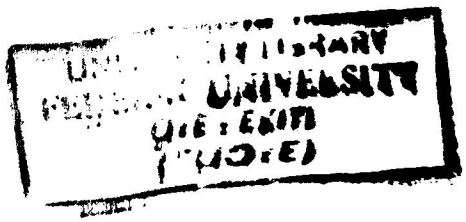
A SURVEY OF THE TECHNIQUES AND TECHNOLOGIES FOR CASSAVA PROCESSING IN EKITI STATE

BY

ADEGOKE ADELEKE OPEOLUWA

ABE/12/0817



DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING,

FEDERAL UNIVERSITY OYE-EKITI,

EKITI STATE, NIGERIA.

NOVEMBER, 2017

A SURVEY OF THE TECHNIQUES AND TECHNOLOGIES FOR CASSAVA PROCESSING IN EKITI STATE.

ADEGOKE, Adeleke Opeoluwa

ABE/12/0817

SUBMITTED TO

DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING.

THE FEDERAL UNIVERSITY OYE-EKITI,

EKITI STATE, NIGERIA.

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF

BACHELOR OF ENGINEERING (B.Eng.) IN AGRICULTURAL AND BIORESOURCES ENGINEERING

NOVEMBER, 2017

DEDICATION

This report is dedicated to the Almighty God who gives wisdom liberally.

CERTIFICATION

This is to certify that **ADEGOKE** Adeleke Opeoluwa, an undergraduate student in the Department of Agricultural and Bioresources Engineering, Federal University Oye-Ekiti with Matriculation Number ABE/12/0817, has successfully carried out and completed this project work in partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Agricultural and Bioresources Engineering. The work embodied in this report is original and has not been submitted in part or full for any other Diploma or Degree in this University or any other University.

Engr. Dr. A. A. Satimehin
(Supervisor) **Date** 18/04/2018

Engr. A. O. Oloye
(Co-Supervisor) **Date** .....

Engr. Dr. A. M. Olaniyan
(Head of Department) **Date** .....

Engr. Professor K. J. Simonyan
(External Examiner) **Date** 30/11/17

AKNOWLEDGMENT

I would like to register my unreserved gratitude to the Immortal, Invisible, the only wise God who in His infinite mercies made me sail through the sea of this programme in thanksgiving and testimonies.

My gratitude goes to my supervisors Dr. A.A Satimehin and, Engr. A.O Oloye, as well as the HOD Dr. A.M Olaniyan for guiding me through the project the authority of the Federal University Oye Ekiti especially those in the Department of Agricultural and Bioresources Engineering as well as the lecturers of the great department, who have taken pains to impart knowledge into me and also guiding me on the path of excellence in academic and career wise. I promise to keep the flag flying.

To all Colleagues here at Federal University Oye Ekiti; Ajibola Oluwaseun, Orisabinone Toluwalase, Popoola Esther, Sanni Olamide kazeem, Adewole Adeniran, Owajoba Ayobami. for your moral support and for making my stay a memorable one.

My gratitude also goes to my parents, Mr. and Mrs. A.A Adegoke for their financial, spiritual and moral support towards my academic pursuit.

ABSTRACT

This study was carried out to examine the techniques and technologies for cassava processing in Ekiti State, to identify the various products from cassava in the study area, to generate ways of improving the techniques and technologies, and to recognize the constraints to processing and marketing of cassava products. The study made use of structured questionnaires, oral interviews and focused group discussions to select a sample size of 120 respondents. The population under study was considered homogeneous. Two local governments were randomly selected, from each of the three senatorial districts in Ekiti State which makes six local governments in all. The technology mostly used by the cassava processors in Ekiti State is the trado-modern technology. trado-modern technology incorporates the traditional technology such as; peeling, washing, fermentation, frying and packing; and the mechanical technology such as Grating and Pressing. Furthermore, the constraints experienced by processors in carrying out their activities and marketing their various products include poor road network, high transport cost, drudgery due to poor access to equipment, inadequate capital and weather related factors relating to sun drying of cassava products during rainy season. The study therefore recommends the need for processors to have access to infrastructural facilities and improved processing technology to enable them take advantage of the emerging market-oriented cassava products so as to improve their means of livelihoods.

Contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

1.0 INTRODUCTION

1.1 GENERAL INTRODUCTION

Cassava is a major staple food in Nigeria. A staple as defined by (IITA, 2007) is one that is eaten regularly and which provide a large proportion of the population's energy and/or nutrients. Cassava serves this function as it is eaten raw or in processed form. As a result of growing urbanization, cassava has become an essential part of the diet of more than 70 million Nigerians (FAO, 2003). The estimated per capital consumption of cassava in Nigeria is 238Kcal (Cock, 1985). According to Nyerhovwo (2004), 80 percent of Nigerians reside in the rural areas and they eat cassava meal at least once a day and when compared with rice and maize, cassava has a carbohydrate content which is about 40% higher than rice and 25% more than maize. Also, it is the cheapest source of calories for both human and animal consumption. Hence, cassava plays a major role in the country's food security. Furthermore, cassava generates income for its producers, processors, transporters and marketers and it serves as raw material in industries such as bakery, textile, paper, plywood and confectioneries (Babaleye, 2004; FAO, 2003). Given the advantages that cassava exhibit such as ability to grow on marginal lands, low input requirement and high drought tolerance, the roles of the crop have increased. These have made it an important commodity for intervention by the government and stakeholders in the Agricultural sector.

Cassava (Manihot esculenta) is an important food crop in the tropics and is a major carbohydrate staple. According to FAO, cassava is the third most important source of calories in the tropics, after rice and corn (FAO, 2002). The use of cassava as a source of ethanol for fuel, energy in animal feed, and starch for industry is increasing (Kolawole and Agbetoye, 2007; Kehinde, 2006).

It plays a major role in efforts to alleviate the African food crisis because of its efficient production of food energy, year-round availability, tolerance to extreme stress conditions, and suitability to present farming and food systems in Africa (Hahn and Keyser 1985, Hahn et al. 1987). Cassava requires more processing than any other food crops in Africa (Ugwu & Ay, 1992).

Cassava roots are processed by a variety of methods in many different products and used in device ways according to local customs and preference to provide the carbohydrate part of the diet processing cassava reduces food loses and stabilizes seasonal fluctuation in supply of the crop (Nweke 1994). In some countries, the leaves are consumed as vegetables, and many traditional foods are processed from cassava roots and leaves. Cassava requires more processing than any other food crops in Africa (Ugwu & Ay, 1992).

According to Ezedinma et al, (2007), the Nigerian cassava production system has some challenges. Cassava production is concentrated in the hands of resource- poor smallholders who cultivate less than 2 hectares of land using rudimentary tools. The average yield per hectare is put at 10.7 tonnes which is not enough to meet the present demand. In addition, cassava output is mainly for the traditional food market. 90 percent of cassava output is consumed, 5-10 are processed into primary raw material and about 2 percent are secondary raw materials. Furthermore, two types of markets exist for cassava products which are: the traditional food-oriented market and new emerging market for cassava products. Babatunde, (2011) stated that presently in Nigeria, agricultural products are underutilized for income generation and cassava is not left out. Cassava roots are prone to wastage due to inefficient harvest and post-harvest handling. Furthermore, there is inadequate information on income opportunities that exist in cassava processing activities.

Ninety percent of cassava output is consumed, 5-10 are processed into primary raw material and about 2 percent are secondary raw materials. Furthermore, two types of markets exist for cassava products which are: the traditional food-oriented market and new emerging market for cassava products. Babatunde, (2011) stated that presently in Nigeria, agricultural products are underutilized for income generation and cassava is not left out. Cassava roots are prone to wastage due to inefficient harvest and post-harvest handling. Furthermore, there is inadequate information on income opportunities that exist in cassava processing activities. Lawal and Jaiyeola, (2007) opined that value addition improves the shelf life of agricultural products and generates income for participants. Since most government interventions and policies are aimed at integrating the rural poor into the mainstream of the economy, one of the ways of achieving this is by adding value to their produce. The evaluation of the present state of small scale cassava processing is therefore imperative. In order to tap the full potential that cassava

presents there is therefore the need for a study on value addition to cassava and the factors that are likely to influence value addition so that rural communities whose livelihoods depend on it would benefit from the present traditional market and emerging food markets. Cassava Processed products include: gari, fufu, lafun, starch, akpu, tapioca, akra-akpu, flour, pupuru, and others.

1.2 Objectives of the Research

The main objective of the study is to know the various techniques and technologies of cassava processing in Ekiti State.

The specific objectives are to:

1. Assess the processing techniques and technologies of cassava.
2. Assess the constraints to processing and marketing of cassava products.
3. Generate ways of improving the techniques and technologies.

1.3 Statement of problem of the Research

Despite her position as the world leader in cassava production, Nigeria is yet to tap the full potential embedded in cassava. The country still imports some cassava products like starch due to underutilization of available resources. Cassava processing is mostly done by women using traditional method which is labour intensive and time consuming. Various initiatives on cassava are yet to yield the expected results. This may be due to the fact that they do not take account of the economic circumstances under which cassava is processed occasioned by inadequate statistics of those who engage in different cassava products particularly at the grassroots level. Cassava processing is mostly done by women using traditional method which is labour intensive and time consuming.

In Ekiti State, it is generally observed that there is low level of investment in cassava processing. This is evident in the preponderance of women most of whom are resource poor in cassava processing enterprises. Inadequate empirical data on value addition to cassava processed might be the bane of the inability of the enterprise to attract the necessary attention of private entrepreneurs in the sector. This therefore portends negative consequences for the food security and employment generation situations in the State. It is important to note that socio-economic characteristics and some other variables can affect the amount of value added to cassava products and these have not been considered over time. It is also important to state that in addition to the common problems faced in cassava processing and marketing such as price fluctuation among

others, processors often differ in the extent to which they experience the constraints. Therefore, present research is aimed at evaluating the processing technologies of cassava and the constraints to processing and marketing of cassava products.

It is also important to state that in addition to the common problems faced in cassava processing and marketing such as price fluctuation among others, processors often differ in the extent to which they experience the constraints. Against this background, this study sought to answer to the following research questions: what are the various products from cassava processing? how much value is added to processed cassava? What are the constraints to processing and marketing of cassava products?

1.4 Scope of the study

The study made use of well framed questionnaires, oral interviews and focused group discussions to select a sample size of 120 respondents to assess the processing techniques and technologies of cassava, assess the constraints to processing and marketing of cassava products, generate ways of improving the techniques and technologies.

1.5 Justification for the study

Fresh cassava roots cannot be stored for long because they rot within 3-4 days of harvest. They are bulky with about 70% moisture content, and therefore transportation of the tubers to urban markets is difficult and expensive. The roots and leaves contain varying amounts of cyanide which is toxic to humans and animals, while the raw cassava roots and uncooked leaves are not palatable. The nutritional status of cassava can also be improved through fortification with other protein-rich crops. Processing reduces food losses and stabilizes seasonal fluctuations in the supply of the crop. Therefore, cassava must be processed into various forms in order to increase the shelf life of the products, facilitate transportation and marketing, reduce cyanide content and improve palatability.

The findings of the study will contribute to the benefit of the nation considering that cassava plays an important role in feeding the nation today. The greater demand for cassava processed products justifies the need to assess the processing techniques and technologies of

cassava, assess the constraints to processing and marketing of cassava products, so as to generate ways of improving the techniques and technologies as well as overcoming the constraints to processing of cassava.

CHAPTER TWO

2.0 LITERATURE REVIEW

Cassava (*Manihot esculenta Crantz*) is one of the favoured root and tuber crops of the tropics and also a major source of energy in the human diet in the tropics. It is the third most important source of calories in the tropics after cereal crops (FAO, 2008). In addition, it is an important staple, food security, and cash crop that thrive where most other crops fail (Olukunle, 2005).The crop originated in South America, where its tubers have been used throughout the ages as a basic food from where it spread to other regions of the world, its cultivation has spread throughout the humid tropics and subtropics (Nwekeet al., 2002). Adetunji and Quadri (2011) reported that cassava is mostly grown on small farmsin Nigeria and usually intercropped with vegetables, plantation crops, yam, sweet potatoes, melon, maize, beans, and other annual crops. FAO (2003) reported that highest production is in Africa with 99.1 million tonnes while 51.5 and 33.2 million tonnes are for Asia and Latin America respectively. Cassava production in Nigeria was put at about 33.8 million tons a year (FAO, 2006).Nworgu (2006) reported that Nigeria has annual output potential for cassava production of 75.5 million tonnes. (Ajao and Adegun 2009) reported that the total area of harvested crop in 2001 was 3.1 million / ha with an averageyield of about 11 t/ha.Katz and Weaver (2003) reported that cassava contains protein and also contain significant amounts of calcium, phosphorus, and Vitamin C.Oluwoleet al. (2004) also reported that edible part of fresh cassava root contains 32% – 35% carbohydrate, 2% – 3% protein, 75% – 80% moisture, 0.1% fat, fibre and 0.70% – 2.50% ash.

Cassava is the most perishable of roots and tuber crops and can deteriorate within two or three days after harvesting. Additionally, the cyanide acid content in cassava roots would need to be reduced to a level that is acceptable and safe for human consumption (Akogun, 2015). For these reasons, cassava is sold as a processed product such as gari, flour, fufu, atieke, to mention a few whilst other roots and tubers are most frequently sold as fresh produce. Otiet al. (2010) defined gari as a creamy-white, granular flour with a slightly fermented flavour and a slightly sour taste made from fermented, gelatinized fresh cassava tubers. It is consumed by either soaking in cold water with sugar, coconut, roasted peanut, fish, or boiled cowpea as complements or as a paste made with hot water and eaten with vegetable sauce (IITA, 2005).

2.1 Cassava processing techniques

Cassava processing procedures vary, depending on products, from simple processing (peel, boil and eat) to complicated procedures for processing into gari, for example, which involve many more steps, namely peeling, grating, pressing, fermenting, sifting, and roasting. Some of these steps reduce cyanide more effectively than others. Processing techniques and procedures differ with countries and localities within a country according to food cultures, environmental factors such as availability of water and fuelwood, the cassava varieties used, and the types of processing equipment and technologies available. The most important traditional culinary preparations of cassava in Africa are "boiled or roasted roots", "fufu" (cassava flour stirred with boiled water over a low-heat fire to give a stiff dough), "eba" (gari soaked in hot water to produce a thick paste) and "chickwangue" (steamed fermented pulp wrapped in leaves).

2.1.1 Gari

In order to make gari fresh cassava roots are peeled, washed and grated. The grated pulp is put in sacks (Jute or polypropylene) and the sacks are placed under heavy stones or pressed with a hydraulic lack between wooden platforms for 3-4 days to express excess liquid from the pulp while it is fermenting. Fermentation imparts an acidic taste to the final product. The dewatered and fermented lumps of pulp are crumbled by hand and most of the fibrous matter is removed. The remaining mass is sieved with traditional sieves (made of woven splinters of cane) or iron or polyethylene mesh. After being sieved, the fine pulp is then roasted in an iron pan or earthen pot over a fire. If the sieved pulp is too wet, it takes longer to roast resulting in a finished lumpy product with dull colour. Palm oil may be added to prevent the pulp from burning during roasting and to give a light yellow colour to the gari. When palm oil is not added, a white gari is produced. Palm oil contains substantial quantities of vitamin A, therefore, yellow gari is 10-30 percent more nutritious and expensive than white gari. The garification or conversion rate of fresh roots into gari is 15-20 %. This value varies with cassava varieties, time of harvesting, age of plant and other environmental factors. Gari is very popular in Nigeria.

Peeling is done mainly by women and children. The peeled roots are grated by women, using a simple traditional grater, but it is done by men if a power driven grater is used. Pressing is done by women in the traditional way but done by men when a hydraulic presser is used. The sieved

fermented pulp is roasted almost exclusively by women in a pan or pot on the fire with fuelwood as the energy source.

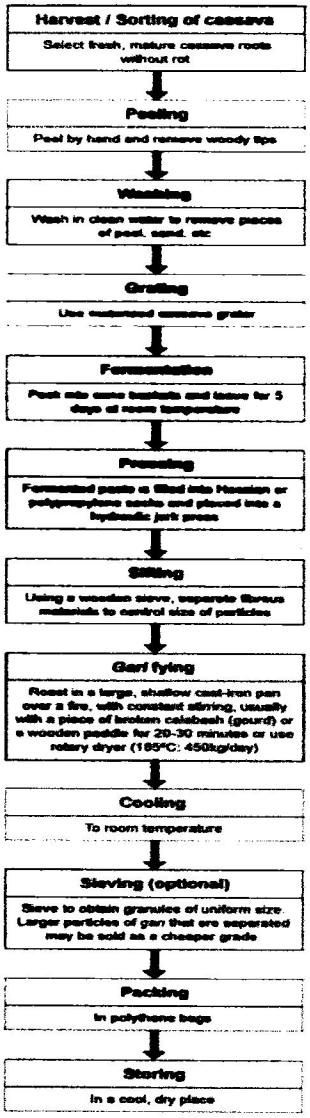


Figure 1: Flow chart for gari production

Source: Google

2.1.2 Fermented and dried cassava pulp

The processing method to ferment and dry cassava pulp is very simple and does not require much labor. It is thus widely used for processing high cyanide cassava varieties in many parts of Africa where water for soaking is available. Whole or peeled roots are immersed in water for 3-4 days for fermentation and softening the tissues. The fermenting roots are then removed and broken into small crumbs, sun-dried on mats, racks, fiat rocks, cement floors or roofs of houses. Drying the fermented roots takes 1-3 days, depending on the prevailing weather. The dried crumbs are then milled into flour.

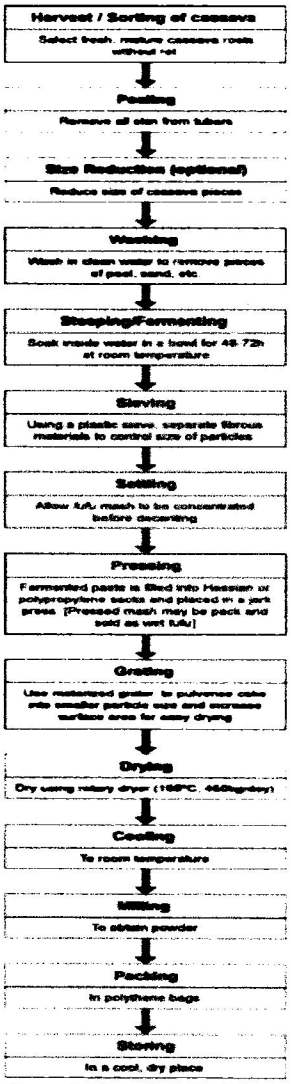


Figure 2: Flow chart for lafun processing *Source: Google*

2.1.3 Wet pulp

The processing procedures for "wet pulp" and of fermented and dried pulp production are similar except for the drying. The wet pulp may be molded into balls, 3-5 cm diameter, put in boiling water and stirred thoroughly to obtain a stiff Wet pulp of about 0.5-1.0 kg is packed in a plastic or polypropylene bag and marketed in cities in Nigeria, Ghana and Cameroon. Urban dwellers therefore do not need to buy fresh roots for processing into wet pulp to prepare wet fufu.

2.1.4 Starch

Cassava roots are peeled, washed and grated. The grated pulp is steeped for 2-3 days in a large quantity of water, stirred and filtered through a piece of cloth. The filtrate stands overnight and the supernatant is then decanted. The starch sediments are air-dried under shade.

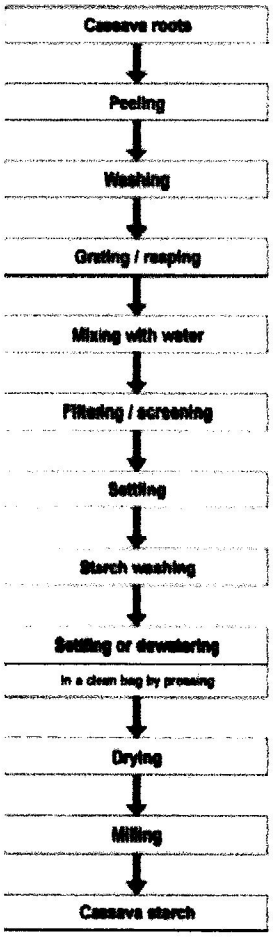


Figure 3: Flow chart for starch production
Source: Google

Figure 3: Flow chart for fufu production.

Source: Google

Cassava processing involves several operations and Kwatia (1986) identified three major classes of cassava processing technologies in Nigeria. These are technology based on drying and dried products with or without fermentation, and technology based on fermented cassava dough and minor processing technologies. These operations are mainly carried out by women. Karunwi and Ezumah (1988) observed that 84 percent of the processors are women and that garri is in many the major end product.

Chinsman and Fiagan (1987) reported that proper processing and preservation of harvested produce minimize post-harvest losses and thus help to off-set shortage in food supply.

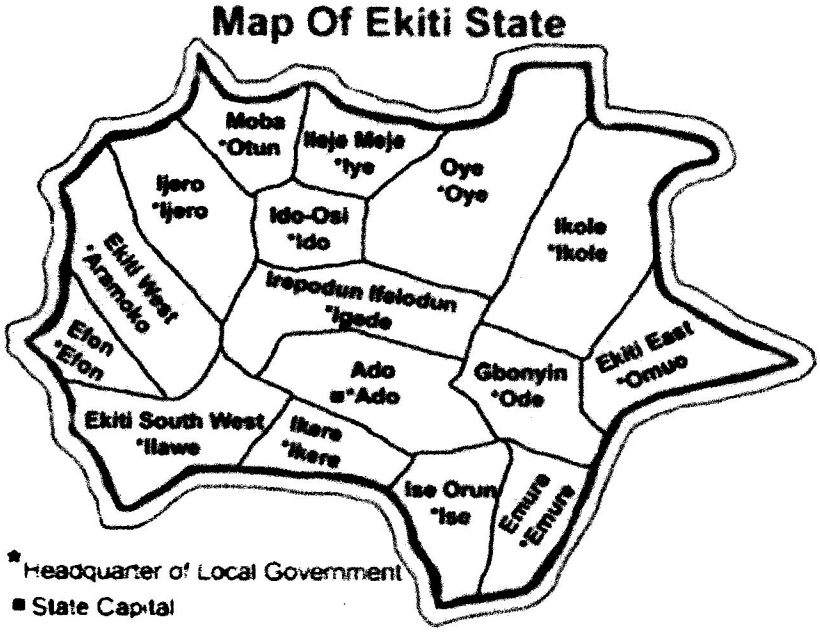
In response to growing labour shortages in Nigeria, researchers have developed a wide array of simple mechanical processing technologies that reduce labour requirements and facilitate the commercial production and processing of cassava. Research Institutes such as Product Development Agency (PRODA), Federal Institute of Industrial Research Oshodi (FIIRO), and International Institute of Tropical Agriculture (IITA), as well as the Agricultural Engineering Departments in several Universities and Polytechnics in the country, have developed many mechanized units designed to remove the constraints that cassava processors face. Thus, several models and variations of cassava processing technologies are available in the market (Taiwo, 2006).These include among others the following: Peeling Machine, Cassava Chipping Machine, Grating Machine, Hammer Mill, Hydraulic Press, Dryers and Pelletizer.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study area

Ekiti is a state in western Nigeria. It was declared a state on 1st October 1996 alongside five others by the military under the dictatorship of General Sani Abacha. The state, carved out of the territory of old Ondo State, covers the former twelve local government areas that made up the Ekiti Zone of old Ondo State. On creation, it had sixteen Local Government Areas (LGAs), having had an additional four carved out of the old ones. Ekiti State is one of the thirty-six states (Federal Capital Territory (Nigeria)) that constitute Nigeria.



Agriculture is the main occupation of the people which provides income and employment for more than 75% of the population of Ekiti State.

The main cash crops are cocoa,coffee, kolanut, cashew and oil palm. Other tree crops include citrus fruits, coconut, mango, sugar-cane, guava and pine apple.

Because of the conducive climatic condition, the state enjoys luxuriant vegetation. It also boasts of various species of timber that provide raw materials for wood based industries. Among the food crops are: yam, cocoyam, cassava, maize, plantain/banana, rice, beans, pepper, tomato and varieties of vegetables.

3.2 Sampling techniques and sample size

The study made use of structured questionnaires, oral interviews and focused group discussions to select a sample size of 120 respondents. The population under study was considered homogeneous. Two local governments were randomly selected, from each of the three senatorial districts in Ekiti state which makes six local governments in all and they are Ado, Ekiti West, Ido/Osi, Ekiti South West, Ikole and Ekiti East Local Governments. In each of the Local Governments, twenty (20) respondents were randomly selected. In all, 120 respondents were sampled. Questionnaires were distributed to all the respondents, and all were retrieved.

3.3 Method of Data Collection

The data required for this study were basically primary and were collected through a structured questionnaire, oral interviews, personal observations and Focused Group Discussions (FGDs). These instruments helped in obtaining information for the study.

3.4 Method of Data Analysis

Data were analyzed using descriptive statistics. Descriptive statistics percentages and cumulative percentages were used to analyze the socio-economic characteristics of the respondents.

3.5 Data collected

Engineering data was collected and the obtained parameters were evaluated.

4.0 RESULTS AND DISCUSSION

Table 1 shows the type of ownership of cassava processing plants in the study area. The table indicates that most of the cassava processors operate on the basis of sole ownership. According to the result obtained, Omuo respondents prefer to run the business solely rather than running it jointly or cooperatively. The result obtained from the respondents that answered to the questionnaires corresponds with the information obtained from the group discussion. The reasons why the respondents prefer to own it solely rather than jointly or cooperatively or run as a family business are: In joint, cooperative or family business, disagreements do occur between the parties involved in the operation. In family business ownership, sometimes gender inequality might set in, all parties can't be active at the same time. The respondents said they have their family members as the most readily available form of labour, indicating that the household size was possibly advantageous to them.

The result in Table 2shows that cassava processing is a female dominated activity in Ado, Ekiti West, Ido/Osi, Ikole and Ekiti East Local Governments except for Ekiti South West where it is marginally dominated by men with 54.5% being males.

In accordance to the information obtained from the focused group discussions, some respondents said it is men generally believed that cassava processing is an activity that should be performed by women and the men folk tend to keep away. The only operations men are involved in are in the grating and pressing because the kind of grater and presser that are currently used involve a lot of manual labour.

The result in table 3 tallies with some facts obtained from some respondents while discussing that most women involve in the business because of their children's welfare after the death of their husbands. In Ekiti East widowers dominates in the processing of cassava (38.5%). It can be clearly seen that the singles don't want to engage in the business because they believe it's a business for the old people and they actually can't go through the stress, more so, they believe it's done by the old people.

TABLE 1 TYPE OF OWNERSHIP

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER CENT	CUMM PER-CENT
SOLE	10	50	50	10	50	50	11	55	55	10	50	50	8	40	40	13	65	65	62	51.67	51.67
JOINT	2	10	60	7	35	85	2	10	65	5	25	75	7	35	75	2	10	75	25	20.83	72.50
CO-OPERATIVE	0	0	60	0	0	85	0	0	65	0	0	75	0	0	75	0	0	75	0	0.00	72.50
FAMILY BIZ	8	40	100	3	15	100	7	35	100	5	25	100	5	25	100	5	25	100	33	27.50	100.00
OTHERS	0	0		0	0		0	0		0	0		0	0		0	0		0	0.00	
TOTAL	20			20			20			20			20			20			120		

TABLE 2 GENDER OF OWNER

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER CENT	CUMM PERCENT
MALE	3	30	30	4	40	40	6	54.5	54.45	4	40	40	2	25	25	5	38.5	38.5	24	38.7	38.7
FEMALE	7	70	100	6	60	100	5	45.5	100	6	60	100	6	75	100	8	61.5	100	38	61.18	100
TOTAL	10			10			11			10			8			13			62		

TABLE 3 MARITAL STATUS

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER CENT	CUMM PER CENT	FREQ	PER CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER CENT
SINGLE	0	0	0	4	40	40	2	18.18	18.18	0	0	0	0	0	0	2	15.4	15.4	8	13.6	13.6
MARRIED	4	40	40	2	20	60	3	27.27	45.45	4	40	40	2	25	25	4	30.8	46.2	19	32.3	45.9
WIDOW	5	50	90	2	20	80	3	27.27	72.72	6	60	100	4	50	75	2	15.4	61.6	22	37.4	83.3
WIDOWER	1	10	100	2	20	100	0	0	72.72	0	0	100	2	25	100	5	38.5	100	10	17	100
DIVORCED	0	0		0	0		3	27.7	100	0	0		0	0		0	0		0	0	
TOTAL	10			10			11			10			8			13			59		

(70%) passed through primary and secondary education i.e. they are educated while 30% are not educated. In Ekiti West Local Government, 100% of the respondents are educated, having acquired either primary, secondary, Islamic, adult or tertiary education. In Ekiti South West, majority (90.91%) of the respondents passed through primary education, Islamic education, secondary education, adult education while and 9.09% had no formal education. In Ikole Local government, 60% passed through primary education or secondary education while 40% had no formal education. In Ido/Osi Local government majority (75%) of the respondent had no formal education while only 25% passed through primary education. In Ekiti East, 38.5% had no formal education while 61.5% passed through primary education, Islamic education, secondary education, adult education. The implication of this is that the processors are likely to readily adopt new technology and innovation. According to the various discussions, the respondents said almost all the cassava processors are school dropouts. This revelation is buttressed by the fact that among all the respondents, only one of them possesses a university degree.

The result in Table 5 shows that all the respondents in all the LGA all have local method experience. The implication of this is that, the experience of cassava processing has affected them and restricted them from adopting new ideas. Most of them were initiated into the business by their parents.

The result in Table 6 shows that, in Ado Local Government, majority (30%) of the respondents have been processing cassava from between 16-20 years, 25% have been processing from between 6-10 years and 11-15 years, 5% has been producing from between 21-25 years and 5% have been producing for more than 25 years. In Ekiti West Local Government, majority (35%) of the respondents have been processing cassava from between 0-5 years, 30% have been processing from between 6-10 years , 25% have been processing from between 11-15 years, 10% has been producing from between 16-20. In Ekiti South West, majority (45%) of the respondents have been processing cassava from between 6-10 years, 35% have been processing from between 11-15 years, 15% has been producing from between 0-5 years and 5% have been producing from 16-20 years. In Ikole Local Government, majority (55%) of the respondents have been processing cassava from between 0-5 years, 30% have been processing from between 6-10 years, 10% has been producing from between 11-15 years and 5% have been producing for more than 25 years. In Ido/Osi Local Government, majority (55%) of the respondents have been processing cassava from between 6-10 years, 40% have been processing from between 0-5 years, 5% has been producing from between 11-15. In Ekiti East, majority (35%) of the respondents have been processing cassava from between 0-5 years, 30% have been processing from between 6-10

years, 15% has been producing from between 16-20 years and 5% have been producing from between 11-15 years and 21-25 years.

The result in Table 7 shows that most of these cassava processing establishment in all the LGAs are located in residential areas. In Ado (100%). Ekiti West (80% of the processing facilities are located in residential areas. 15% are located on the farm while only 5% are located in industrial area. In Ekiti South West, 90% of the processing facilities are located in residential areas while only 10% are located right on the farm. In Ikole LGA. 90% of the processing facilities are located in residential areas while only 10% are located on the farm. In Ido Osi LGA. 90% of the processing facilities are located in residential areas while only 10% are located right on the farm. In Ekiti East, 90% of the processing facilities are located in residential areas while only 10% are located right on the farm.The majority of the respondents believe that siting these enterprises in residential areas have some advantages which include: easy accessibility to the raw materials, easy accessibility to market for their products, easy access to sources of water, it eliminates the need for long distance transportation of their products to residential areas, easy access to machines as many of them cannot afford to acquire the machines. Some disadvantages stated are: noise pollution from the machines, odour from fermented cassava water.

The result in Table 8 shows that, majority of the respondents in the study area obtained their raw materials through direct purchase from the farmers (market purchase). Meanwhile the respondents stated that they could not store their cassava for a long time due to high rate of perishability and poor storage facility and obtaining from the farmers is stress-reduced.

From Table 9, the analysis revealed that the most dominant product in all the six LGAs are garri, fufu, lafun, and starch. Garri is the most dominant product in Ekiti West, Ido/Osi, Ekiti South West, Ikole and Ekiti East Local Governments while Ado Local Government has fufuas the most dominant product.

TABLE 4 LEVEL OF EDUCATION

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
ISLAMIC EDU	0	0	0	0	0	0	2	18.18	18.18	0	0	0	0	0	0	1	7.7	7.7	3	4.8	4.8
PRIMARY EDU	6	60	60	3	30	30	5	45.45	63.63	5	50	50	2	25	25	4	30.8	38.5	25	40.3	45.1
SECONDARY EDU	1	10	70	5	50	80	2	18.18	81.81	1	10	60	0	0	25	0	0	38.5	9	14.52	59.62
ADULT EDU	0	0	70	1	10	90	1	9.09	90.9	0	0	60	0	0	25	3	23.1	61.6	5	8.04	67.66
TERTIARY EDU	0	0	70	1	10	100	0	0	90.9	0	0	60	0	0	25	0	0	0	1	1.61	68.27
NO FORMAL EDU	3	30	100	0	0		1	9.09	100	4	40	100	6	75	100	5	38.5	100	19	30.64	100
TOTAL	10			10			11			10			8			13			62		

TABLE 5:
PROCESSINGEXPERIENC
E

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
LOCAL METHOD	20	100	100	20	100	100	20	100	100	20	100	100	20	100	100	20	100	100	120	100	100
MODERN METHOD	0	0		0	0	0	0	0		0	0		0	0		0	0		0	0	
TOTAL	20			20			20			20			20			20			120		

6 YEARS OF EXPERIENCE

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
	2	10	10	7	35	35	3	15	15	11	55	55	8	40	40	7	35	35	38	31.7	31.7
	5	25	35	6	30	65	9	45	60	6	30	85	11	55	95	6	30	65	43	35.8	67.5
	5	25	60	5	25	90	7	35	95	2	10	95	1	5	100	2	10	75	22	18.3	85.8
	6	30	90	2	10	100	1	5	100	0	0	95	0	0		3	15	90	12	10	95.8
	1	5	95	0	0		0	0		0	0	95	0	0		2	10	100	3	2.5	98.3
S	1	5	100	0	0		0	0		1	5	100	0	0		0	0		2	1.67	100
	20			20			20			20			20			20			120		

7 LOCATION OF THE PROCESSING FACILITY

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
ENTIAL	20	100	100	16	80	80	18	90	90	18	90	90	18	90	90	18	90	90	108	90	90
TRIAL	0	0		1	5	85	0	0	90	0	0	90	0	0	90	0	0	90	1	0.83	90.83
E	0	0		3	15	100	2	10	100	2	10	100	2	10	100	2	10	100	11	9.17	100
	20			20			20			20			20			20			120		

TABLE 8 SOURCES OF CASSAVA TUBERS

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
FARM HARVEST	0	0	0	3	15	15	9	45	45	2	10	10	5	25	25	2	10	10	21	17.5	17.5
MARKET PURCHASE	20	100	100	17	85	100	11	55	100	18	90	100	15	75	100	18	90	100	99	82.5	100
TOTAL	20			20			20			20			20			20			120		

TABLE 9 CASSAVA PRODUCTS OF THE PROCESSING FACILITY

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER CENT	FREQ	PER-CENT	CUMM. PER-CENT
GARRI	14	36.84	36.84	14	56	56	12	41.4	41.4	17	42.5	42.5	14	37.8	37.8	10	10	10	81	41.8	41.8
FUFU	16	42.08	78.92	7	28	84	10	34.5	75.9	15	37.5	80	13	35.1	72.9	7	78	68	68	35.1	76.9
LAFUN	4	10.52	89.44	1	4	88	4	13.8	89.7	3	7.5	87.5	4	10.8	83.7	3	12	80	19	15.8	92.7
STARCH	4	10.52	100	3	12	100	3	10.35	100	5	12.5	100	6	16.2	100	5	20	100	26	21.7	114.4
AKPU																					
TAPIOCA																					
AKRA-AKPU																					
FLOUR																					
PUPURU																					
OTHERS																					
TOTAL	38			25			29			40			37			25			194		

From Table 10. the survey showed that the space allocated for siting the processing facilities in each of the LGAs are mostly less than 66.89m^2. In Ado (65%). Ekiti West (60%). Ekiti South West (65%). Ikole (65%). Ido/Osi (70%) and Ekiti East (90%) while the rest are between 66.89m^2- 133.78m^2.

This ascertains what some respondents explained during discussions that most of cassava processors run it on a small scale due to inability to afford the price of land or machines so they just start it either in their compound or they for some available spaces around them and start.

In Table 11, it can be clearly seen that the cassava peels are either disposed by feeding them to goats which is the most used disposal method in the study area or dumped on earth fills which is due to the fact as reported by a respondent that most of the processors do not know the importance of cassava peels except to feed goats.

From Table 15. the result obtained illustrates that an average of 101-500 tubers of cassava are processed in Ado (75%), Ekiti East (75%), Ikole (60%), Ido/Osi (75%) while an average of 0-100 tubers of cassava are produced in Ekiti South West (55%) and Ekiti East (60%). Minority of the respondents in Ado (5%), Ekiti West (10%), Ekiti South West (15%). and Ekiti East (5%) tend to produce more tubers of cassava of an average of 501-1000 tubers. When getting information from the processors during group discussion, somepointed out the reasons behind the processing of not so many cassava. Some said its due to not enough labour, some said it's due to the high cost of transporting the cassava tubers, and some said it's because of the stress involved.

Table 16 shows the various sources of water used for processing the cassava with well as the most used source of water in Ado (75%), Ekiti West (65%), Ekiti South West (60%). Ikole (75%). Ido/Osi (80%), Ekiti East (65%). Reservoirs, boreholes and streams are not really used as the source of water. It was also confirmed during the group discussion that well seems to be the most widely used water source because its readily available, it's the commonest water source and moreso the available boreholes are the ones constructed by the government and most of them are no longer functioning properly and majority of the inhabitants wants to collect water from the borehole hereby leading to delay in getting water from boreholes.

[illegible] PEELS SPACE

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
[illegible] m66.89m³	13	65	65	12	60	[illegible]0	12	60	60	13	65	65	14	70	70	18	90	90	82	68.3	68.3
.89m³-3.78m³	7	35	100	7	35	95	7	35	95	7	35	100	6	30	100	2	10	100	36	30	98.3
0.67m³-1.45m³	0	0		1	5	100	1	5	100	0	0		0	0					2	1.67	99.97
1.34m³-1.45m³	0	0		0	0		0	0		0	0		0	0					0	0	99.97
ore than 5.12m³	0	0		0	0		0	0		0	0		0	0					0	0	99.97
THERS	0	0		0	0		0	0		0	0		0	0					0	0	99.97
OTAL	20			20			20			20			20			20			120		

ABLE 11 DISPOSAL OF CASSAVA PEELS

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PERCENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
XPOSON ARTHELLS	4	20	20	3	15	15	3	15	[illegible]	1	5	5	3	15	15	2	10	10	16	13.3	13.3
NIMAL ED	16	80	100	17	85	100	17	85	100	19	95	100	17	85	100	18	90	100	104	86.7	100
THERS	0	0		0	0		0	0		0	0		0	0		0	0		0	0	100
OTAL	20			20			20			20			20			20			120		

15 QUANTITY OF CASSAVA PROCESSED IN A DAY

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
5	4	20	20	3	15	15	11	55	55	8	40	40	5	25	25	12	60	60	43	35.8	35.8
	15	75	95	15	75	90	6	30	85	12	60	100	15	75	100	7	35	95	70	58.3	94.1
00	1	5	100	2	10	100	3	15	100	0	0		0	0		1	5	100	7	5.8	100
000	0	0		0	0		0	0		0	0		0	0		0	0				
S	0	0		0	0		0	0		0	0		0	0		0	0				
	20			20			20			20			20			20			120		

16 SOURCE OF WATER

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
	15	75	75	13	65	65	12	60	60	15	75	75	16	80	80	13	65	65	84	70	70
VOIR	3	15	90	2	10	75	2	10	70	0	0	75	2	10	90	2	10	75	11	9.2	79.2
HOLE	2	10	100	2	10	85	0	0	70	3	15	90	0	0	90	3	15	80	10	8.3	87.5
M	0	0		3	15	100	6	30	100	2	10	100	2	10	100	2	10	100	15	12.5	100
	20			20			20			20			20			20					

ABLE 17 PROCESSING TECHNOLOGY

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
ADITIONAL	3	15	15	8	40	40	9	45	45	7	35	35	6	30	30	5	25	25	38	31.7	31.7
ADO-ODERN	17	85	100	12	60	100	11	55	100	13	65	100	14	70	100	15	75	100	82	68.3	100
ODERN	0	0		0	0		0	0		0	0		0	0		0	0				
TAL	20			20			20			20			20			20			120		

Table 17 shows that majority (68.3%) of the processors in the study area practice the trado-modern technology while the rest practice full traditional method. Trado-modern method involves both traditional and modern methods of processing. The modern method applied in some operations like grinding and pressing while the other operations are done manually. During the interactive session with some of the respondents, they complained that the cost of machines are high while some said they are not aware of the existence of various machines that can be used for such operations as peeling, drying, sieving, frying, frying. operations and this is because of the inaccessibility to information that can improve their production.

In Table 19, all the respondents are both wholesalers and retailers of their products. During the discussions, three points of sale were identified by the respondents. 33.9% of the respondents sold their products at the market, 22.9% at home, 40.7% at the processing centres and the remaining 2.5% of respondents combine any two of the points in order to sell their products. These imply that there is ready traditional food market for products of cassava. These products are further sold to wholesalers, retailers, consumers and food vendors.

In Table 20, majority of the respondent in the study area face the problem of sun-drying during rainy season. As an engineer, dryers should be designed to eradicate this problem. In Table 21, seasonal fluctuation in prices is a major problem in the study area because it determines the quantity of products produced except in Ekiti West where it is not a major problem for them as only 25% of the respondents agreed to the problem.

In Table 22. high cost of transporting inputs is one of the problems faced by cassava processors in Ado (95%), Ekiti West (50%), Ekiti South West (95%), Ido/Osi (70%). The respondents related the awareness of the improved ways of processing that they can't own them because of the high cost of purchasing them. On the other hand, processors in Ikole (45%) and Ekiti East (40%), are of the view that it is not a major problem and during the group discussions it was stated that most of the processors are not aware of the mechanized technology for processing cassava.

In Table 23. majority of the processors in Ado (90%), Ekiti West (75%), Ekiti South West (95%), Ikole (60%) agreed to the fact that cassava is highly perishable and that is why they prefer to purchase cassava from the market rather than cultivating it and moreso that has been the reason behind the processing of not so many tubers of cassava. While in Ido/Osi, just 3% of the respondents agreed to that problem. Also, in Ikole, 45% of the respondents agreed to that problem. In Table 24. 65% of the respondents are faced with the challenge of labour scarcity because most of the inhabitants are involved in other sectors of the economy.

In Ekiti West, the respondents (60%) said it's not a problem. In Ekiti South West, majority of the respondents asserted that it's one of their major problems as it goes a long way in affecting the quantity of products produced. In Ikole, 70% of the respondents admitted on the problem of labour scarcity. 75% of the respondents also admitted in Ido/Osi. While just 25% of the respondents agreed to that problem. which means it's not a major problem in Ekiti East LGA. Table 25 clarified that high cost of transporting cassava is a major problem in most of the LGAs as majority of the respondents in the study area agreed to the problem.

Table 26 clearly shows that the study admitted that the roads for transportation are poor and it goes a long way in hindering the marketability of their products, transport of inputs and cassava as well. All the respondent in the study area certified that poor roads for transportation is a major problem in cassava processing.

The results in Table 27 shows that, water supply is a problem in Ado LGA as 80% of the respondents agreed to the problem, water supply is not really a problem in Ekiti West LGA as 40% agreed to the problem, water supply is a major problem in the processing of cassava as 90% of the respondents admitted to this problem in Ekiti South West. In Ikole LGA, 55% of the respondents agreed to the problem of water supply and in Ekiti South West LGA, 80% of the respondents agreed to this problem which signifies it as a major problem in Ekiti East LGA.

Problem of electricity is majorly a problem in almost all parts of the country, and this reflected in the powering of machines for cassava processing in table 28, as most of the respondents in the study area agreed that it is one of their major problems.

Table 29 related that long period of fermentation during wet season is one of the major problems in all the study area except for Ido LGA respondents (25%) where they feel it's not a problem. The result of this problem is that, the production of the various products of cassava would be delayed as all the products entails fermentation.

TABLE 19 MARKETING CHANNELS

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT
ESALE	20	50	50	20	50	50	20	50	50	20	50	50	20	50	50	20	50	50	120	50	50
L	20	50	100	20	50	100	20	50	100	20	50	100	20	50	100	20	50	100	120	50	50
	40			40			40			40			40			40			240		

EMS ASSOCIATED WITH CASSAVA PROCESSING

20 PROBLEMS OF SUN-DRYING DURING RAINY SEASON

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
IGLY REE	0	0	0	2	55	55	0	0	0	2	10	10	1	5	5	2	10	10	7	5.83	5.83
REE	5	25	25	4	20	75	0	0	0	5	25	35	7	35	40	5	25	35	26	21.7	27.53
E	10	50	75	5	25	100	11	55	55	8	40	75	10	50	90	8	40	75	52	43.3	70.83
IGLY E	5	25	100	9	0		9	45	100	5	25	100	2	10	100	5	25	100	35	29.2	100
	20			20			20			20			20			20			120		

ABLE 21 SEASONAL FLUNCTUATION IN PRICES

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
TRONGLY SAGREE	0	0	0	11	55	55	0	0	0	0	0	0	0	0	0	0	0	0	11	9.17	9.17
SAGREE	1	5	5	4	20	75	1	5	5	1	5	5	2	10	10	6	30	30	15	12.5	21.67
GREE	14	70	75	5	25	100	9	45	50	9	45	50	13	65	75	10	50	80	60	50	71.67
RONGLY GREE	5	25	100	0	0		10	50	100	10	50	100	5	25	100	4	20	100	34	28.3	100
OTAL	20			20			20			20			20			20			120		

BLE 22 HIGH COST OF TRANSPORTING
PUTS

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER CENT	FREQ	PER-CENT	CUMM. PER-CENT
RONGLY SAGREE	0	0	0	4	20	20	0	0	0	1	5	5	0	0	0	2	10	10	7	5.83	5.83
SAGREE	1	5	5	6	30	50	1	5	5	10	50	55	6	30	30	10	50	60	34	28.3	34.13
REE	11	55	60	9	45	95	16	80	85	8	40	95	10	50	80	6	30	90	60	50	84.13
RONGLY REE	8	40	100	1	5	100	3	15	100	1	5	100	4	20	100	2	10	100	19	15.8	100
TAL	20			20			20			20			20			20			120		

LE 23 CASSAVA IS HIGHLY
ISHABLE

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
ONGLY GREE	0	0	0	2	10	10	0	0	0	1	5	5	0	0	0	0	0	0	3	2.5	2.5
GREE	2	10	10	3	15	25	1	5	5	7	35	40	17	85	85	11	55	55	41	34.2	36.7
EE	5	25	35	10	50	75	14	70	75	8	40	80	0	0	85	5	25	80	42	35	71.7
ONGLY EE	13	65	100	5	25	100	5	25	100	4	20	100	3	15	100	4	20	100	34	28.3	100
AL	20			20			20			20			20			20			120		

LE 24 PROBLEMS OF LABOUR
RCITY

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
NGLY GREE	0	0	0	3	15	15	0	0	0	2	10	10	0	0	0	4	20	20	9	7.5	7.5
GREE	7	35	35	9	45	60	1	5	5	12	60	70	5	25	25	11	55	75	45	37.5	45
E	9	45	80	6	30	90	12	60	65	5	25	95	15	75	100	5	25	100	52	43.3	88.3
NGLY E	4	20	100	2	10	100	7	35	100	1	5	100	0	0		0	0		14	11.7	100
L	20			20			20			20			20			20			120		

TABLE 25: HIGH COST OF TRANSPORTING CASSAVA

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT
STRONGLY DISAGREE	0	0	0	0	0	0	0	0	0	3	15	15	0	0	0	0	0	0	3	2.5	2
DISAGREE	3	15	15	5	25	25	0	0	0	9	45	60	1	5	5	11	55	55	29	24.2	26
AGREE	9	45	60	9	45	70	14	70	70	6	30	90	16	80	85	4	20	75	58	48.3	
STRONGLY AGREE	8	40	100	6	30	100	6	30	100	2	10	100	3	15	100	5	25	100	30	25	1
TOTAL	20			20			20			20			20			20			120		

TABLE 26 POOR ROADS FOR TRANSPORTATION

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
STRONGLY DISAGREE	0	0	0	1	5	5	0	0	0	2	10	10	0	0	0	0	0	0	3	2.5	2.5
DISAGREE	10	50	50	4	20	25	1	5	5	3	15	25	12	50	50	6	30	30	36	30	32.5
AGREE	8	40	90	13	65	90	13	65	70	8	40	65	8	50	100	8	40	70	58	48.3	80.8
STRONGLY AGREE	2	10	100	2	10	100	6	30	100	7	35	100	0	0		6	30	100	23	19.2	100
TOTAL	20			20			20			20			20			20			120		

TABLE 27 PROBLEMS OF WATER SUPPLY

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
STRONGLY DISAGREE	0	0	0	2	10	10	0	0	0	2	10	10	0	0	0	0	0	0	4	3.3	3.3
DISAGREE	4	20	20	10	50	60	2	10	10	7	35	45	14	70	70	4	20	20	41	34.2	37.5
AGREE	15	75	95	5	25	85	9	45	55	6	30	75	5	25	95	10	50	70	50	41.7	79.2
STRONGLY AGREE	1	5	100	3	15	100	9	45	100	5	25	100	1	5	100	6	30	100	25	20.8	100
TOTAL	20			20			20			20			20			20			120		

TABLE 28 PROBLEMS OF ELECTRICITY SUPPLY IN POWERING MACHINI

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
STRONGLY DISAGREE	0	0	0	2	10	10	0	0	0	0	0	0	2	10	10	0	0	0	4	3.3	3.3
DISAGREE	8	40	40	4	20	30	0	0	0	1	5	5	4	20	30	3	15	15	20	16.7	20
AGREE	8	40	80	11	55	85	14	70	70	6	30	35	14	70	100	11	55	70	64	533	73.3
STRONGLY AGREE	4	20	100	3	15	100	6	30	100	13	65	100	0			6	30	100	32	26.7	100
TOTAL	20			20			20			20			20			20			120		

TABLE 29 PROBLEMS OF LONG PERIOD OF FERMENTATION DURING WET SEASON

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
STRONGLY DISAGREE	0	0	0	1	5	5	0	0	0	1	5	5	1	5	5	0	0	0	3	2.5	2.5
DISAGREE	3	15	15	6	30	35	0	0	0	8	40	45	14	70	75	5	25	25	36	30	32.5
AGREE	10	50	65	8	40	75	10	50	50	7	35	80	1	5	80	9	45	70	45	37.5	70
STRONGLY AGREE	7	35	100	5	25	100	10	50	100	4	20	100	4	20	100	6	30	100	36	30	100
TOTAL	20			20			20			20			20			20			120		

In Table 30, the problem of poor access to information that can improve cassava processing is mostly a major problem in the study area except in Ido where only 35% agreed.

In Table 31, most of the respondents in the study area agreed to the fact that inadequate capital is a major problem in the processing of cassava. During the discussions, it was clearly stated that money is the main driver of any business and the processing of cassava is not an exception. It was also said that money is needed in all the operations carried out in the processing of cassava for example in the payment of wages for the labourers, purchase of cassava tubers as well as other machines and inputs necessary for the processing. Money is also very much involved in the transportation of the products.

BLE 30 PROBLEMS OF POOR ACCESS TO INFORMATION THAT CAN IMPROVE CASSAVA
OCESSING

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT
RONGLY AGREE	0	0	0	1	5	5	1	5	5	0	0	0	1	5	5	0	0	0	3	2.5	2.5
AGREE	7	35	35	4	20	25	1	5	10	0	0	0	12	60	65	2	10	10	26	21.7	24.2
REE	12	60	95	10	50	75	12	60	70	12	60	60	7	35	100	15	75	85	68	56.7	80.9
RONGLY REE	1	5	100	5	25	100	6	30	100	8	40	100	0	0		3	15	100	23	19.2	100
TAL	20			20			20			20			20			20			120		

BLE 31 PROBLEMS OF INADEQUATE
PITAL

	ADO LGA			ARAMOKO LGA			ILAWE LGA			IKOLE LGA			IDO LGA			OMUO LGA			TOTAL		
	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM. PER-CENT	FREQ	PER-CENT	CUMM PER-CENT
RONGLY AGREE	0	0	0	2	10	10	0	0	0	0	0	0	0	0	0	1	5	5	3	2.5	2.5
AGREE	0	0	0	3	15	25	0	0	0	1	5	5	6	30	30	5	25	30	15	12.5	15
REE	1	5	5	10	50	75	14	70	70	9	45	50	9	45	75	8	40	70	51	42.5	57.5
RONGLY REE	19	95	100	5	25	100	6	30	100	10	50	100	5	25	100	6	30	100	51	42.5	100
TAL	20			20			20			20			20			20			120		

4.1 Technologies used in cassava processing

In the course of this survey, various techniques used in cassava processing in Ekiti were discovered. The different unit operations involved in the processing of cassava involves: peeling.washing, grating, pressing, fermentation, sieving, roasting, drying, soaking, decanting, pounding, cooking, bagging.

4.1.1 Peeling

Peeling of cassava roots is yet to be mechanized as the operation is only carried out manually using sharp knives.

4.1.2 Grating

The grating operation is mostly carried out manually, mechanical graters of various makes and models are not in use in the study area.

Traditional method

Manual grating is considered the most tedious and painful operation of the whole process. The women who still grate the cassava manually, when asked about the problems of gari processing, simply showed the palms of their hands. Manual grating of one tonne of fresh peeled cassava roots generally requires 10-15 man days of effort of about 6hours daily. (Cock 1985). The cassava is usually grated at least one hour after washing in order that excess water can drain off the peeled and washed cassava, otherwise the roots are too slippery and too difficult to hold during grating. The manual grater is usually only a piece of galvanized metal sheet or even a piece of flattened can or tin, punched with about 3mm diameter nails leaving a raised jagged flange on the underside. This grating surface is fixed on a wooden frame and the cassava pieces are pressed against the jagged side of the metal and rubbed vigorously with strong downward movements. Particular care has to be taken and some skill is required "*not to also grate the fingers*" but still accidents sometimes happen. This traditional technology can be improved by mounting the grating surface on a wooden table at a convenient height so the rubbing action is horizontal rather than in a downward slant when the grating surface is supported against the operators legs It is not possible to completely grate a whole cassava piece, 3% to 5% of the cassava has to be left ungrated (Flach1990, Bencini 1991).

Mechanized grating

Sometimes a group of processors do purchase their own mechanically powered rasping or grating machine or a private contractor travels within a group of villages grating cassava for a fee. There are two types of mechanical grater in common use: i) modified hammer mills and ii) graters using an abrasive disc. The abrasive surface can be either cylindrical or a flat disc (figure 5.5) and is frequently a galvanized metal sheet with nail-punched holes, as in the hand grater, and attached to a wooden frame. It is said the grating surface normally wears out with six months of regular use and must be replaced otherwise the output of the machine is significantly reduced. One further disadvantage with this rudimentary grating surface is the difficulty of cleaning it after use. Debris becomes lodged in the holes and within the torn flanges and becomes a substrate for microbial growth and the possible subsequent contamination of the grated cassava which could affect the subsequent fermentation.

Many of the simple graters in use have been developed by local institutions like AMMOTEC and CRIN.

Figure4: Mechanized grater

4.1.3 Fermentation and de-watering

Traditional method

In the traditional operations fermentation and pressing (de-watering) are done in one operation. The grated mash is packed inside baskets, jute bags or perforated plastic sacks and left to ferment for 1-4 days. The duration of the operation affects the colour, taste and texture of the gari. This duration can be reduced by seeding the freshly grated mash with previously fermented liquor as a starter, provided that it can be mixed thoroughly. Fermentation takes

place in two phases. Initially the starch in the roots is hydrolysed by *Corynebacterium* to give sugars. These are metabolised to organic acids which hydrolyse the cyanogenic glucosides in the cassava and releases HCN. When sufficient acid has been formed the second phase, characterised by Geotrichum candida growth, begins. From the sugars the mould produces the aldehydes and esters that give gari its typical flavour (Bruisma et al 1983). During dewatering some soluble cyanide and organic acid is removed with the press liquor It also contains some starch and may be used as a base for stews and soups or the starch can be recovered by allowing the liquor to settle and decanting off the liquid.

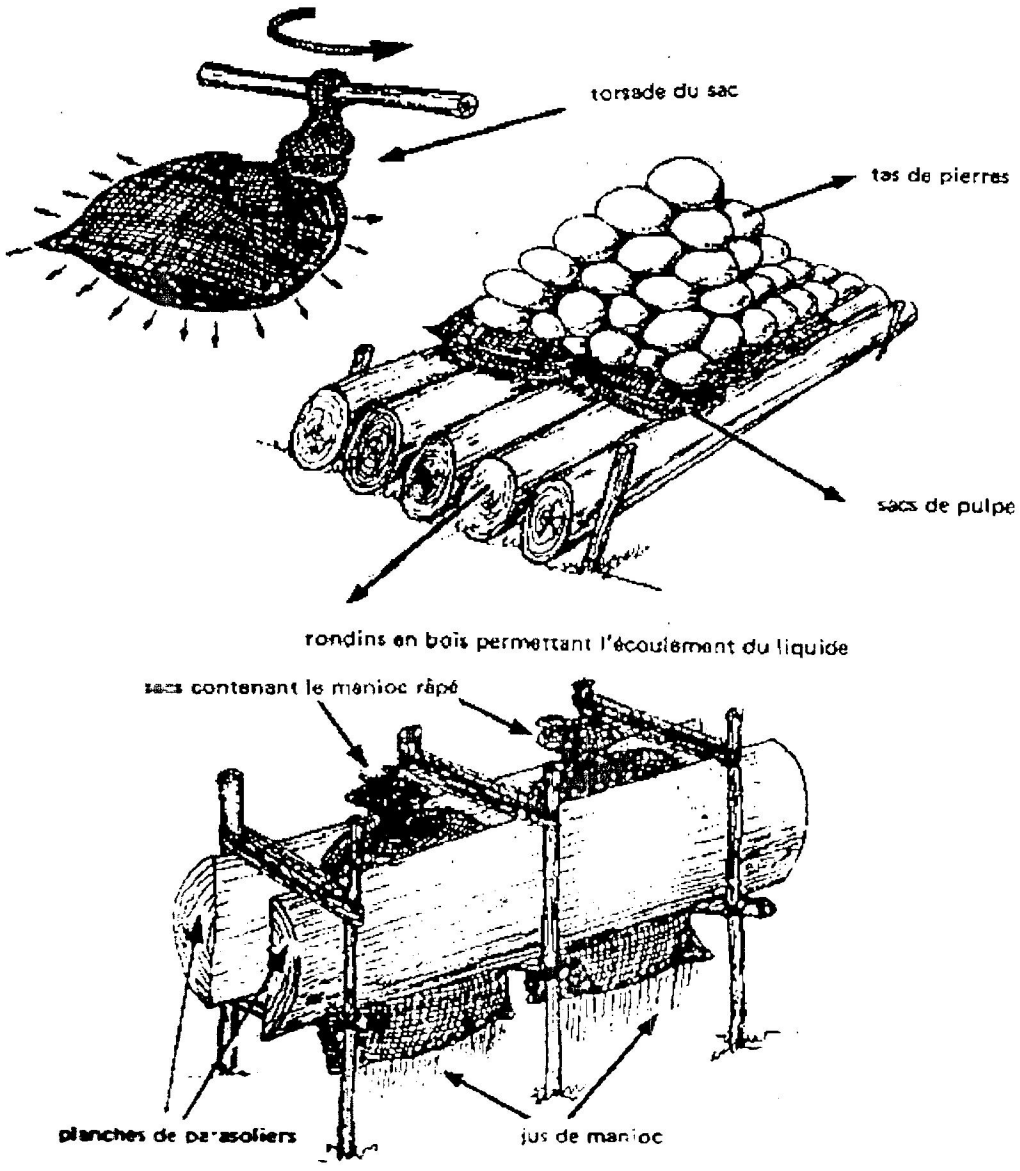


Figure 5: Traditional method of pressing and fermentation

Source :(Muchnik and Vinck 1984)

Figure 6: A cassava processor dewatering and fermenting the grated cassava.

During the fermentation period the container is put under pressure by piling heavy stones on it, by strongly twisting the neck of the sacks and pressing the bag or sack between wooden poles tightened by ropes. In the latter cases the bag or sack is re-tightened every day as the liquor flows out of the cassava mash.

Improved or small commercial methods

In larger scale operations pressing takes place after fermentation. The grated mash is left to ferment for one to four days in its container. Pressing is done using one of a number of designs of screw or hydraulic press which need access to simple workshops for their construction.

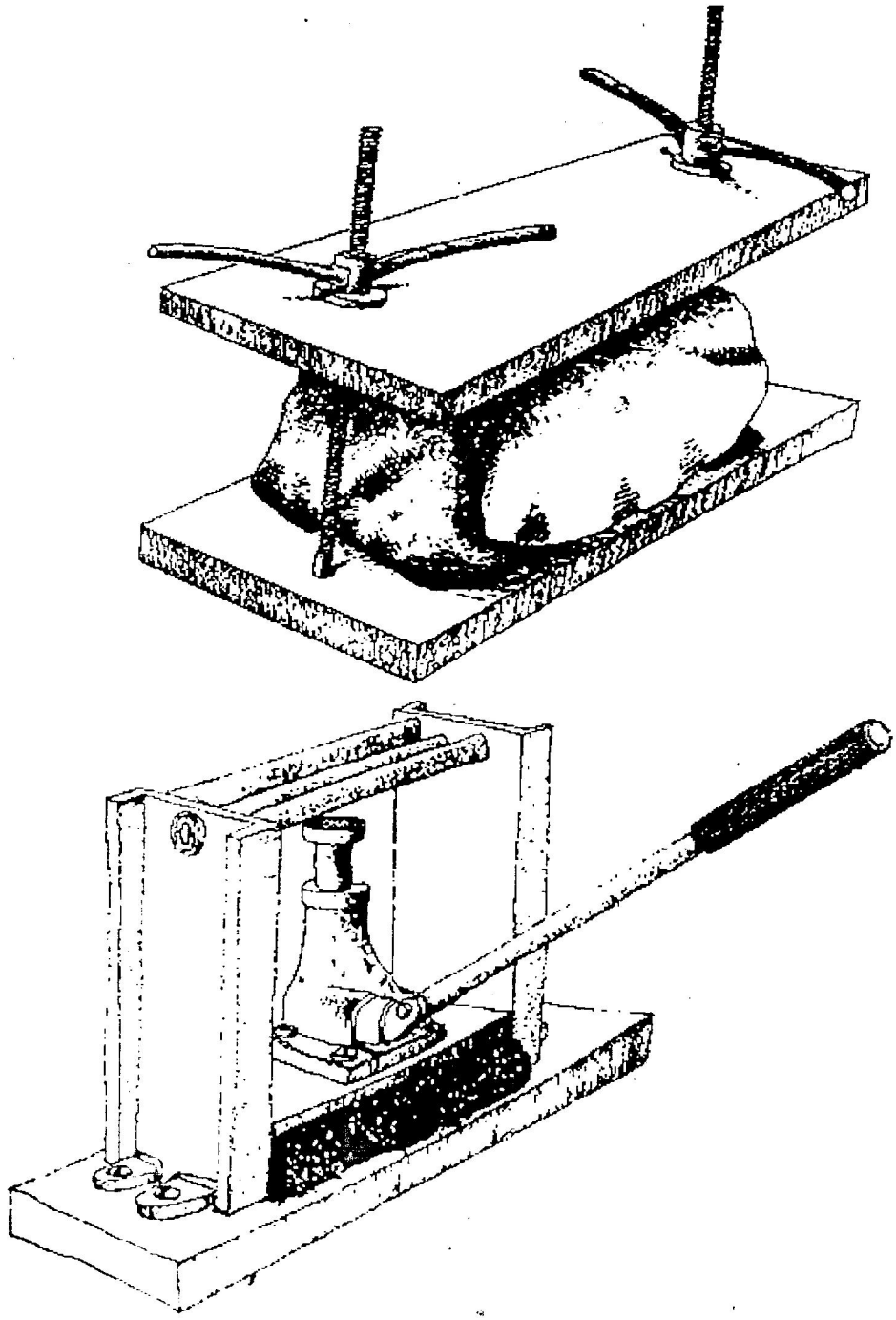


Figure 7: *Improved pressing methods*
Source: Google

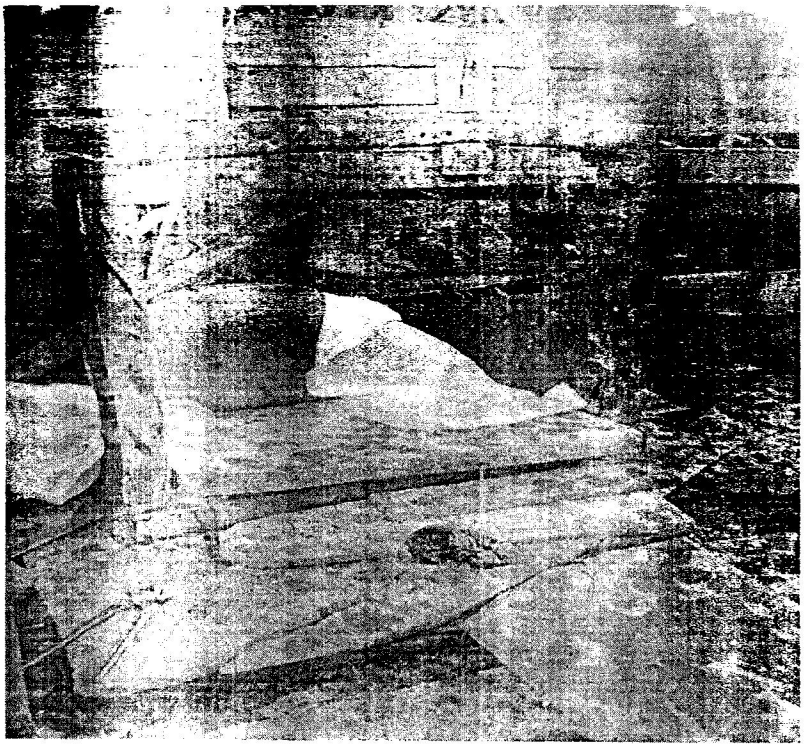


Figure 8: Hydraulic press

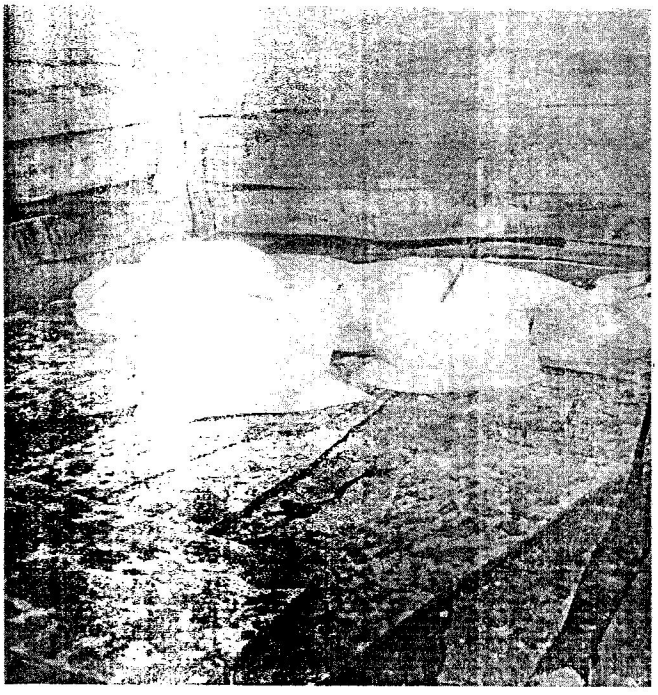


Figure 9: Dewatering of cassava

4.1.4 Sieving

After pressing the de-watered cassava mash is a solid cake which has to be pulverized and sieved to remove the large lumps and fibre (from the central vascular strands) and to obtain a homogenous product. Uniform particle size is important because it makes room for

more uniform particles during the frying operation, smaller particles taking less time and less energy in roasting.

Traditionally sieving is done manually using sieves made from palm leaves, bamboo or raffia cane. The sieving operation is not very difficult or arduous compared to some of the other gari processing operations. Perhaps for this reason there is little advanced sieving equipment at village level but mechanical sieves are included even in small commercial operations. Sieves are usually single or double screen trays which oscillate by means of an eccentric cam driven by small electric motor or powered by some means from the engine driving the plant.

Figure [illegible] sieve

4.1.5 Frying and drying

Traditional method

Garification and drying are combined in the "frying" of the gari. At village level gari is fried in shallow cast-iron pans (figure 9), or in the more traditional areas in earthenware pans, over an open wood fire (Figure 8). The sieved cassava mash is spread thinly in the pan in 2-3kg batches. A piece of calabash is often used to press the mash against the hot surface of the pan but it must be scraped quickly and stirred constantly to keep the material moving to prevent it burning until frying is completed when it reaches a temperature of. The rapid heating partially gelatinises the gari which is dried during the operation of frying. The process takes 30-35 minutes, with the moisture content of the final product reduced to about 18% (Muchnik and Vivier 1984, Bencini 1991).

Gari frying is a complex procedure which, in traditional processing, depends for its success almost entirely on the skill of the operator. Simply stirring the cassava mash over a fire could yield a product which may look like gari but will not be acceptable to consumers. Assessing the point at which the grains are completely gelatinized and the frying complete is a very subjective judgement and depends on the experience and skill of the operator. Experienced gari processors know when garification is complete simply by the appearance of the particles and by the feel of the texture whilst stirring.

A traditional fireplace consists of three large stones supporting the frying pan. This causes a great deal of discomfort to the operators due to exposure to heat and smoke from the fire and steam from the wet cassava mash. At the same time the system is very inefficient in its use of fuel, energy consumption per unit of dried gari is considered to be very high. Even enclosing the fire on three sides will improve fuel consumption and reduce the smoke blowing into the faces of the operator. The inefficiency of frying and firewood consumption are the most important issues in traditional gari production that need to be addressed most urgently.

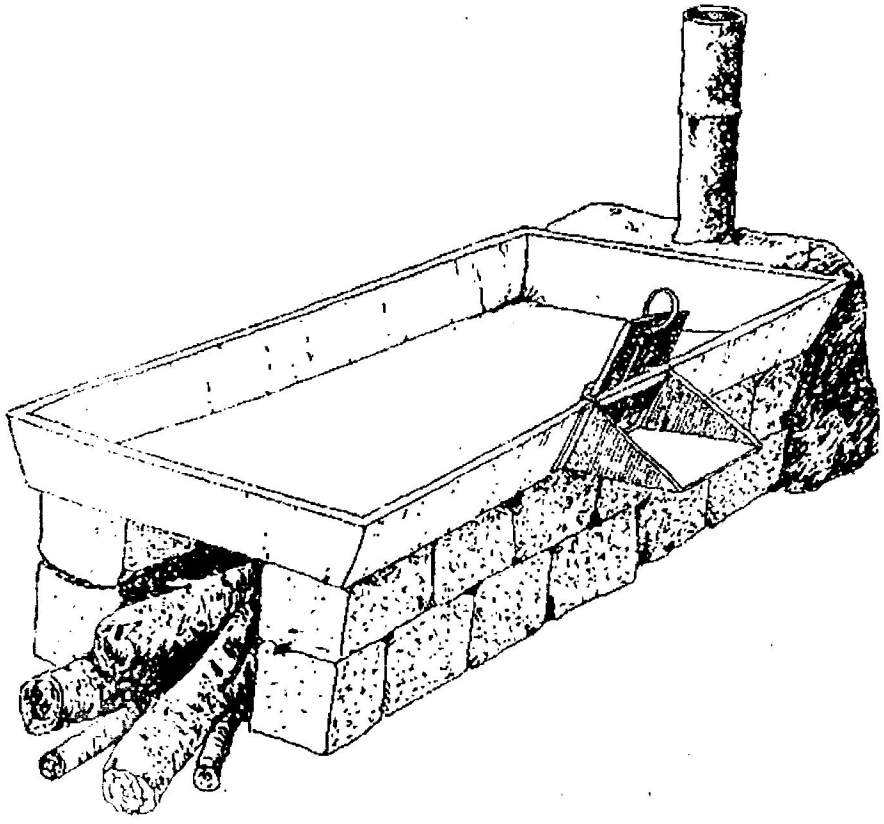


Figure 11: Village gari frying stand
Source: Google

Figure 12: A shallow cast-iron pan

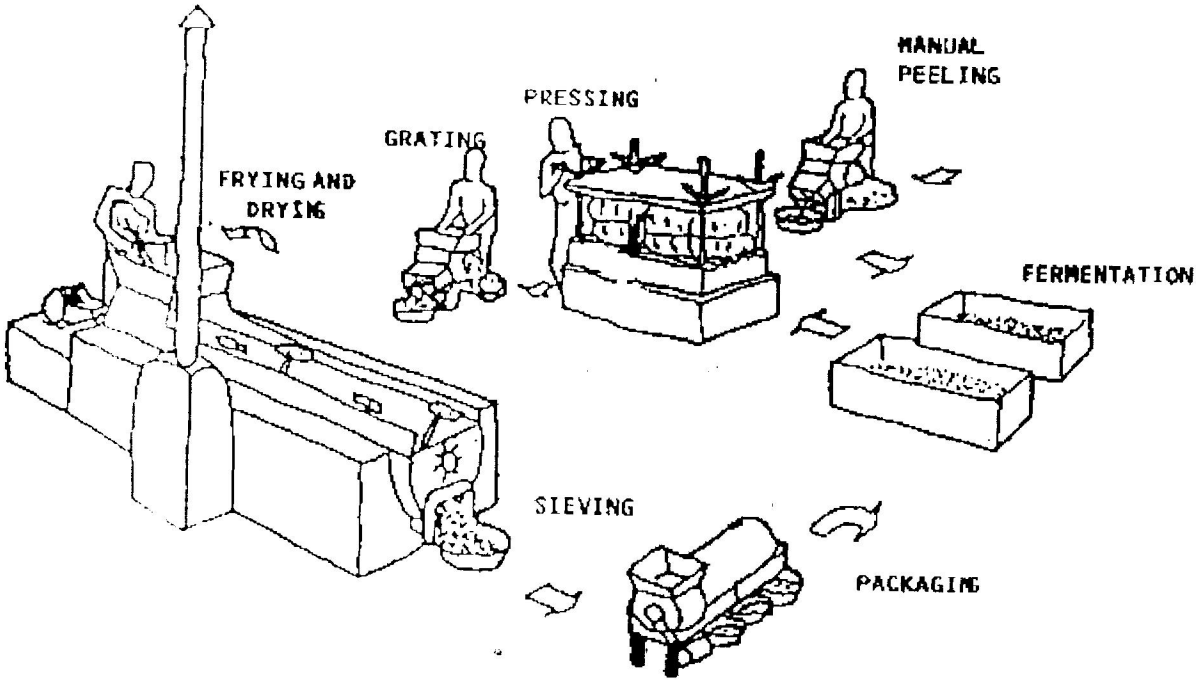


Figure 13: A mini cassava processing enterprise
Source: Google

TECHNIQUES USED TO PRODUCE LAFUN IN EKITI STATE

The fermented roots are peeled, cut into small pieces, and sun dried on mats, flat rocks, cement floors, or the roofs of houses.

The dried pieces are milled into flour.

TECHNIQUES USED TO PRODUCE FUFU IN EKITI STATE

Peel the cassava, wash the cassava and soak in water for three days for fermentation to take place. The soaking should not exceed 4 days. By this time the cassava should be soft and marshy. Pack the cassava in one sac and tie the sac. Use press, [hydraulic or screw] or load heavy stones on the cassava to press water out, so that it will dry quickly. After squeezing the water out spread the cassava on clean slab or polythene sheets. For fufu the next step is to remove the cassava from the fermentation tank, wash carefully, and put in a clean bowl. Get another big bowl half filled with water and a strong plastic filter. Start to filter the fufu into the clean bowl of water. After filtering, throw away the fibrous residue or feed it to goats. Allow the filtrate to settle and drain the water away. Cook the filtrate, pound *and cook again*

TECHNIQUES USED TO PRODUCE STARCH IN EKITI STATE

Cassava roots are peeled, washed and grated. The grated pulp is steeped for 2-3 days in a large quantity of water, stirred and filtered through a piece of cloth. The filtrate stands overnight and the supernatant is then decanted. The starch sediments are air-dried under shade.

TECHNOLOGIES USED IN CASSAVA PROCESSING

The technology mostly used by the cassava processors in Ekiti state is the Trado-Modern technology. Trado-Modern technology incorporates the traditional technology such as: Peeling, Washing, Fermentation, Frying and Packing; and the mechanical technology such as Grating and Pressing.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

In Ekiti State, cassava processing into 4 major products (garri, fufu, lafun and starch) involves the use of both traditional and mechanical methods of production in the study area. Mechanical methods were used mainly for such operations as grating and dewateringwhile the traditional method was applied in all other operations except grating and dewatering.

To be able to generate ways of improving the techniques and technologies of cassava processing, this study makes the following recommendations based on the findings of the study:

- There should be provision of good roads in order to reduce the cost of transportation of cassava and its products. Also, the problem of water should be addressed through the digging of boreholes or wells very close to the processing centre.

- Governments, non-governmental organizations and private individuals particularly our engineers need to design and fabricate low-cost processing equipments and other items that will reduce both the time spent on each operation and the labour requirements for each. It is hoped that greater attention and support for women cassava processors would improve productivity as well as raise their standard of living.

- Processors should be provided with adequate processing technology in order to improve value addition to cassava and reduce the drudgery it entails. Cassava farmers should therefore be educated on the potentials that exist in cassava processing and how they can seize the opportunities to increase their income;

- Small scale entrepreneurs should seize the opportunities offered by cassava processing as a means of income diversification; and

- Government and development agencies should organize sensitization programmes for cassava processors on the potentials that exist in the new emerging markets for cassava products

REFERENCES

Akinrele, I.A., A S. Cook, and R.A. Holgate. (1962). The manufacture of gari from Cassava in Nigeria. In Proceedings of the First International Congress on Food Technology, London. Pages 633-644.

Asinobi, C. O., B. (2010). Cassava production, processing trends and constraints in Ohaji Egbema Local Government Area of Imo State, Nigeria. Imo State University, Owerri.

Babaleye, T. (2004): "Cassava: a crop for hard times and modern times: The importance of cassava" Journal of Agriculture, Food and Environment 5(2):76 76.

Babatunde, J. (2011): "Value Addition: Key to Cassava Revolution in Nigeria". The Vanguard Newspaper. 20th September, 2011.

Cock, I.H. (1985): "New Potential for a Neglected Crop". Boulder Colorado: West view Press.

Etejer, G.O., and RB. Bhat. 1985. Traditional preparation and uses of cassava in Nigeria. Economic Botany 39: 157-164.

Ezedinma, C.; Ojiako, I.A.; Okechukwu, J.: Lemehi,A.M.; Umar, L.; Sanni,M.; Akoroda, F.; Ogbe, E.; Okoro,G.; Tamwali; Dixon, A.,(2007): "The cassava food commodity market and trade network in Nigeria". IITA, Ibadan. Nigeria.

FAO (2002): Food and Agriculture Organisation (FAO) website. www.fao.org.

FAO (2003): Food and Agriculture Organization (FAO) website. www.fao.org.

FAO (2008): Food and Agriculture Organization (FAO) website. www.fao.org.

Hahn, S.K. and J. Keyser. 1985. Cassava: a basic food of Africa. Outlook on Agriculture, 4: 95-100.

Hahn, S.K., N.M. Mahungu, J.A Otoo, M.A M. Msabaha, N.B. Lutaladio, and M.T. Dahniya. (1987). Cassava and African food crisis. Tropical root crops and the African food crisis. Proceedings, Third Triennial Symposium of the International Society for tropical Root Crops - Africa Branch, edited by E.R Terry, M. Akoroda, and O. B. Arene, 17-23 August 1986, Owerri, Nigeria. Pages 24-29

Hillocks, R. (2002): "Cassava in Africa". CABI Publishing.

Igbeka, J.C. 1987. Simulation of moisture profile in stored gari. Journal of Food and Agriculture, 1: 5-9.

IITA (International Institute of Tropical Agriculture) (2007).*Nigerian's cassava industry*, Statistical Handbook, Ibadan, Nigeria.

Ikpi, A.E., T. Gebremeskel, N.D. Hahn, H. Ezumah, and J.A. Ekpere. 1986. Cassava -a crop for household food security. A 1986 situation analysis from Oyo Local Government

Area, Nigeria. Report of IITA-UNICEF consultation on promotion of household food production and nutrition, 2-8 March 1986. United Nations Children's Fund, New York. USA. 113 pp.

Jones, W.O., and A.I. Akinrele. 1986. Improvement of cassava processing and marketing – recommendations and report to National Accelerated Food Production Program. IITA. Ibadan, Nigeria. 53 pp.

Karunwi, A and H.C Ezumah (1988). "Economics of indigenous cassava processing techniques In a Humid Forest Ecology of Nigeria" Casaava. Based cropping Systems Research 11, IITA, Ibadan pp.181-193.

Kehinde T. 2006. Utilization Potentials of Cassava in Nigeria: The Domestic and Industrial Products. Food Reviews international,22 (1): 29-42.

Kolawole, O.P. and Agbetoye, L. A.S. 2007. Engineering Research to Improve Cassava Processing Technology. International J. Food Engineering, 2007. Published by Berkeley Electronic Press,

Lancaster, P.A., and J.E. Brooks. 1983. Cassava leaves as human food. Economic Botany 37(3): 331 -348.

Mahungu, N.M., Y. Yamaguchi, A M. Almazan, and S.K. Hahn. 1987. Reduction of cyanide during processing of cassava to some traditional African foods. Journal of Food and Agriculture 1: 11 - 15.

Numfor, F.A., and P. Ay. 1987. Postharvest technologies of root and tuber crops in Cameroon: a survey. Memoires ettravaux de l'IRA, Cameroon. 54 pp.

Nwachukwu, S.U., and A W. Edwards.1987. Microorganisms associated with cassava fermentation for lafun production. Journal of Food and Agriculture 1: 39-42.

Nweke, I. C and Enete, A.A. (1999). Gender Surprises in food production, processing and marketing with emphasis on cassava in Africa. COSCA working paper No. 19. Collaborative study of cassava in Africa, IITA, Ibadan, Nigeria.

Nweke, F.I., Ngoram K., Dixon, A.G.O., Ugwu, B.O. and Ajobo, O. Cassava production and processing in Cote d'Ivoire COSCA working paper No. 23 Collaborative Study of Cassava in Africa, IITA, Ibadan, Nigeria.

Oke, O. L. 1968. Cassava as food In Nigeria. World Review of Nutrition and Dietetics 9: 227-250

Okezie, B.O., C.M. Proctor, and F. Numfor. 1988. Tropical root and tuber crops storage, processing and utilization In Cameroon-a diagnostic survey report. Tropical Roots and Tubers Research Project, USAID Contract No. 631-005. 117 pp.

Stella. O. O. (2008). Appropriate technology for cassava processing in Nigeria: User's point of view. *Journal of International Women's Studies,* 9(3).

APPENDIX

FEDERAL UNIVERSITY OYE-EKITI

DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINERING

A SURVEY OF TECHNIQUES AND TECHNOLOGIES FOR CASSAVA PROCESSING IN EKITI STATE

Dear Sir/Madam,

A SURVEY OF TECHNIQUES AND TECHNOLOGIES FOR CASSAVA PROCESSING IN EKITI STATE

I hereby humbly request for your kind cooperation in completing the following questionnaire which is designed for research purposes only. I am a final year student of the above named university. I am carrying out a research on the above subject matter. The research is being undertaken with a view to assess the techniques and technologies used for the processing of cassava and the constraints to processing and marketing of cassava products by processors in Ekiti State. The research aims at being able to generate ways of improving the processing techniques and technologies in the State so as to enhance productivity in cassava processing and overall income of the processors.

You are therefore kindly requested to answer the questions as truthfully as possible. All information that you provide will be treated with strict confidentiality. Kindly note that this is not an examination, and so there are no right or wrong answers as all answers are equally valuable in the efforts at improving the processing of cassava in Ekiti State.

Thank you so much for your kind cooperation.

Mr. Adeleke ADEGOKE
Researcher

SECTION A: PERSONAL INFORMATION

1. Type of Ownership of the cassava processing facility
   (a) Sole (b) Joint (c) Cooperative (d) Family Business (e) others (please specify .....)
2. Gender of owner (if Sole or Joint Ownership)
   (a) Male (b) Female
3. Marital status
   (a) Single (b) Married (c) Widow (d) Widower (e) Divorced
4. Level of education
   (a) Quranic Education (b) Primary education (c) Secondary education (d) Adult education (e) Tertiary education (f) No formal education
5. Processing experience
   (a) Local method (b) Modern method
6. Years of processing experience
   (a) 0-5 (b) 6-10 (c) 11-15 (d) 16-20 (e) 21-25 (f) others please specify .....

SECTION B: PROCESSING TECHNIQUES AND TECHNOLOGIES.

7. Location of the processing facility
   (a) Residential area (b) Industrial area (c) On the farm
8. Source(s) of cassava tubers
   (a) Farm harvest (b) Market purchase
9. Cassava products of the processing facility
   (a) Garri (b) Fufu (c) Lafun (d) Starch (e) Akpu (f) Tapioca (g) Akra-akpu (h) Flour (i) Pupuru (j) Others (please specify .....)
10. Processing space
    (a) Less than 1 plot (b) 1-2 plots (c) 3-5 plots (d) 6-8 plots (e) More than 8 plots (f) Others (please specify .....)
11. How do you dispose your cassava peels?
    (a) Dump on earth fills (b) Use asanimal feed (c) Others (please specify .....)
12. How do you dispose your waste water?
    (a) Directly into municipal drains (b) Poured into a soak away pit (c) Poured directly on the earth surface (d) Others (please specify .....)
13. How do you transport your cassava peels?
    (a) Truck (b) Hand (c) Pan (d) Others (please specify.....)
14. Method of Transportation of cassava for processing
    (a) Truck (b) Pan (c) Hand (d) Others please specify.....
15. What quantity of cassava do you process in a day?
    (a) Less than 100 tubers (b) 101-500 tubers (c) 501-1000 tubers (d) 1001-2000 tubers (e) Above 2000 tubers
16. What source of water do you use for the processing?
    (a) Well (b) Reservoir (c) Borehole (d) Stream (d) Others (please specify.....)
17. Storage capacity of fresh cassava
    (a) 0-5 tons (b) 6-10 tons (c) 11-15 tons (d) 16-20 tons (e) Others (please specify.....)
18. Storage capacity of processed cassava

(a) 0-5 tons (b) 6-10 tons (c) 11-15 tons (d) 16-20 tons (e) others please specify .....)

19. Please describe the processing techniques you use for the following cassava products
    (a) Garri -
    (b) Fufu -
    (c) Lafun -
    (d) Starch -
    (e) Akpu -
    (f) Tapioca -
    (g) Akra-akpu -
    (h) Flour -
    (i) Pupuru -
    (j) Others *(please specify.....)*
20. What processing technology do you use?
    a) Traditional
    b) Trado-modern
    c) Modern
21. What operations do you carry out with the Traditional technology?

22. What operations do you carry out withthe Modern technology?

23. Please specify the duration taken to process cassava into the following products
    a) Garri -
    b) Fufu -
    c) Lafun -
    d) Starch -
    e) Akpu -
    f) Tapioca -
    g) Akra-akpu -
    h) Flour -
    i) Pupuru -
    j) Others (please specify.....)
24. Number of workers used in the processing of cassava
    (a) 0-15 (b) 16-30 (c) 31-45 (d) 46-60 (e) more than 60 please specify.....
25. Marketing channel
    (a) Wholesale (b) Retail

SECTION 3: PROBLEMS ASSOCIATED WITH CASSAVA PROCESSING

Kindly indicate the extent to which you agree (or disagree) with the following statements

S No	Problems of cassava processing	Strongly disagree	Disagree	Agree	Strongly agree
26	There are problems of sun-drying during the rainy season				
27	Seasonal fluctuation in prices do occur				
28	Cost of transporting inputs are high				
29	Cassava is highly perishable				
30	There are problems of labour scarcity				
31	Transportation cost of cassava is high				
32	The roads are poor for transportation				
33	There are problems of water supply				
34	There are problems of electricity supply in powering the machines				
35	Long period of fermentation during wet season is a problem in processing				
36	Poor access to information that can improve cassava processing				
37	Problems of inadequate capital				