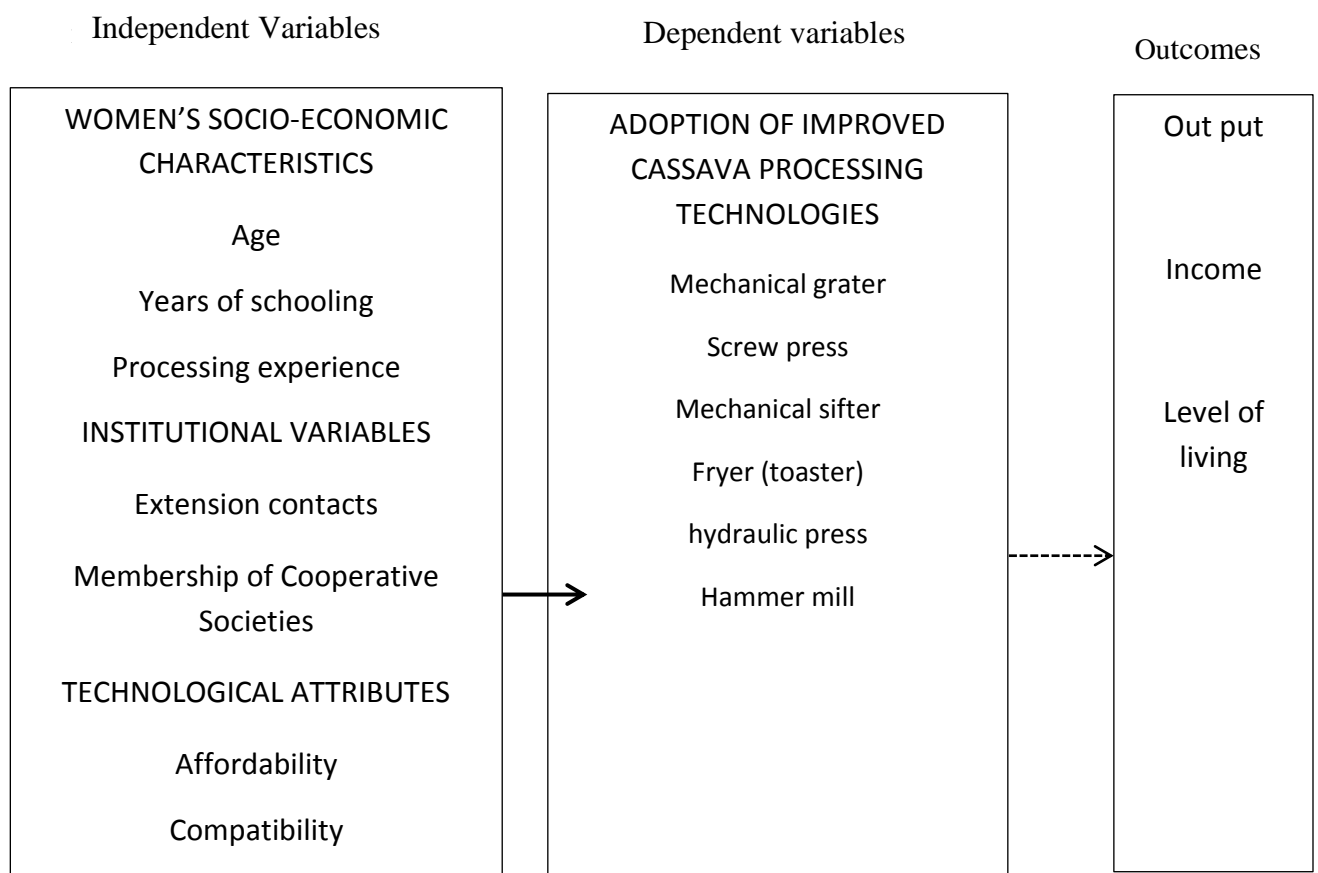


Figure 2.1: A model showing factors influencing adoption of improved Cassava processing technologies.

CHAPTER THREE

METHODOLOGY

3.1 DESCRIPTION OF THE STUDY AREA

The Study is conducted in Jigawa State. The State was excised from Kano State on August 27, 1991. The State covers a total land area of about 22,410 sq Km. It lies between longitude 8.00⁰ E to 10⁰.15”E and latitude 11.00⁰ N and 13.00⁰ N in the Sudan savanna with traces of Guinea savanna in the southern part of the state. It is bordered on the West by Kano State, on the East by Bauchi and Yobe States and on the North by Katsina State and the Republic of Niger (N.I.G, 2004). The State has a population of 4,348,649 people (NPC, 2006) while the estimated population in 2015 was 5,372,754 at 2.9% rate of population growth. Farming is among the major occupation of the people who are predominantly Hausa/Fulani. Out of 5,372,754 people, about 90% of the populations are predominantly engaged in rural and subsistence farming. Agriculture is the mainstay of livelihood for over 90% of the population. Many of the citizens are involved in production of crop such as groundnut, millet, sorghum, soybean, cassava etc. (JARDA, 1991). The State’s economic activity is largely characterized by informal sector activities with agriculture as the major economic activity. Over 80% of household in the state derived their income from farming. Jigawa State, with its capital at Dutse is currently made up of 27 local government areas and is administratively classified into four (4) zones by Jigawa State Agricultural and Rural Development Authority (JARDA). The zones are as follows:

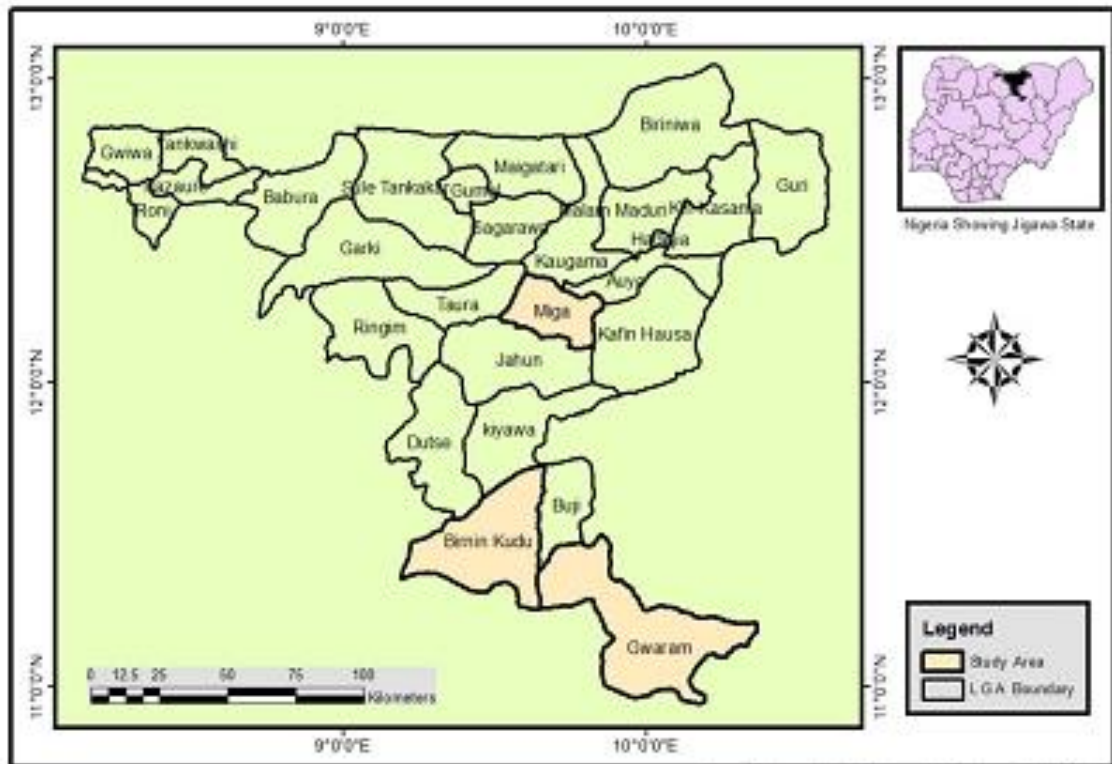
Zone 1: Birnin Kudu, Gwaram, Buji, Jahun, Kiyawa, Dutse and Miga LGAs

Zone 2: Gumel, Maigatari, Garki, Ringim, Taura and Gagarawa LGAs

Zone 3: Hadejia, Guri, Birniwa, Malam Madori, Auyo, Kiri kasama, Kafin Hausa and Kaugama LGAs

Zone 4: Kazaure, Yankwashi, Roni, Babura, Sule Tankarkar and Gwiwa LGAs (JARDA, 2006).

The highest proportion of cassava area is estimated to fall under Zone I of the state Agricultural Development Programme (ADP) i.e. in the central part of the state (JARDA, 1991). Thus, this zone was purposively selected for the study.



Source: Cartography Lab Geography Department BUK (2017)

Figure 3.1: A Map of Jigawa State showing the study area

3.2 SAMPLING TECHNIQUE

The study employs Multi-stage random sampling technique in the selection of the respondents. The first stage involved purposive selection of Zone I out of the four zones by Jigawa State Agricultural Development Authority (JARDA). The selection was based on the intensity and concentration of production and processing activities of cassava. The second stage involved purposive selection of 3 Local Government Areas (LGA's) Birnin-Kudu, Gwaram and Miga. Third stage involved random selection of twelve (12) cooperatives from each of the Local Government areas. Three

cooperatives from Birnin-Kudu LGA, five cooperatives from Gwaram LGA as well as four cooperatives from Miga LGA. Were purposively selected. The final stage was a random sampling of (50%) of the Members from each cooperative, making a total of 150 women drawn from a sampling frame of 300 women processors cooperatives.

Table 1: Summary of Sampling framed and Size

S/N0	Local Government Areas	Women Cooperative Society	Cassava Processors	in	Membership sampled	Number sampled (50%)
1.	Birnin Kudu	<ul style="list-style-type: none"> Gauraki tsohuwa women cassava processors association Garin gamji women cassava processors cooperative society Galadanci women cassava processors cooperative society 			46	23
2.	Gwaram	<ul style="list-style-type: none"> Kila unguwar bayan gari women cassava cooperative society Kila kofar yamma women cooperative societyLTD Rahama association of cassava processors cooperative society Farin dutse women cassasa processors cooperative society Sabuwar gwaram zandam Nagogo women cassava cooperative society LTD 			24	12
3.	Miga	<ul style="list-style-type: none"> Kafin doki women cassava cooperative societyLTD Kofar yamma women multipurpose cooperative society Gululu women cassava processors cooperative society Gululu kofar arewa women processors of cassava cooperative society 			10	5
					16	8
					40	20
					40	20
					28	14
					24	12
					18	9
Total					300	150

Source: Reconnaissance Survey, 2017.

3.3. METHODS OF DATA COLLECTION

Data for this study was collected from primary and secondary sources. Primary data was collected by means of a well-structured pre-tested questionnaire which was administered to 150 cassava processors by well-trained enumerators, guided by the researcher. The data collected include that on socio-economic characteristics of the women processors such as age, sex, level of education, marital status, house hold size, years of experience, level of income, farm size, access to extension services, access to agricultural credit and mode of disseminating agricultural technology as well as constraint associated with women processors using improved cassava processing technologies in the study area among others.

3.4. ANALYTICAL TECHNIQUES

Descriptive Statistic such as frequencies, means, percentages, range and ranking were used to analyze the data to achieve part of objectives i, ii, iii and v. Inferential statistics such as logistic regression model was used to achieve objective iv.

3.4.1 Model Specification

The various analytical techniques to be used in this study were specified as follows:

3.4.2. Descriptive Statistics

Descriptive statistics are concerned with scientific methods for summarizing, presenting and analyzing data as well as drawing valid conclusion and making reasonable decision on the basic of such analysis (Adamu & Tinuke, 1997). For this study, the descriptive statistics like mean, percentage, frequency distribution, range and rank ordering was used.

Percentage: the ratio that equate the second number ratio to 100.

$$\% = \frac{x}{n} \times 100 \dots\dots\dots (1)$$

Where

% = percentage

X = individual observation

n = total observation or sample size

Arithmetic Mean: is defined as the set of score divided by the number of score.

Mathematically

Written as:

$$\bar{X} = \frac{X_1 + X_2 + X_3 + \dots + X_n}{n} \quad (2)$$

Where;

Σ = summation notation

X_i = individual observation

$i = 1, 2, 3, \dots, n$

n = total number of observations

Frequency Distribution: Frequency distribution is the tabulation of a given collection of data in an order with its frequency attached to each value or group of values (Mamman, 2005).

3.4.3. Logit Regression Model

Logistic regression is a regression model where the dependent variable is considered as dichotomous/binary variables coded 0 and 1 (Brian & Sabine, 2004). The model uses maximum likelihood estimation (MLE) procedure. The advantage of this is that, the probabilities are bound between 1 and 0. Logit regression conceptually gives maximum estimates, overcome the shortcomings associated with linear model of regression and provide estimates that are consistent and efficient (Gujrati, 2004)

This model was used to determine the socio-economic factors that affected the women's adoption of the improved cassava processing technologies in the study area.

The general form of the model is specified as follows

$F(X_1, X_2, X_3, X_4, \dots, X_{11})$. Explicitly specified, the equation becomes;

$$Y = +b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 \dots + b_{11}X_{11} +$$

u Where;

Y = Number of technologies adopted by the respondents

X_1 = Age (in years)

X_2 = House hold size (number)

X_3 = Processing Experience (in years)

X_4 = Marital status (Dummy)

X_5 = Educational status (1=formal, 0 otherwise)

X_6 = Primary occupation

X_7 = Cooperative membership (Member =1, 0 otherwise)

X_8 = Contact with extension agent (Yes=1, No=0)

X_9 = Personal income (₦)

X_{10} = Access to credit (naira/year)

a = constant term

U = Error term (implicit)

Table2: Definition of Variables for analysis

S/NO	Description	Unit
Independent		
1.	Age	(Years)
2.	Household Size	Number
3.	Marital Status	
4.	Processing Experience	(Years)
5.	Educational status	(Years)
6.	Primary Occupation	(Years)
7.	Income (₦)	
8.	Cooperative Membership	
9.	Extension contact	
10.	Access to credit	
	Dependent Variable	
	Improved cassava processing Technologies	
	1.Mechanical grater	
	2. Screw press	
	3. Mechanical Sifter	
	4. Fryer (Toaster)	
	5. Hydraulic press	
	6. Hammer mill	

KEYS: In this study six improved cassava processing technologies were considered.

Note: the dependent variable will be 1 or 0, if respondent use a technology will score 1, if he did not uses he will score 0. This is applied to all the six (6) technologies.

3.4.3. Technology Acceptance Model (TAM)

User acceptance of technology has been an important field of study for over two decades now. Although many models have been proposed to explain and predict the use of a system, the Technology Acceptance Model has been the only one which has captured the most attention of the adoption researchers (Chutter, 2009).

3.4.3. The Extent of Adoption

Adoption is viewed as a mental process which an individual passes through in deciding to use an innovation. Onyenweaku (1987), Rogers (1969) observed independently that prior to the adoption of new technology by an individual farmer, he/or she follows an adoption process which involves undergoing a number of mental processes namely, Awareness, Interest, Evaluation, Trial and adoption.

CHAPTER FOUR

4.0

RESULTS AND DISCUSSION

4.1 SOCIO-ECONOMIC CHARACTERISTICS OF THE WOMEN CASSAVA PROCESSORS

This chapter presents results obtained from the analysis of surveyed data. The socio economic characteristics of the respondents usually assist in getting a clear understanding of their behaviour as well as providing a hint towards explaining their disposition that could improve their productivity Adebayo and Akinwade, (2012). The socio economic variables identified for this study include; Age, Household size, Education level, processing experience, Marital Status, Primary occupation, membership of cooperative, income level of the respondent, and contact with extension agents.

Table 3a: Socio economic characteristics of women cassava processors

Variable	Frequency	Percentage	Min	Max	Mean	SD
Age (yrs)						
15-24	9	6	15	60	36.15	9.441
25-34	55	36.4				
35-44	60	39.7				
45-54	20	13.2				
55-64	6	4.7				
House hold size (no)						
0-3						
4-7	8	14.6	1	4	11.79	0.811
8-11	40	26.5				
12-15	47	31.1				
	55	27.8				
Processing Exp (yrs)						
1-5	38	25.1	1	5	8.13	0.93
6-10	62	41.1				
11-15	32	21.1				
16-20	12	11.3				
21-25	6	1.3				
TOTAL	150	100%				

Source: Field Survey Data, 2017.

4.1.1 Age of Women Processors

Age plays an important role in decision making. This is true in traditional societies like Nigeria, where responsibilities are assigned according to age (Mohammed, 2012) Table 3a. Showed that more than one third (39.7%) of the women cassava processors were within the age of 35-44. The mean age of the respondents was 36 years, meaning that more than one third of the respondents were in their youthful and active age. The age bracket of 31-50 years is usually innovative, motivated and adaptive individuals (Atala, 2012).

This implies that most of the respondents have tendency to be more productive in the study. This result agrees favourably with that of Okunade (1998) who found that majority of the women processors were in their active age range of 21-50 years. Also, Olaniyan (1998) found in his study of adoption of improved cassava processing technologies that majority (74%) of the women processors were in their active age of 21-40 years.

4.1.2 House hold size of the Respondents

Refers to the actual number of dependents living with house hold head under the same roof that eat and drink from the same bowl and pot. Information on the house hold size of the respondents in the study area is presented in Table 3a. The result indicates that almost one third (31.1%) of the respondents have house hold sizes that range from 8-11. The mean house hold size of the respondents was 11.79. The high number (12) of household size might not be unconnected to the fact that most of the cassava farmers in the study area practiced polygamy system of marriage and sometime, in the North, having large house hold size is a source of pride and a compelling force to produce more output by the farm family. The implication of this result is that larger households would relatively dedicate most of their farm income on responsibilities

associated with their large family sizes, signifying the livelihood of the farm family being poor. Therefore, the size of the house hold determines the poverty status of the family. This finding is also in tandem with the findings of Odebode, (2005); Mungong, (2001); and Bammeke (2003), who, in their various studies, reported that households that have larger family size of 12 individuals contradicts the national average of 5 reported by National Bureau of Statistics (NBS, 2009).

4.1.3 Processing Experience

Experience refers to practical acquaintance with the facts or events in working/farming activities which were determine by the length of period the respondents spent in the activities. The result in Table 3a. Revealed that the years of experience of cassava processors in the study area ranged between 1 and 5 years with an average of 8 years. The average years of experienced of 8 implies that most of the cassava processors in the study area have relatively high years of experience. It is therefore expected that most of the cassava processors in the area would be more economically viable and more efficient in their production and processing activities. This is also in tandem with the work of Ogunbameru (2010) who reported that the more experience in farming the easier to utilize an innovation. The standard deviation of the mean analysis of (0.93) also revealed that the cassava processors in the study area had low variation in respect to the years of experience, confirming that the years of experience of the processors revolving around 8 years.

Table 3b: Socio economic characteristics of Women Cassava Processors

Variables	Frequency	Percentage (%)
Marital status		
Married	129	85.4
Single	2	1.4
Divorced	12	8.6
Widow	7	4.6
Educational status		
Quranic education	69	54.3
Primary education	47	31.1
Secondary education	24	11.9
Tertiary (ND/NCE)	10	2.7
Primary occupation		
Processing	130	56.9
Civil servant	2	8.8
Livestock rearing	13	21.5
Trading	5	12.8
Cooperative membership		
Member	131	98.7
Non-member	19	1.3
Contact with Extension agent		
Contact	123	63.5
No contact	27	36.5
Frequency of contact with extension agent		
Weekly	33	26.8
Fortnightly	12	9.8
Monthly	78	63.4

Source: Field Survey Data, 2017.

4.1.4 Marital Status of women processors

Marital status of a population may be defined as the population of single, married, widowed and divorced people within it (Okafor & Andrew, 1994). It could be tied up to the house hold size and may likely affect the level of responsibility and labour to the processors. The result in Table 3b revealed that the marital status of women processors majority (85.4%) were married. 1.4% were single, 8.6% were divorced and 4.6% were widowed. Married respondents could have more responsibilities ranging from family to community, hence could take keen interest on environmental factors

that affect crop production activities. This finding is similar with that of Adebayo and Akinwade (2012) who reported that 78% of farmers in most households in Nigeria are married. According to Haruna (2011), settled men and women with responsibilities are willing to seek innovations that will increase their living standard. However, the result is a departure from the notion that marriage is an impediment to women participation in agricultural activities on the claim that culture deprives women from such activities.

4.1.5 Educational Status of women processors

Education is an important variable that tends to influence adoption of modern technology, the result from table 3b indicated that more than half of the respondents (54.3%) had no formal education this implies that there is possibility of being ignorant of innovations, consequently, poor or low adoption and usage of innovations by the women. (Agwu *et al.*, 2008). Since many farmers do not possess the education and technical know-how to transform certain innovations into practical reality, they may not adopt them and this has to do with the degree to which an innovation is relatively difficult to follow and use (Ekong, 2005). This is because non educated persons are not enlightened to easily accept new innovation practices and hence could not be better processors. Adding that increasing women education is a key ingredient for women empowerment which would affect women processors (Agwu *et al.*, 2008). This finding is in conformity with that of (Agbamu & Orhorhoro 2007) who found that educational level significantly influenced the adoption of recommended practices.

4.1.6 Primary Occupation

Occupation of the population are largely influenced by the setting of their environment as well as their local economy as is often the case in most rural Africa

and Nigeria in particular where livelihood strategies usually involve mixture of activities including farm and off-farm employment (Haruna, 2011).

The result from 3b revealed that more than half (56.9%) were engaged in processing as their primary occupation. about 21.5% and 12.8% are into livestock rearing and trading while only 8.8% are into civil service. This is in accordance with the findings of Kurimoto (2002) who reported that majority of the rural people are predominantly farmers.

4.1.7 Cooperative Membership

Association is form when individuals recognize common and desirable needs among themselves (Olukosi, 2007). The result from 3b revealed that majority (98.7%) belong to either one cooperative or the other while the remaining 1.3% doesn't belong to any association.

According to Shimonyan and Arokoyo, (2001) membership of associations enhances dissemination of agricultural and processing information. Therefore, more processors are likely to adopt the improved technologies. Consequently, (Saddiq, 2012) reported that with high number of years in social organization, one is expected to have positive influence in his/her farming activities.

4.1.8 Contact with Extension Agents

This is defined as the frequency of the respondents contact with extension workers. The result shows that more than half of the respondents (63.5%) had contact with extension agents either weekly (33%), fortnightly (12%) or monthly (78%) while about 36.5% indicated that they don't have Contact with extension agents. This agreed with the findings of (Olukosi, 2007) in relation to his study on impact of IITA on farmer's improvement in level of production in Yobe state who reported that

majority of intervention farmer's increase in production as associated with frequent contact with extension agents.

Table 4: Distribution of Respondents based on Annual income and Access to credit

Variables	Frequency	Percentages (%)
Annual income (₦)		
<₦38,750	68	45.33
₦38,750 -₦77,500	80	53.33
>₦77,500	2	1.333
Commercial bank		
Commercial bank	2	1.333
Cooperative society	112	74.66
Local money lenders	6	4
Friends and relatives	10	6.666
Religious institution	7	4.666
Non-Governmental organization	1	0.666
Esusu group	12	8
Amount of credit accessed		
₦ 10,000-₦25,999	43	28.666
₦26,000-₦50,999	58	38.666
₦51,000-₦75,999	33	22
₦76,000-₦100,000	16	10.666
Total	150	100

Source: Field Survey, 2017

4.1.9 Personal income distribution and credit source

The Result in 4 revealed that (45.33%) of the women processors earned less than ₦38,750 about 53.33% of the women had an annual income of ₦38,750 - ₦77, 500. This indicates that income generated from cassava processing which depended on the quantity and frequency of cassava processed is low to invest in a new technology Agbamu et al., (1996). This finding is a departure from (Okeke, 2001) who reported that cassava processing which depended on the quantity and frequency of cassava

processed is high and thus a processor with high income is expected to have enough to invest in a new technology. The finding of Ani et al., (2008) which confirmed that farm income made significant contribution to adoption corroborates that of Agbamu *et al.*, (1996). The poor economic status of most Nigerian farmers has inhibited the adoption of most agricultural technologies. An innovation perceived as advantageous may not be adopted because of the cost.

The results in 4 associated to credit source indicated that majority (74.66%) of the women sourced credit through cooperative societies, 8% from Esusu groups and 6.666% was through friends and relatives. While the local money lenders, commercial banks, religious institutions and Non- Governmental organizations (NGOs) were negligible (0.666%). This implies that most of the women obtained credit from cooperative societies indicating that they are active members who pay their dues (Fayese, 2002). This is because women generally do not own land or other assets; it has been traditionally difficult for women to obtain bank loans or other forms of credit through banking system (Fabiya, *et al.*, 2001). This could provide explanation for the low access bank credit (1.333%) by the respondents.

4.1.10 Amount of credit accessed

Results of the study have further indicated that 100% of the women received some amount of money in form of credit although to a varying degree. Thus, a large proportion of the respondents (38.666%) were able to access between ₦ 26,000 and ₦50,999 as credit while 30% accessed ₦10,000 to ₦25,999. The result 4 indicated low accessibility to credit by the women processors. More so, lack of accessibility to credit facilities have been reported in many parts of sub-Saharan Africa as well as other developing countries as the limiting factor for increased agricultural productivity (Eze *et al.*, 2006; Junge *et al.*, 2009, Okoedo-okojie & onemolease, 2009). Chikwedu

et al., (1994) found credit to have appositive influence on adoption. Polson and Spencer (1990); Baidu –For son (1999) and Benjamin (2010) confirmed that rural farmers are noted not to adopt most modern production technologies because they are relatively poor. Therefore, for them to adopt most techniques, they must require subsidy or credit.

Table 5: Available Technologies Used by Rural Women Cassava Processors

S/No	Technologies	Responses	
		Frequency	%
1	Traditional cassava Processing Technologies	109	72.6
2	Modern Improved cassava Processing Technologies	41	27.3

Source: Field Survey, 2017

The result presented in table 5 above revealed that, both traditional and modern improved cassava processing technologies are available in the study area. However, the most common method or technology used by the rural women in processing cassava is traditional methods that involved the use of local tools and equipment. This can be observe from their responses presented above, where 72.6% of the rural women processors utilized traditional techniques while only 27.3% employed modern improved processing technologies.

From the result of this analysis, it appears that, traditional method are being used in cassava processing by rural women in Zone I, Jigawa State, the reason may be because they find it easy to access the local tools than, most of the modern machines required in using modern improved processing technologies. This may be attributed to high cost of the machine and the processors' lack of access to capital which has been observed as the most important factor responsible for stagnation and at –worst affecting technology adoption decisions (Owolabi, 2012).

Table 6: Awareness and Adoption of Improved Cassava Processing Technologies

S/No	Technologies	Awareness		Adaption	
		Frequency	%	Frequency	%
1	Mechanical grater	78	52.0	45	30.0
2	Screw press	98	65.3	37	24.7
3	Mechanical sifter	101	67.3	49	32.7
4	Fryer (toaster)	83	55.3	37	24.7
5	Hydraulic press	98	65.3	44	29.3
6	Hammer mill	102	68.0	41	27.3

Source: Field Survey, 2017

The level of women cassava processor's awareness of improved cassava processing technologies as presented in Table 6 above was based on mechanical grater, screw press, mechanical sifter, fryer (toaster) Hydraulic press and Hammer mill which are mostly familiar with by the processors. The result shows that, the processors are more aware of Hammer mill with the highest awareness level of 68.0%. This was closely followed by Mechanical sifter with awareness level of 67.3%. Similarly, the Hydraulic press and screw press have awareness level of 65.3%, each. Finally, the Fryer (toaster) has the least awareness level of 55.3%. The average level of awareness is 62.2% and this implies that the level of awareness of the improved cassava processing technologies is high. This may be attributed to the fact that, 10 Women were trained by the Ministry of Economic and Youth Empowerment skills acquisition programme, in Jigawa State Cassava processing plant situated at Kila in Gwaram Local Government. The purpose of their training was to create awareness among women's member cooperative on the need to be aware and adopt the improved cassava processing technology in their local communities. Therefore, with a combination of cooperative organization augmented by extension activities, greater impact in winning adoption of agricultural innovations in the study area will be more assured (Nasiru,

2017). The level of women cassava processor's adoption of improved cassava processing technologies as presented in Table 6 above was based on mechanical grater, screw press, mechanical sifter, fryer (toaster) Hydraulic press and Hammer mill which are mostly familiar with by the processors.

The results shows that, the Mechanical sifter have the highest adoption level of 32.7%. This was followed by mechanical grater with the adoption level of 30%. Similarly, the Hydraulic press have adoption level of 29.3%, the Hammer mill have adoption level of 27.3%. Lastly, screw press and fryer (toaster) have the adoption level of 24.7% each. The average level of adoption is 28.1% and this implies that the level of adoption of the improved cassava processing technologies is fairly low.

4.1.11 The level of acceptance of improved cassava processing technologies

The decision to accept or reject the improved cassava processing technologies is determined by measuring the mean of four (4) construct viz. perceived ease of use (PE), perceived usefulness (PU), attitude (AT) and behavioral intention to use (BI). The means were compared with the likert- scale coded.

Table 7: Acceptance level of improved cassava processing technologies

Construct	Measurement Instrument	Mean	SD
Perceived Ease of Use (PE)	The processing technologies are easy to apply E ₁	4.91	0.26
	Learning how to make use of the technologies is easy E ₂	4.91	0.31
	It is easy to become skillful in the use of the technologies E ₃	4.86	0.37
	The use technologies may increase profit U ₁	4.91	0.45
	The use technologies may increase access to quality seedlings U ₂	4.94	0.32
Perceived Usefulness	Introducing processing technologies may fail as processors resort to use of traditional method A ₁	4.80	0.81
	Access to quality seedling may improve if the use of technologies is sustained A ₂	1.44	1.10
	Access to processing machines is for influential community members or cooperative society A ₃	4.56	0.44
Attitude (AT)	I intend to use improved cassava processing technologies in future B ₁	2.42	1.43
	I will recommend others to use improved processing technologies B ₂	4.74	0.36
Behavioural Intention To Use (BI)			

Code for the likert scale: 1= strongly disagree, 2= disagree, 3= undecided, 4=agree, 5=strongly agree

Source: Field survey data, 2017. Level of acceptance estimate = 65.32%

The result from table 7 shows that more than half of the processors have strong perception that improved cassava processing technologies have ease of use, they also strongly agreed that the technologies are useful, they also indicated positive attitude

towards using the technologies and eventually they indicated their interest to continue using the technologies and even recommend other processors to use the technologies in future. Base on this result it is clear that the acceptance level of improved cassava processing technologies is high.

Table 8: Factors influencing women use of the improved processing technologies

Independent Variables	B	S.E.	Sig.	Exp(B)
X_1 =Age	-0.041	0.312	0.896	0.960
X_2 =Marital Status	-1.615	1.204	0.032	0.199
X_3 =House hold size	-1.260	0.464	0.007	0.284
X_4 =Level of education	-0.739	0.307	0.016	0.478
X_5 =Processing Experience	0.422	0.304	0.165	1.526
X_6 =Access to credit	0.780	0.370	0.035	2.181
X_7 =Contact with Extension Agents	0.991	0.450	0.028	2.693
X_8 =Cooperative Membership	0.612	0.304	0.044	1.845
Constant	-0.461	0.497	0.000	0.630

*Significant @ 10%, ** Significant @ 5%, *** Significant @ 1%, NS= Not Significant

Factors that determine women's adoption or use of the improved cassava processing technologies. The Logit regression equation recorded a chi-square of 4.328 (Table 8). About 75% of the independent explanatory variables were statistically significant at 0.05 levels. The variables of Marital Status(X_2), House hold size (X_3), Level of education (X_4), Access to credit (X_5) Contact with Extension Agents (X_6) and Cooperative Membership (X_7) revealed positively significant relationship with women's adoption or use of the improved cassava processing technologies. These underscore the relevance of the variables in women's adoption of improved cassava processing technologies and their socio-economic status in designing agricultural policies and programmes since they determine the adoption of improved cassava processing technologies. However, Age (X_1) and processing experience (X_5) do not exert significant effects on women's adoption or use of the improved cassava

processing technologies and should not be considered valuable while designing intervention strategies. However, the result entails that, women cassava processors with different age and processing experience were indifferent in their adoption of the improved cassava processing technologies in Zone I, Jigawa State Nigeria. These findings agree with the findings of similar studies such as Deji (2005) who found membership of association significant to the adoption behaviour of farmers. Also Odebode (2008) who emphasized the importance of credit in the use of appropriate cassava processing technologies. Similarly, Umar (2004) found extension contact significant in adoption of recommended onion production practices in Goronyo Local Government Area of Sokoto State, Nigeria. However, the result is contrary to that, of. Mauceri *et al.* (2005), Adesina and Zinnah (1993) that as processors grow older, there is an increase in risk aversion and a decreased interest in long term investment in the processing. Increase in literacy level will most likely result in an increased processor's level of adoption of improved cassava technology. Similarly, Bello *et al.*, (2011), discovered processing experience as variable that influence adoption of agricultural innovations.

Table 9: Constraints Encountered by the Women Cassava Processors

SN	Constraints	Frequency	%	Rank
1	Inadequate income/capital	35	22.0	1 st
2	Shortage of processing facilities	28	17.6	2 nd
3	Complexities of technology	27	17.0	3 rd
4	High cost of machinery	24	15.4	4 th
5	Inadequate improved varieties	22	13.8	5 th
6	Poor road net work	13	8.5	6 th
7	Irregular power supply	10	6.3	7 th

*Multiple Response Exist, hence >% = 100

Cassava processors faced several constraints in their processing activities. The study revealed that Table 9 below shows the constraints faced by the women cassava processors in order of importance. As women play dominant roles in cooperative societies (Aigbe, 2012). The most pressing constraints faced by the women processors was inadequate income/capital was also explained in the work of Sasore (2005), who stated that majority of the processors, particularly women, face problem when seeking credit because of government policies, lack of collateral and prejudices against them. Other constraints revealed in table 9 Shortage of processing machines (17.6%). This affected them, as they could not receive any new idea on operational mechanism of cassava processing technology as such their productivity was very low. The next constraints ranked third by the women processors were Complexities of the technology by women processors (17.0%), high cost of machines (15.4%), Inadequate improved varieties (13.8%), Poor road network (8.5%) and unsteady power supply (6.3%) which were ranked 2nd, 3rd, 4th, 5th, 6th and 7th respectively.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

This Study examined the Adoption of improved cassava processing technologies among rural women processors in Zone I Jigawa State, Nigeria .Multi-Stage sampling techniques consisting purposive and random sampling was used in selecting 150 Women cassava processors cooperative societies. Socio-economic characteristics of women cassava processors and available technology used by the rural women cassava processors and awareness to the use of improved cassava processing technologies by women processors were determined as well as socio-economic factors influencing the adoption of improved cassava processing technology and constraints militating the women using improved cassava processing technologies in the study area. For the purpose of data analysis descriptive statistics such as frequencies, means, percentages and range were used. Results of the processor's socio-economic characteristics revealed that most of them were married women with a mean age of 36years with low level of literacy. However, more than one third of the processors (45.7%) had formal education (primary 31.1%, secondary11.9% and tertiary 2.7%) while those with Qur'anic knowledge constitute about 54.3%. More than one third of the cassava processors (41.1%) have 6-10 years of processing experience. It also turned out that they were all registered members of one form of association or the other with (98.7%) belonging to one type of cooperative or the other with having frequent contact with extension agents. The result of Logistic regression shows that, the processors are more aware of Hammer mill with the highest awareness level of 65.3%, each. Finally, the fryer (toaster) has the least awareness level of 55.3%. The average level of awareness is 62.2% and this implies that the level of awareness of the improved cassava

processing technologies is high. This may be attributed to the fact that, 10 Women were trained by the ministry of Economic and Youth Empowerment skill acquisition programme, in Jigawa State processing plant situated at Killa in Gwaran Local Government. The Logit regression equation recorded a Chi-square (X^2) value of 4.328 with a degree of freedom (df=6) which was significant at 5% level. It further revealed that Marital Status (X_2), House hold size (X_3), Level of education (X_4), Access to credit (X_5) Contact with Extension Agents (X_6) and Cooperative Membership (X_7) were all significant and are positively related to the adoption of improved cassava processing technology. Only Age and processing experience are not significant.

The constraints were ranked in order of their magnitude of their importance as perceived by the respondents. The ranking was based on maximum of 7 for the most critical from the result identified as major constraints in the study, all were overwhelmingly agreed upon by all the respondents as being the major constraint in the study area. These constraints include inadequate income/capital (1st), Shortage of processing facilities, (2nd) Complexities of technology (3rd), high cost of machinery, (4th) Inadequate improved varieties (5th), Poor road network (6th) and unsteady power supply (7th) among others.

5.2 CONCLUSION

Based on the research findings the results of the study showed that small- scale (house hold) women cassava processors in the study area relied mostly on traditional methods or low level technology for their operations. In terms of adoption, majority of the respondents did not use the improved processing technology because of its cost; only few used them for processing their cassava into various products in the study area. Traditional methods of cassava processing were found to be laborious, time consuming, provide low yield and lacked storage capabilities. Availability of relevant

modern processing technologies to improve on the level of existing traditional methods in the study area was grossly inadequate. Also, this study has revealed that there were various opportunities for local investment in the cassava business, ranging from production to processing and marketing based on the profitability of the enterprises.

From the finding of the study, socio-economic factors of women cassava processors have influences on the adoption of the improved cassava technology and for this reasons the study conclude and reject the alternative hypothesis (H_a).

5.3 RECOMMENDATIONS

Based on the research findings of this study the following policy recommendations have been suggested.

- i. More efforts from all the cassava stakeholders should be geared towards diffusing the technologies to all other parts of the study area.
- ii. Improved technology developed by researchers should ensure better quality of cassava products and to produce more food varieties from the crop, reduce the labour and time involved in processing and minimizing cost of processing;
- iii. Processors should be encouraged to form cooperative societies to pool their resources together to enable them to have access to improved farm inputs and to enhance the accessibility to agricultural information.
- iv. The extension component of the JARDA should be strengthened to enable it meet the challenges of technology assimilation and adoption.
- v. JARDA in conjunction with other relevant stakeholders in the cassava sector should work toward achieving total acceptance of the technologies in the area.

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APPENDIX I

QUESTIONNAIRE FOR CASSAVA PROCESSORS

Section A: Socio economic characteristics of women cassava processors

1. Local Government Area.....
2. Name of village.....
3. Village location.....
4. Age.....
5. Marital Status
(a) Married () (b) Single () (c) Divorced () (d) Widow ()
6. Level of Educational
(a) Quranic Education () (b) Primary Education () (c) Secondary Education () (e) Tertiary Education () (e) other specify.....
7. What is your main source of income?
a) Processing b) others specify-----
8. What was the source of your capital for the business?
(a) Personal saving () (b) Co-operatives () (c) Friends () (d) Bank () (e) Others
9. Household size.....
11. For how long have you been in the business? (Years)
12. Do you have other off-farm sources of income? (Tick one and specify)
(a) None () (b) Salaried work () (c) Commerce () (d) Transport () (e) Others specify.....
13. Primary Occupation?
a) Farming () b) Marketing of Cassava () c) Processing of Cassava () d) other Specify-----
14. Secondary occupation?
a) Farming () b) Marketing of Cassava () c) Civil Servant () d) Processing of Cassava () e) other specify-----
15. What is your scale of processing?
a) Small scale () b) Medium scale () c) Large scale ()
16. Who do you sell your products to?
(a) Wholesalers () (b) Retailers () (c) Consumers ()
17. Reason for cassava processing?
(a) Home consumption () (b) Income generation () (c) Both A and B () (d) Others specify.....
18. If Yes to Q19, then how frequent do you receive information on Cassava processing?
(a) Weekly (b) Forth-nightly () (c) Monthly () (d) Others specify..... ()

Section B: Cassava processing Techniques

19. Which type of cassava do you process?
(a) Local variety () (b) Improved variety () (c) Others specify.....
20. Do you have other off-farm sources of income? (Tick one and specify)

- (a) None () (b) Salaried work () (c) Commerce ()
 (d) Transport () (e) Others specify.....

21. What method do you employ in processing your cassava?

- (a) Traditional () (b) Improved ()

22. Which type of improved processing equipment are you aware of?

- (a) Grater () (b) Sifter () (c) Fryer toaster () (d) Press () (e) Hammer mill ()
 (f) Others Specify.....

23. Which type of improved processing equipment do you use on a continuous basis?

- (a) Grater () (b) Sifter () (c) Fryer toaster () (d) Press () (e) Hammer mill ()
 (f) Others Specify.....

24. Mention the type of cassava products you produce.....

25. How do you store your cassava products?

Specify.....

26. What kind of labour is used in your Processing business?

- (a) Family () (b) Hired () (c) Family and hired ()
 (d) Others specify.....

Section C: Awareness and Use of improved Cassava processing Technologies among Women processors

S/N	Recommended Technology	Are you aware of this Technology		Do you try it		Do you adopt it		If yes indicate the year of first adoption
		Yes	No	Yes	No	Yes	No	
1.	Mechanical grater							2010
2.	Screw press							2011
3.	Mechanical sifter							2012
4.	Fryer (toaster)							2013
5.	Hydraulic press							2014
6.	Hammer mill							2015

a) Table showing Women processors response using 5-point likert-type adoption scale and weighted values will be as follows: Awareness=1; Interest=2; Evaluation=3; Trial=4; Adoption=5

S/NO	TECHNOLOGY	A=1	I=2	E=3	T=4	A=5
1.	Mechanical grater					
2.	Screw press					
3.	Mechanical Sifter					
4.	Fryer (toaster)					
5.	Hydraulic press					
6.	Hammer mill					

b) Kindly indicate your opinion with respects to:

I. EASE OF USE

Ease of use	SA	A	U	SD
The processing technologies are easy to adopt				
Learning how to make use of the technology is easy				
It is easy to become skillful in the use of the technologies				

II. PERCEIVED USEFULNESS

Perceived usefulness	SA	A	U	SD
The use of technologies may increase processing				
The use of technologies may increase profit				
The use of technologies may increase quality of seedlings				

III. ATTITUDE

Attitude towards use	SA	A	U	SD
Introducing processing technologies may fail as processors resort to use of traditional method				
Access to quality seedling may improve if the use of technologies is sustained				
Access to processing machines is for influential community members or cooperative society				

IV. BEHAVIORAL INTENTION TO USE

Attitude towards use	SA	A	U	SD
I intend to use improved cassava processing technologies in future				
I will recommend others to use improved processing technologies				

Section D: Factors influencing adoption of improved cassava processing Technology

. Do you belong to any association?

. If yes to Question 17, mention how many associations.....

. Do you have contact with Extension agent? (a) Yes () (b) No ()

27. Do you have access to credit? Yes () No ()

28. If yes, to question (Q29) above from which of the following sources?

(Please tick as appropriate)

(a Commercial bank ()

(b Cooperative society ()

(c Local money lenders ()

(d Friends and relatives ()

(e Religious institution ()

(f Non-Governmental organization ()

(g Esusu group ()

(h Other (specify) - - - - -

29. If you have access to credit, how much did you receive as credit for your cassava processing activities in the last one year? -----Naira

30. What is the quantity of cassava per Kg you process in a typical day? -----Kg

31. How many days in a week do you process cassava to flour / Garri ? -----Days---

a) AFFORDABILITY:

Which of the following machines were you able to buy? Tick the correct option

In the table below as applied to each machine. (1= Affordable 0 otherwise)

S/N	Machines	1	0
1.	Mechanical grater		
2.	Screw press		
3	Mechanical Sifter		
4.	Fryer (toaster)		
5.	Hydraulic press		
6.	Hammer mill		
Others, specify:			
S/N	Machines	1	0
1.			
2.			
3.			
4.			
5.			

b) COMPATIBILITY:

Which of the following machines meets your needs or compatible with your values?

Tick the correct option in the table below as applied to each machine (1 = compactible, 0 otherwise).

S/N	Machines	1	0
1.	Mechanical grater		
2.	Screw press		
3	Mechanical Sifter		
4.	Fryer (toaster)		
5.	Hydraulic press		
6.	Hammer mill		
Others, specify:			
S/N	Machines	1	0
1.			
2.			
3.			
4.			
5.			

c) COMPLEXITY

Which of the following machines are complex to use or has high level of risk? Tick

The correct option in the table below as applied to each machine. (1 = Complexity, 0 otherwise)

S/N	Machines	1	0
1.	Mechanical grater		
2.	Screw press		
3.	Mechanical Sifter		
4.	Fryer (toaster)		
5.	Hydraulic press		
6.	Hammer mill		
Others, specify:			
S/N	Machines	1	0
1.			
2.			
3.			
4.			
5.			

Section E: Constraints of using improved cassava processing Machines

32. Which of the following problems do you encounter in using the machines? Tick, if any.

- i) Lack of credit facilities ()
- ii) Shortage of processing machines ()
- iii) Complexities of technology ()
- iv) High cost of machines ()
- v) Inadequate improved varieties ()
- vi) Poor road network ()
- vii) Unsteady power supply ()
- viii) Others (specify):