



*National Root Crops Research Institute, Umudike (NRCRI). www.nrcri.gov.ng
Foundation for Partnership Initiatives in the Niger Delta, PIND www.pindfoundation.org*



**IMPROVED AGRONOMIC PRACTICES
FOR SUSTAINABLE HIGH YIELD
OF CASSAVA IN NIGERIA**





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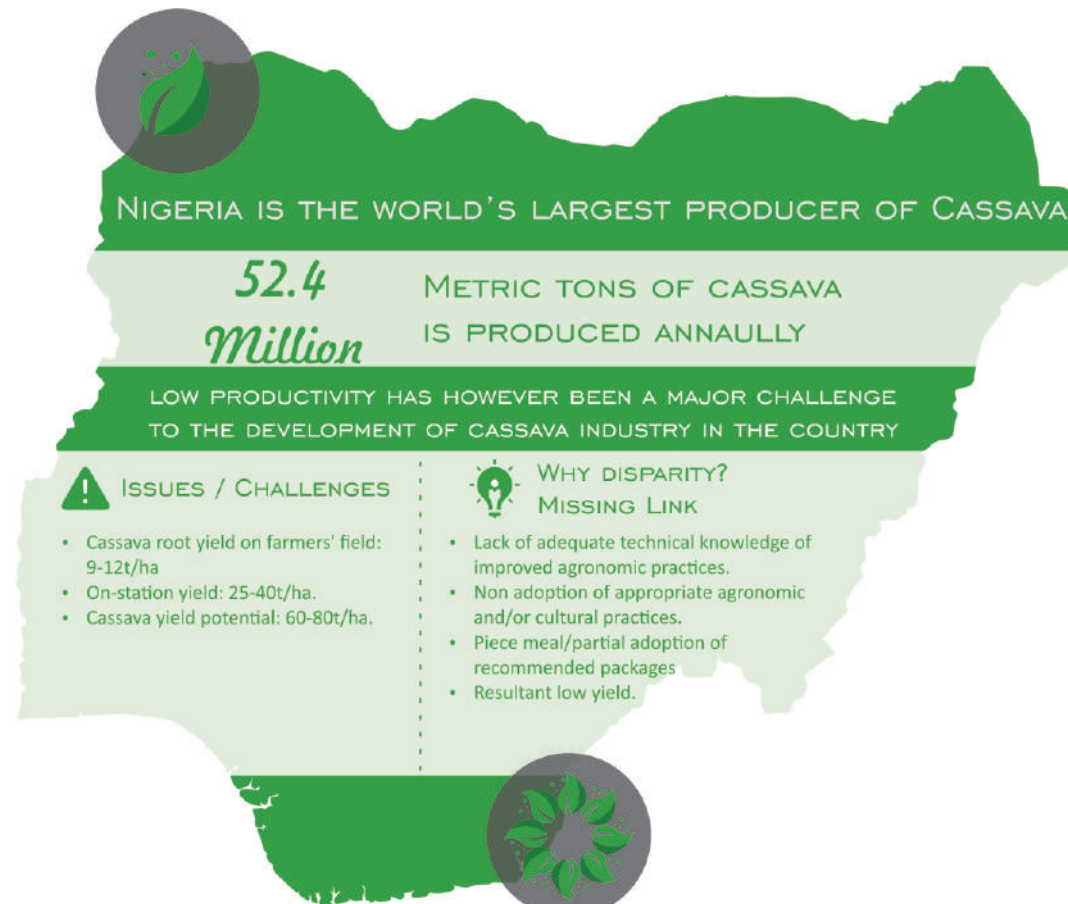
1. INTRODUCTION



1. INTRODUCTION

Cassava, (*Manihot esculenta* Crantz), is a staple for most Nigerians, supplying about 70% of the total calorie intake of over 60 million people in the country. Globally, it provides calories for nearly 600 million people in developing countries. It is a hardy crop, and easily adaptable to different ecological zones of Nigeria. Apart from its use as a major source of carbohydrate, it has diverse uses in the pharmaceutical, confectionery and livestock industries. Thus it gradually gaining importance as an industrial crop.

1.1 CASSAVA PRODUCTION IN NIGERIA



2. LAND PREPARATION



2.1. Land/Site Selection

- Select fertile land on a flat terrain or gentle slope.
- Steep slopes should be avoided as they could be erosion-prone.
- Select deep, well drained, loamy sand soil.
- Avoid waterlogged soils (otherwise prepare ridge or mounds).
- Avoid stony soil as it affects storage root

Note

Presence of certain plant species or earthworm casts, are indicators of fertile soils.

■ Good soil (loamy sand) can be moulded into a ball that breaks under slight pressure).

■ Cassava grows poorly in clayey and stony soils

2.2. Land Clearing

- Clear the land with minimum damage to the top soil
- Practice minimum tillage in sandy soil to conserve soil, organic matter, moisture, and reduce soil erosion.
- Care should be taken to avoid damage to the top soil by using heavy machinery. Such damage paves way to rapid land degradation and subsequent poor yields of cassava produce.
- Avoid slash and burn to conserve the organic

matter of the soil (OM is the power house)

- Economic trees (oil palm, teak, mahogany etc) can be left but pruned to avoid shading cassava.

2.3. Seed Bed Preparation

- Cassava can be planted on flat, ridges or mounds depending on soil type.
- On deep, well drained loamy sand – Plough and harrow (for good weed control, soil contact with stem cuttings and storage root formation)
- Make mounds or ridges in water logged soil condition.
- For mechanized farming: Plough, harrow and ridge with depth of 20-30cm

Note: Poor land preparation results in poor plant establishment and increased weed competition.



3. PLANTING



3.1. Selection of Planting Materials

Careful selection of cassava variety is an important step leading to high yield and increase in quality of produce.

Good varieties must:

- Grow fast (vigorous growth) under different climatic conditions & ecological zones
- Give good yields
- Tolerate major diseases and pests
- Mature early
- Give high root yields (fresh and dry)
- Has high starch & crude protein content to meet end-users quality characteristics
- Store well in ground for more than 18 months
- Start with the right variety, for the right output, and for the right income.



Note: You need to select the variety with the highest performance in your farm site and environs.

3.2. Sources of Planting Materials

- National Root Crops Research Institute (NRCRI), Umudike or its sub-stations at Igbariam, Otobi, Kuru, Nyanya, Maro and Ireshi
- International Institute of Tropical Agriculture (IITA), Ibadan.
- State Agricultural Development Programs (ADP)
- National Seed Service
- Cassava Stem producers/Outgrowers
- Cassava Growers Association

Cassava varieties: NR 8082, TMS 98/0505, TMS 98/0581, TME 419, NR87184, TMS 98/0510, TMS 30572, NR 8212, TMS 4(2)1425, UMUCASS 36, UMUCASS 37 and UMUCASS38

3.3. Stem Selection and Management.

- Select mature woody/semiwoody stems from healthy plants that are 6-18 months old.
- Do not use green portions. Middle portions of the stem establish better than the tips and basal portions
- Stems should be disease free without evidence of cankers/wounds or any disease symptoms on stems and leaves.



- Select thick stems for better storage and sprouting.
- Stems to be planted at a later date should be stored standing under shade.

- One hectare of farm needs 55-60 bundles of cassava stem each containing 50 stems of 1m length
- Cut stems into stakes of 20-25cm length with sharp cutlass/machete, secateurs, chain/hack saw.
- Stakes should have at least 5-7 nodes.
- Avoid cuttings being bruised by cutting with blunt objects.
- Treat with fungicide/insecticide (Champion, Benlate, Diazinon, Perfection and nutrex)
- Treat with termiticide before planting in fields predisposed to termite attack



Note:
Poor preparation and handling of stem cuttings could result in poor sprouting, rooting, and low yield.

Table 1: Fungicide/insecticide types, rates and time of application

FUNGICIDE/INSECTICIDE	RATE	TIME OF APPLICATION
Tecto 60	10-20g/20-30 litres of water	Morning/Evening
Neem leaf powder	1kg/5 litres of water	Morning/Evening
Basudin	40ml/20-30 litres of water	Morning/Evening

Source: Eke-Okoro, Ekwe and Nwosu, 2005

3.4. Cassava Planting and Planting Method/Position

- Select correct planting time: April-May for early planting and August for late planting in the rainforest, May-June in the Savanah
- Plant cassava at a time when there is adequate moisture in the soil. Let your timing be such that the field receives at least 60 days of rainfall before the dry season begins. This ensures good sprouting and crop establishment.

Note: *Planting date recommendations should fit within local farming calendars.*

- Plant stakes at slanting position of 45 degrees, burying 2/3 of the length into the soil with the bud facing upwards.
- Planting position depends on soil types: vertical, horizontal or slanting position.
- Use horizontal planting method for multiple stem production. In this case, the stakes are completely buried in the soil to a depth of 5cm.
- Use vertical planting method in porous, loose or sandy soils and environments prone to lodging. This makes deeper rooting of the stakes possible.
- Plant in rows or lines for ease of other operations.

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4. WEED MANAGEMENT



Weeds compete with cassava for space, light, and water and can reduce cassava yields by about 40%. Therefore, keep the farm weed-free by either manual weeding or application of herbicides. Cultural method can also be used.

4.1. Manual Weeding:

This is done using machetes, cutlasses, hoes, and any other tool adapted to clear the weed. Weeding should be done three times, specifically at the 4, 8 and 12 weeks after planting where pre-emergence herbicide is not used.

4.2. Use of Herbicides:

Herbicides may be applied pre or post-emergence of crops.

- a. Apply pre-emergence herbicides immediately after planting or 1-2 days after planting. Spray the herbicides either in the morning or evening only. Some pre-emergence herbicides and recommended rates are:
 - i. Primextra at 5 litres/ha or 350-375ml/15 litres knapsack sprayer
 - ii. Cotoran 5000fw at 5litres/ha or 350-370ml/15litres knapsack sprayer
 - iii. Fusilade at 4 litres/ha
- b. Apply post-emergence herbicides at 4-8 months after planting.

Spray herbicides in the morning or evening only. Some post-emergence herbicides and rates of application are:

- i. Glyphosate at 3 litres/ha or 225ml/15 litres knapsack sprayer
- ii. Paraquat at 2 litres/ha or 150ml/15 litres knapsack sprayer. Shield should be used to keep chemical off the crop

Glyphosate and Paraquat may be used as a pre-planting herbicide to kill fallow vegetation.

4.3. Cultural Method of Weed Control

Cultural method of weed control entails adopting practices that minimize weed growth in a cassava field. This includes planting before weed emergence, use of low growing cover crops like egusi, cowpea, sweet potato; mulching of young cassava fields and use of low branching varieties with early canopy closure to suppress weeds.



5. FERTILIZER APPLICATION



Cassava grows well in less fertile soils compared to other crops. It, however, responds well to the application of inorganic fertilizers and farm yard manures. The optimal rates of fertilizer to apply depend on the inherent soil fertility. Generally, blanket application of 400kg/ha of 15:15:15 NPK can be done where soil analysis has not been done to determine specific nutrient requirements

5.1. Fertilizer Types and Application Method

- Fertilizer types: NPK 15:15:15 and 12:12:17+2MgO
- Rate: 400 kg/ha
- Time of application: Single dose 2 months after planting
- Split application: first application 3-4 WAP; second application 12-14 WAP
- Application Methods: Ring or band methods (10cm away from cassava in a ring of 6cm wide)
- Apply 20g/plant or a match box/plant

Any of the recommendations in the table below can also be used:

Table 2: Fertilizer types, rates, methods and periods of application

FERTILIZER TYPE	RATE, kg/ha	METHOD	PERIOD
NPK 20:10:10:25:1Zn	400-600	Band	8 week after planting
NPK 20:10:5:10:10Ca	400-600	Band	8 week after planting
NPK 12:12:17:2mg	400-600	Band	8 week after planting

Or, apply straight fertilizer at 90kgN:20kgP:75kgK per hectare plus 4-5kg/ha Agrolyzer (micronutrient supplement).

Apply organic manure to soils regularly to improve organic matter in the soil, at 3000-5000kg per hectare plus 4-6kg/ha Agrolyzer.



**6.
CASSAVA PESTS
AND DISEASE
CONTROL**



6.1. Pest Control

The major pests of cassava in the farm are termites, grasshoppers, cassava mealy bugs, green spider mites, rats, bush fowls, grass cutters, wild pigs and man. These can be controlled as follows:

- i. Termites: treat stakes with Basudin at 40ml per 20 litres of water or dip the stakes in a solution of Ultracide at 400gm per liter of water
- ii. Grasshoppers: when the population of the insect is high, spray with Vetox 85 at 1.5kg per 250 litres of water per hectare, otherwise, hand pick.
- iii. Cassava mealy bug and green spider mites: these can be controlled by:
 - Use of resistant cassava varieties
 - Good farm sanitation and removal of infected plants
 - Early planting of cassava
 - Use of natural enemies like beetles and predatory mites
 - Planting in horizontal position and completely burying the stakes
 - Dipping stakes for 5 minutes in mixture of 20ml of Nuvacron and 10 litres of water and air-drying before planting
- iv. Rats, bush fowls, grass-cutters, wild pigs, man:

These may be controlled by:

- Fencing
- Use of traps
- Use of scare crows
- Use of security men

6.2. Disease Control

Cassava diseases are mainly caused by viruses, bacteria and fungi. These cause injuries which express themselves in symptoms such as discoloration of leaves, lesions and sores on stems and storage roots. Physiological stress from drought and nutrient deficiencies can also cause diseases that express similar symptoms.

Major diseases of cassava are cassava mosaic disease (CMD), cassava bacterial blight (CBB), cassava anthracnose disease (CAD) and cassava root rot (CRR).

- i. Cassava Mosaic Disease (CMD): Caused by a virus, this disease is recognized by yellowing (chlorosis) of cassava leaves and distortion (twisting) of the leaves to make their shapes different from normal. It occurs mainly during the rainy season and is controlled by using healthy, disease resistant cassava varieties and crop rotation.



- ii. **Bacterial Blight:** This is a disease caused by bacteria and is predominant during the rainy season. Symptoms are different shapes of water-soaked patches on the leaf (angular spots), wilting of leaves and branches, gum exudate on the stem and dieback of the branch tops or stem. Control by:
 - Using resistant varieties (most of the improved varieties are diseases and pest resistant as listed on page 5)
 - Using disease-free or clean stakes
 - Practicing good crop sanitation by burying infected plants or plant residues.

- Using resistant cassava varieties
- Correct use of farm inputs like fertilizers
- Planting in areas or soils with good drainage; early harvest of cassava roots will reduce incidence of this disease.



Green spider mite



Cassava bacteria blight



Cassava bacteria blight

Cassava Anthracnose Disease: It is caused by fungus, and recognized by dark-brown wounds (lesions or canker) on the stem that may lead to wilting and dropping of leaves. It also occurs mainly during the rainy season. Control by:

- Using resistant cassava varieties
- Using clean and disease-free stems
- Practicing good crop sanitation by burying infected plants and residues.



Cassava bacteria blight



Cassava Mosaic Disease



Cassava Mealy bug

Cassava Root Rot: The disease is caused by fungus and other micro-organisms. Symptom is the decaying of roots resulting to wilting and collapsing of the plant. It occurs mostly on water-logged soils. Control by:



Cassava brown streak



Cassava brown streak



Major Cassava pests and Disease

7. HARVESTING



Most cassava varieties are mature for harvesting at 10-12 months after planting. Cut the stem 20cm above soil level and lift roots by pulling the stump. Harvest when the soil is moist, not too dry, to avoid damage to the roots. Detached roots that are free from adhering soils can be gathered into heaps and, thereafter, conveyed to appropriate place for processing

- Harvesting is mostly manual
- Harvest on time to avoid loss.
- Harvest as soon as the storage roots are mature.
- Optimum time for harvesting varies according to the variety, climate and soil factors.
- Early maturing varieties 9-12 months and late maturing varieties 12-18 months

Note

Delayed harvesting may cause roots to become fibrous or rot





8. References

Eke-Okoro, O. N., Ekwe, K. C. and Nwosu, K. I. (2005). Cassava stem and Root Production: A Practical Manual

Ezulike, T. O. Nwosu, K. I., Udealor, A. and Eke-Okoro, O. N. (2006). Guide to Cassava Production in Nigeria.

Extension Guide No.16, National Root Crops Research Institute, Umudike





NIGERIA IS THE WORLD'S LARGEST PRODUCER OF CASSAVA

52.4
Million

METRIC TONS OF CASSAVA
IS PRODUCED ANNUALLY

LOW PRODUCTIVITY HAS HOWEVER BEEN A MAJOR CHALLENGE
TO THE DEVELOPMENT OF CASSAVA INDUSTRY IN THE COUNTRY



ISSUES / CHALLENGES

- Cassava root yield on farmers' field: 9-12t/ha
- On-station yield: 25-40t/ha.
- Cassava yield potential: 60-80t/ha.



WHY DISPARITY? MISSING LINK

- Lack of adequate technical knowledge of improved agronomic practices.
- Non adoption of appropriate agronomic and/or cultural practices.
- Piece meal/partial adoption of recommended packages
- Resultant low yield.



TABLE 1: FUNGICIDE, INSECTICIDE AND HERBICIDE RECOMMENDED FOR CASAVA PRODUCTION

FUNGICIDE

S/N	Name	Active Ingredient	Mode Of Action	Uses	Rate Of Application	Time Of Application
1	Ultimax Plus	Copper oxide + metalaxyl	Contact and systemic	To control fungal attack on cassava	800g/ha 50g in 15LT of water	Morning or evening

INSECTICIDE

S/N	Name	Active Ingredient	Mode Of Action	Uses	Rate Of Application	Time Of Application
1	Relamda Plus	Lambdacyhalot hrin + dimenthoate	Contact and stomach poisoning	Controls Aphidmealy bugs other insects	50ml in 15 liter of water	Morning and evening
2	Cyperkill	Cypermethrin + dimenthoate	Contact and stomach poisoning	Aphid white flies mealy bugs etc	50ml in 15 liter of water	Morning and evening
3	Termifos	Chlorpyrifos	Contact stomach and respiratory	Termites	60ml in 15liter of water	Morning or evening

RODENTICIDE

S/N	Name	Active Ingredient	Mode Of Action	Uses	Rate Of Application	Time Of Application
1	Rodilon wax block	Difenthialone	Stomach poisoning and dehydration	To control rats and other rodents	1 block per 10 meters interval in the affected area	Note: do not touch with bare hand

HERBICIDE USE 4.2

S/N	Name	Active Ingredient	Mode Of Action	Uses	Rate Of Application	Time Of Application
1	Xtravest	Atrazine + metholachlor	Pre-emergence	Seed weed control	4-5 litre per hecter 300 – 350ml in 15 LT water	1-2 days after planting morning or evening
2	Lagon	Aclonifen +isoxafluto	Pre-emergence	Seed weed control	500-750 mill/hectre 60 – 75ml in 15lt water	1-2 days after planting morning /evening
3	Relisate (Clearweed)	Glyphosate	Pre-plant and post emergence/ systemic	To control existing weeds	3-4 litres per hecter 250-300ml in 15 litre of water	Morning/ Evening



S/N	Name	Active Ingredient	Mode Of Action	Uses	Rate Of Application	Time Of Application
4	Reliquat Weedcrusher	Paraquat	Contact, pre-plant post emergence	To control existing weeds	2LT/ha 200ml in 15LT of water	Morning / evening
5	Narowdown	Plugzifip – p- butyl	Post emergence selective herbicide	Control existing grassy weed in cassava farm	2.5LT/ha 250ml in 15 liter of water	4-6 weeks after planting