

**DELTA STATE GOVERNMENT**

**OFFICE OF THE CHIEF JOB CREATION OFFICER,**

**GOVERNOR'S OFFICE.**

**YOUTH AGRICULTURAL ENTREPRENEURS PROGRAMME**

**(YAGEP)**

**TRAINING MANUAL**

**ON**

**CASSAVA PRODUCTION AND VALUE ADDITION**

**BY**

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## **OUTLINE OF TOPICS**

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- 3. UTILIZATION**

## CASSAVA PRODUCTION AND VALUE ADDITION

### INTRODUCTION



Cassava (*Manihot Esculenta Crantz*), also called Manioc, yupa, tapioca root etc. is a woody shrub of the family *Euphorbiaceous* (spungei) which is native to North East Brazil in South America. It is extensively cultivated as an annual crop in tropical and subtropical regions for the edible starchy tuberous root, a major source of carbohydrate, cassava when dried to powdery (or pearly) extract is called tapioca, its fermented, flaky version is named Garri,

It is variously known in different places as tapioca, Ege (Yoruba) Imidaka (Urhobo), Imanaka (Ukwani), Embada (Ijaw), Rogo (Hausa) and Akpu (Igbo).

Cassava is the largest source of food carbohydrate in the tropics, before rice and maize. Cassava is a major staple food in developing world, providing a basic diet for over half a billion people.

However, the risk in cyanide intoxication in the crop is negligible. Cassava does not contain HCN at all. But cyanogenic glucosides which upon an enzymatic breakdown catalyzed by linanarase release HCN (Bokanga 1992). This is therefore eliminated when cassava is well processed.

Since its cassava introduction into the country, cassava as food crop and an industrial raw material has been in forefront of agro industrial sector of Nigeria economy though the cassava usage as industrial raw material is more of a recent development. This cassava economic phenomenon is not only limited in Nigeria.

There is every indication that the world production of cassava root was estimated to be 184 million tons in 2002 rising to 230 million tons in 2008. The majority of this production in 2002 was in Africa where 99.1 million tones are grown; 51.5 million tons were grown in Asia and 33.2 million tones in Latin America and Caribbean. Nigeria is known to be world's largest producer of cassava. However, based on the statistics from the FAO of the United Nations Thailand is the

largest exporting country of dried cassava with a total of 771 million tons of world export in 2005.

Cassava is one of the most drought tolerant crops, capable of growing on marginal soils.

Nigeria is the world's largest producer of Cassava while Thailand is the largest exporter. From Historical records, cassava stems first got to Nigeria via Bony/Koko ports in Warri Province in 1667 through the Portuguese explorers.

With the setting up of **cassava bread development fund** to increase our utilization of cassava in bread and confectioneries products, it is necessary for the job creation committee through the YAGEPRENUER trainees across Delta State to also set up cassava stems multiplication projects to meet the upsurge for demand of improved cassava stems varieties for the benefits of Deltans. To meet the increasing demand for improved planting materials to increase productivity.

Therefore, this workshop would be a catalyst to awaken in each participant the potential available in cultivation, processing and utilization of cassava.

Cassava and its food- Products as of today is one of the major staple food in Nigerian homes, there has been strong competition between using cassava as food items and using as an industrial raw material. Fortunately, this has promoted a wider cultivation / utilization of this crop.

Cassava is considered to be the most important root crop in tropical Africa with starchy, thickened and tuberous roots providing over 50% of the calories intake for more than 200 million people (**IITA, 1992**). A survey of Delta State of Nigeria indicates the majority of rural population is engaged in agricultural industries of which tuber especially cassava form the major staple food (Ijere, 1977).

It is therefore, very appropriate at this point to have a practical and intellectual discussion. To promote the socio-economic benefits of developing cassava in Nigeria and its potentials for the purpose of exposing cultivators, processors, marketers, consumers and the general public to its diverse and beneficial usage, and it will help to reduce unemployed in the Delta State.

In recent times High Quality Cassava Flour (**HQCF**) has been developed and some factories have already commenced production in Nigeria at commercial quantity.

Research have shown that High Quality Cassava Flour (**HQCF**). By Private investments in the Nigeria cassava sector stimulated by Presidential initiative on cassava in 2007 raised High Quality Cassava Flour (**HQCF**) production to an estimated 40,000 tones but unfortunately there was no ready market for the **High Quality Cassava Flour (HQCF)**.

This had a negative effect on cassava production and processing, this should be noted by this new initiative of Federal Government Cassava Bread Development programme of 40% replacement of wheat flour with the inclusion of High Quality cassava flour (**HQCF**) in bread and up to 100% in other confectioneries products which are initially produced from wheat flour for success, more so as the Federal Government wants to reduce import independence of wheat, conserve scarce foreign exchange, and create more jobs for our farmers.

Other benefits that will arise for good management are: -

- It has also been established through research that High Quality Flour (**HQCF**) can be substituted or adapted in bakery paper board and ply wood.
- Cassava leaves are good vegetables for soup being rich in proteins.
- Cassava starch is used in the food industry to produce Confectioneries-Noodles, ice-cream, wafers and various bakery products including composite bread: as animal feed, cassava roots are fed directly to pigs. Meals from cassava also proved to be a good substitute up to 60% for maize in some poultry rations. Cassava meal may be fed directly to layers if the diet is well balanced in other nutrients
- Industrial uses of cassava include the production of starch (important in the textile and newsprint industries), glues, adhesives, alcohol, methane, glucose syrup, dextrose, acetone and butanol. The potentials of cassava starch in the brewing industry are enormous (IITA, 1993 and 1994).

In Delta state bakeries are already using 20% High quality cassava flour (**HQCF**) in addition to 80% wheat flour in bread production.

To attest to this, Research intelligence magazine Vol2 N.5 Sept/ Oct 2012 edition, did a special feature on the use of High Quality cassava flour (**HQCF**) in the production of bread. The magazine crew visited Iveno bakeries, Oleh where cassava bread is presently produced and Gon Chucks Agro products limited Mbiri, high quality cassava flour producing factory

30 Bakers are trained so far in Delta State, there is need to organize stepping up of their training be constituted as core trainer to train new ones, as this type of training the trainees workshop.

## **PROBLEM STATEMENT**

Nigeria spends over N635 billion wheat flour importation for bread and other confectioneries. This has consistently depleted our foreign reserves and created job for other farmers in foreign countries.

The traditional uses of cassava in Garri and other traditional food recipes have not been sufficient enough to improve pricing and increase cassava cultivation. Hence the need for diversification in utilization of cassava. It has been found that some countries have used other alternative sources of flour for bread production. There, is also an increasing pricing for wheat flour, which pushed bread prices out of the reach of the common man.

There is also youth disinterest in cassava cultivation due to low pricing of cassava tuber; hence cultivation is left in the hands of the aging and peasant farming population. Whose capacity for large scale cultivation is limited.

High quality cassava flour (HQCF) in bread is timely diversification that possesses solution to increasing and stabilizing cassava prices and hence increases cassava productivity/ utilization.

It is very appropriate at this point in time when the naira is now three hundred and fifty (N350) Naira to one dollar (\$1) to work inward to develop our cassava processing techniques to develop finished products that would meet up with international standards and generate foreign exchange, in turn create more jobs for the large army of unemployment youths. This will go a long way to stimulate further cultivation of cassava and also to enhance its contribution to the growth of the National Economy.

We believe this initiative by the job creation committee for **YAGRENEURS** will launch Delta State into this International Market and it is a welcome Development to carry out this workshop in Delta Central the Home of cassava since 1667 when it first got to Nigeria via Bonny/Koko Ports in Warri Province through the Portuguese explorer.

The essence of this training and the target audience of Youths, from research they are in the fore front of cassava production, processing and utilization. But are limited to few products with poor packaging which has reduced the benefit that is supposed to accrue from the labour they put into this activity.

While Nigeria is the largest producer of cassava in the world, Thailand is the largest exporter because they have harnessed their cassava processing techniques.

In the International Market chips and pellets is the most acceptable mode of trading in cassava products which our local cassava processors are not conversant with.

With the support of the Job Creation Committee to help set up model centre's and install modern Equipment like **peeling machine, chipping machines, pelletizing machine Hamer mills and sieving machine** to enable our small scale cassava processors benefit from this large international market. Currently cassava chips are selling for four hundred Dollar (\$400) at an exchange rate of two hundred and fifty Naira to one dollar would amount to one hundred thousand Naira (100,000) per ton of cassava chips.

## CASSAVA PRODUCTION

### **Site selection**

Choose an accessible well-drained fertile soil.

### **Varieties**

The following varieties are recommended for their high yield and processing quality: TMS 30572, NR 8082, NR8083, TMS 4(2) 1425, TMS 81/00110, TMS 92/0326. An additional 10 varieties are in the process of being released.

### **Weed control and land preparation**

A total herbicide – Round up (a glyphosate) should be applied at the rate of 4–5 l/ha 10 days before land preparation.

For cost effectiveness and optimum plant population, mechanization and planting on ridges are recommended.

### **Liming**

It is recommended that 5 (50 kg) bags of agricultural lime be applied /ha during land preparation.

### **Planting and planting material**

1. Planting starts in April and can be extended to October.
2. The quantity recommended for 1 ha is 60 bundles of cassava stem.
3. Stem cuttings 25 cm long should be planted at a spacing of 1 m x 1 m.
4. Maintain 100% planting rate by replacing dead or nonviable stems.

### **Post-planting weed control**

Where a total herbicide was not used before land preparation, it is recommended that a selective pre-emergence herbicide be applied within three days after planting. Five litres of Primextra is recommended /ha.

### **Fertilizer use, type and rate**

The following fertilizers and their rate/ha are recommended

- NPK 15:15:15–12 (50 kg) bags

- NPK 20:10:10–9 (50 kg) bags
- NPK 12:12:17–15 (50 kg) bags

Apply fertilizer at 8 weeks after planting. Apply fertilizer in a ring, 6 cm wide and 10 cm from the plant or broadcast with care around the plant, making sure the fertilizer does not touch the stem or leaves.

## **Yield**

Yield of 25 t/ha and above can be obtained with good agronomic practices and management.

## **Note**

To reduce cost of production and attain high yields, it is recommended that land preparation be fully mechanized. A power tiller can be used if the total land area under cultivation is not more than 250ha

Production cost for one hectare of cassava to ensure yield of 25 t/ha and above.

1	Land preparation	1000
2	Cassava cuttings (60 bundles)	
3	Planting (8 pd*)	2000
4	Pre-emergence herbicides (5 liters)	
5	Fertilizer (20:10:10, 9 bags at N7000/bag)	
6	Insecticides (2 liters at N1500/l)	
7	Application of herbicide 3Pd at N1000 Pd	
8	Application of insecticide	
9	Application of fertilizer (8 pd at N1000/pd)	
10	One weeding (20 pd at N1000 /pd)	
11	Harvesting (35 pd at N1000 /pd)	
	Total	

\* pd = person days. Farm labor wage rates vary by location

Note: Fixed capital investments are not included. Such capital investments include knapsack or boom sprayers, tractors or power tillers, stem cutters, planters, and harvesters. With planters and harvesters, manual labor use can be minimized.

## **FROM LAND PREPARATION TO HARVEST**

### **VARIETIES:**

The following varieties are recommended for their high yield and processing qualities **TMS 1425 (2)**

**TMS 81/00110, TMS 92/0326, TME 419, TMS 30572, NR 8082, NR 8083**

Mature stems with hard wood, the soft portion of the stems should not be used because it is prone to rot

### **SITE SELECTION:**

The land that is most suitable for cassava production is a well drain and fertile land although can cassava can be cultivated in marginal soil and can be boosted supported with fertilizer.

### **WEED CONTROL:**

One of the main reason for low yield in cassava production is the problem of weed, it reduces the quantity of yield by 40% to avoid this problem;

Before land preparation is done a total herbicide –Round up (a glyphosate) should be used to spray the site, 5 litres would be required to spray one (1) hectare, the land should be left for ten (10) days before land preparation is done.

### **TIME OF PLANTING:**

Planting should be done during April /May when the soil is moist and planting can extend to October.

### **LIMING:**

Due to continue use of land, the nutrients in the soil is lost, with the application of hydrated lime the soil nutrient is restored.

### **TRACTORIZATION:**

After ten (10) days when the weeds have died the land should be tractorized to loosen the soil and make the land ready for cultivation.

### **QUANTITY OF STEMS PER HECTARE:**

Sixty (60) Bundles of 50 cuttings per bundle is required to cultivate one (1) hectare of land a 1M X 0.8m with a plant population of twelve thousand five hundred (12,500) per hectare. Dead stems should be replaced to maintain the required plant population.

### **TREATMENT OF STEMS:**

Cassava stems should be treated with seed dressers Apron plus by adding it to water putting the cassava cuttings in a basin with water and left for a while and removed to drip dry under a shaded area before it is planted to the field.

### **SIZE OF CUTTINGS:**

The stems should be cut at four to five nodes, sharp cutlass should be used to avoid damaging the stems.

### **POST PLANTING:**

In case where a total herbicide is not used before the land preparation, it is recommended that selective pre-emergency herbicide is applied within three (3) days after planting. 5litres of premextra is recommended per hectare.

### **FERTILIZER APPLICATION:**

**FIRST APPLICATION:** eight (8) weeks after planting of the farm the first dose of fertilizer is to be applied at 20g per stand this would amount to 4.5 bags of NPK 20:10:10 or 15:15:15 (50kg bag)

### **HERBICIDE/ INSECTICIDES:**

5 litres of herbicides and 2 litres of insecticides would be applied to one hectare of planted cassava farm.

**SECOND APPLICATION OF FERTILIZER:** Eight weeks after the first application a second dose of fertilizer is to be applied to the cassava farm at 20g per stand would amount to 4bags (50kg) to four and half bags (4-4.5bags).

## **WEEDING:**

There would be one hand weeding to be done before the maturity of the cassava is ready for harvesting.

## **HARVESTING:**

The cassava tubers would be matured for harvesting between (10-12) months.

## **CASSAVA UTILIZATION**

### **FOOD**

Gari  
Fufu  
High Quality Cassava Flour  
Tapioca  
Lafun  
Kpokpogari  
Glucose Syrup  
Glue  
Composite Bread  
Ethanol



### **LIVESTOCK**

Cassava in the livestock feed industry  
Cassava products for animal feeding

### **PROCESSING CENTER**

Location, layout and design of cassava processing center  
Integrated Cassava Resource Center Layout (pdf.136kb)

### **Starch**

Cassava starch in paper, textile and adhesives industries  
Cassava starch utilization in food industries  
Cassava starch production

## **HIGH QUALITY CASSAVA FLOUR**

With the cassava bread development find small scale cassava flour processors would carry the message of cassava flour utilization to all the nooks and cranny of Delta State thereby increasing the income of small holding farmers, improve the quality of Akpu from the wet State which make its shelf life short, producing odourless powder fufu would encourage more people to add it to their daily food intake. Thereby having more products in the market and exporting to neighboring Economic Community of West African State, (ECOWAS) Africa Union (AU) Across the African Continent and beyond to European Union (EU) America, Asia and Australia Continents.

Cassava as food and industrial raw material has been in the forefront of agro – Industrial Sector of Nigeria's Economy we appeal to Governor Dr. Ifeanyi Okowa to build on the cassava transformation platform to include small scale cassava processors as it is done in china to utilize the Enormous cassava that is produced in Delta State as the largest cassava producing State in Nigeria. Delta would position itself on the top of the world as not only the leading but also as the largest exporters of cassava based products from Nigeria to the world market.

### **ATTACHED IS THE REQUIRED EQUIPMENT**

Peeling Machine → milling Machine →Cassava Sieves → Cassava Dryer → Hammer Mill

### **CASSAVA FLOUR PROCESSING**

Cassava Roots → Peeling → Washing → Mill → Sieving → Drying → Flour.

### **CASSAVA STARCH**

Cassava starch is an important industrial raw material which is used in the manufacture of a number of products, including food adhesives, thickening agents and pharmaceuticals. There is a high demand for starch in industry, and cassava

starch has been used to fill some of this demand. Tubers arriving at the production plants entire peels are removed and washed.

### **PRODUCTION FLOW CHART**

Fresh tuber → Peel → Wash → Grate → Wash out Starch → Settle  
Scrape; Resettle → De-water → Sun-dry → Pulverize → Bag → Store .

### **EQUIPMENT REQUIRED**

Peeling Machine Milling Machine Sedimentation Tank Dryer Pulverizing Machine.

### **GARRI (TOasted GRANULE)**

Garri is the most continent food form of all the cassava products. It has higher market opportunities because of the ease of conversion into food or eaten directly. Hence, the most appealing, especially to the working – class urban and rural consumers. The markets for garri potentially have a significant market among the medium – high income groups. Garri can also be fortified with fish.

An efficient marketing system therefore will play a dynamic role in stimulating production and consumption of cassava products by satisfying existing demands and guiding producers to new production opportunities and encouraging innovation in response to market demand and prices. The availability of good market intermediaries in the marketing processing will provide and incentive for growth in cassava production.

### **CASSAVA CHIPS AND PELLETS**

Cassava Chips and Pellets are produced of chips, the fresh tubers are washed, peeled, and cut into 3-6cm long. The slices are then dried, and bagged. Pellets are produced from chips after chips have been dried they are ground and hardened into cylindrical pellets about 2cm long up to 1cm in diameter. It is in form of chips and pellets that most of the cassava used for livestock fed in the temperate countries is imported. Of late, pellets have become more popular than chips because they are denser and easier to handle. Thailand is one of the major suppliers of cassava pellets to the world.

## **MACHINE USED IN PROCESSING CHIPS**

Peeling Machine → Chipping Machine → Dryer

## **CASSAVA CHIPS PROCESSING**

Cassava Roots → Wash → Peel → Chip → Dry.

## **MACHINE USED IN PROCESSING PELLETS**

Peeling Machine → Milling Machine → Pellet Machine.

### **CONCLUSION:**

The present day farmers are living in the context of globalization and liberalization of world markets. This means that African food products such as cassava products have to compete with European food products which heavily subsidized and promoted even in our own domestic markets. Thus, there is a need for us to have firm control over our own production, in terms of quality and quantity, by improving our post-harvest techniques. One of the African Scientist said and quotes: “The engine behind Africa’s economic potential is food processing sector, and it is of fundamental importance to strengthen it, give it breathing space and accord it its proper strategic role”

Therefore, with these opportunities extended to YAGEPreneurs by the Job Creation Committee, this would launch Delta State as not only the leading cassava State but also as a leading cassava finished products producer thereby developing our cassava production and creating jobs for the large army of unemployed youths in line with the dream of His Excellency Dr Ifeanyi Arthur Okowa Executive Governor of Delta State.

