

# **Seed Yam Production and storage**

## **An Advisory Booklet**

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## **SEED YAM PRODUCTION AND STORAGE**

### **SECTION 1:**

#### **BACKGROUND INFORMATION**

- About 74% of the total World output of yam tuber production are from Nigeria, making her the largest producer in the world.
- Yam cultivation is regarded as part of the culture of Nigeria. It is now being cultivated in all the Southern

State , States within the Central zone and Kaduna State.

- Although there are various cultivars of yam in Nigeria, the ones that are commercially produced are the white yams. Dioscorea rotundata and yellow yam D. cayenensis.
- Each zone has specific strain of white yam that is suitable for propagation, storage and production of planting materials. These zones, therefore, have various native names given to these strains of white yam.
- Other cultivars of yam available for cultivation are:
  - (a) D. alata, Water yam
  - (b) D. dumentorium, bitter
  - (c) D. cayenensis, Yellow yam
  - (d) D. Bulbifera, Hungry Man.s yam
- The part of the yam eaten (the tuber), is also the part

that is prepared for propagation, hence many farmers find it difficult to expand their plantation acreage annually because of the high cost of planting materials in the off season.

- Researchers have, however, developed some useful techniques by which farmers can secure planting materials and thereby increase the acreage of yam production yearly.

#### **SOME INDIGENOUS PRACTICES TO ENSURE PROFITABLE TUBER PRODUCTION**

- Land for tuber cultivation must be totally cleared of vegetation before the ridges are made. Farmers' believe that vegetation mixed with ridges retards tuberisation of yam and expose the tubers to nematode infection and insect attack.

- Specific knife that is not used for domestic purpose must be used on tubers for planting. “This knife for preparing yam for planting must be used for that purpose only.”
- The Ebiras are endowed with the secret of yam tuber production, which is kept within the tribe. They produce early maturing tubers that are big and nutritious. Because their harvest is early, their tubers meet high demand and good prices all over the country.
- For yellow yam, the sett for planting must not be big and must not be planted too deep into the ridge because the rate of decay is slow. “Farmers do not put on cap when planting yellow yam because of the belief that the vine will not be long but produce branches, which will not aid tuberisation”.

Farmers use the yam tubers (Fig.

### **SEED YAM AND PHYSIOLOGICAL FACTORS OF IMPORTANCE**

1) as the major planting material. The tubers have some intrinsic factors that must be mentioned that affect “seed” yams during storage that can affect their availability for use for cultivation.



Fig 1 Ware Yams, Yams Minisett and Seed Yams Ref. NCRI

#### **(a) Dormancy**

- Yam tubers will not sprout immediately after harvest. They usually go through a period of dormancy before sprouting can occur.

- Dormancy of the tubers can last from 3 to 5 months depending on the species in your locality.
- The aim of storage of “seed” yam for planting is to extend the shelf life against damage, infection, insect infestation or rotting to coincide with the planting season. The longer the dormancy period, the longer the shelf and the better the tubers as seed. Dormancy also allows yam tubers to stay in the market for long period.
- After dormancy period, the “seed” yam tubers will start to sprout. This reduces the food reserve because the energy for germination is drawn from the reserve. From experience, farmers plant their “seed” yam tubers

just before or at the initiation of sprouts. If not planted, the “seed” yam tubers eventually become weak and later die and dry up and become useless.

#### **(b) Seed yam tuber dehydration**

The causes of dehydration are another factor of note in post harvest handling of “seed” yams. Ordinarily, about 30% of “seed” yam tuber dry up before the planting season sets in hence it is important to have this at the back of your mind to help in selecting appropriate storage system that will protect “seed” yams from dehydration.

#### **The following aid in tuber dehydration:**

- **Respiration:** Because the tubers are living, they respire. The energy required for respiration is drawn from the food stored in the yam tuber.

High temperature in yam tuber store further increase respiration and hence reduce storage life of the “seed” yam tubers. Manipulation of store temperature condition for low region by structural and atmospheric consideration can retard respiration, prolong storage life and increase vigour of the “seed” yam tuber during storage.

- **Transpiration:** this refers to loss of water from the tuber tissues through the skin pores. Different species have different thickness of skin coat. Water loss is usually very rapid the tubers become smaller after storage for about 4 months because of the dryness of the atmosphere and the

larger surface area for transpiration.

**(c) Attack by pest and spoilage**

**Micro-Organisms**

Unprotected “seed” yam tubers are easily attacked by scale insects, tuber worms, nematodes and fungi. All these draw on the food reserve in the tuber and eventually kill “seed” yam.

**SECTION 2**

**PLANTING MATERIALS FOR  
YAM**

**TUBER PRODUCTION**

The objective of this section is to provide information and guide on the indigenous methods of “seed” yam production.

**(a) Milking of mature tuber**

- When the yam tuber is mature and the leaves are turning yellow, the mature tubers are cut off from the vine at the top crown. The cut tuber is removed and the

crown covered with soil to continue growth process.

- The covered crown will produce “seed” yam of irregular scattered head form.

**Precaution:** This exercise must, however, be carried out when the rains are still on to ensure successful production of “seed” yam.

- The harvesting of the “seed” yam produced after “milking” should be done about four months after milking when the vine must have dried out completely. Care must be taken to avoid bruising as much as possible.

**Storage of the “seed” yam is carried out as follows:**

- Prepare a cool environment protected from direct sunlight by placing wooden platform on the floor.
- Sprinkle wood ash and or “PifPaf” insecticide on the

platform before arranging the “seed” yam on it.

- Sprinkle the materials, as above, layer by layer as you arrange your “seed” yam.
- Cover the whole arrangement with dry-grass and inspect monthly to note initiation of sprout.
- At the initiation of sprout, you can either plant or sell the seed yam tubers.

#### **(b) Production of yam setts**

Farmers mostly in the South Western zone, employ this method to produce “seed” yam for planting. The method is as follows:

- Select the cultivar of yam tuber you want to produce into sett. The tuber must not be diseased or bruised (Should have healthy coat and crown).

- Do not select yam tubers that have been milked, i.e. without the crown to avoid the risk of infection in storage.
- Make slices with knife meant for production setts. The slices should be about 250 gm and each must have the yam coat in place to provide the sprout points.
- You can make a vertical cut through the yam tuber before cutting into setts.
- Prepare wood ash, especially, that of either neem tree or palm bunch.
- Sprinkle the wood ash on the cut surfaces and exposed part of the yam as protection against infection.

- Prepare a trench, either under the tree or under a shed, of about 4 ft X 6 ft in a well drained soil.
- Sprinkle wood ash on the floor of the trench then spread palm fronds (leaves). Sprinkle wood ash on the leaves again before arranging the yam setts in the trench.
- After arrangement of the yam setts, sprinkle with wood ash and cover with palm leaves before finally covering with sand
- Remove for planting or sale at the initiation of sprout.

The methods a & b above allow farmers to:

- Maintain “seed” source for planting.

- Maintain their source of yam cultivar.
- Provide stock for sale of “seed” yam during the planting season when planting materials are scarce and command high price.

However, the methods do not ensure rapid multiplication for commercial production of yam tubers.

### SECTION 3

#### RAPID METHODS FOR SEED YAM TUBER PRODUCTION

This section describes method by the use of minisetts of yam tubers, vine cuttings and true seeds of yam for the rapid production of “seed” yam tuber to increase the acreage planted to yam tubers. The land space needed is small for the

production of a large number of “seed” yam tubers. The techniques are also good for the preservation and extension of good yam cultivars.

#### A. MINISETT TECHNIQUE

Materials needed:

- Fertile land that have been cleared of weed.
- Choice of unblemished yam tubers that still carries the crown.
- New knife.
- Wood ash or Benlate fungicide.
- Rope for staking.
- Poles for staking.
- Palm bunch without the palm fruits or grass for mulching.

*Procedure:*

- Remove all weeds and stumps from the piece of land. If these are not properly removed, they could be sources of infection on the planted yam minisetts.
- Make parallel ridges/beds.

- Put pole at 10 ft intervals on the ridges/beds. The pole could be about 5 ft high.
- Join the top of the poles with rope along the length of each ridges. Then tie 4 ft rope along the horizontal rope at about 1 ft interval and let them drop vertically but not touching the ridges. These vertical ropes will eventually be used to train the yam vines.
- With the elected yam tuber cultivar and new knife cut the yam tuber into horizontal slices not less than 1 inch in thickness.
- Cut each slice into two halves then cut each half into two equal halves thereby having four-yam minisett from each slice. Make sure that the yam skin is still in place.
- Sprinkle the minisett with wood ash or immerse in Benlate fungicide at the

recommended dosage for 2 minutes. Air-dry before the next stage.

- Plant each yam minisett on the prepared ridge with the spacing of 6 inches.
- After planting, mulch heavily with cut pieces of palm bunches and irrigate.
- With the vertical ropes, train the vine as they grow so that the leaves can spread for maximum exposure to sunlight.
- Irrigate properly if planted during the dry season.
- The “seed” yam tubers will be ready for harvesting as soon as the vines become dry.
- Harvest after rain or irrigation so that you do not inflict mechanical injury on the small tubers.
- Expose to sun for the skin to harden for about 24 hour.

## **B. VINE CUTTINGS**

The method of producing tubers from vine cuttings is possible but not yet popular. The appropriate vine will produce micro-tubers from which “seed” yams are produced.

***Procedure:***

- Select appropriate cultivar of yam tuber.
- Select mature green and healthy vine.
- Cut vine at least to about 6 inches in length and must include at least one node.
- Make sure that about 2.5c.m. of vine tissue is left attached below and above the node with the leaf intact.
- Plant the vine in such a way that the nodes are in the soil while the leaf is above the soil surface.
- Make sure that planting is done in a shaded area protecting the planted

vine and leaf from direct light.

- Provide enough humidity to ensure establishment of the vine.
- It is advisable to use vines that are young (not more than 5 weeks old).
- Remove from shade and transplant rooted vines on prepared ridges.
- Nurture until mature for harvesting.
- Harvested micro-tubers should be replanted following the procedure for the miniset for the production of “seed” yam.

#### **SECTION 4**

#### **“SEED” YAM STORAGE STRUCTURES**

Section 4 deals with the structure for the storage of “seed” yam tubers.

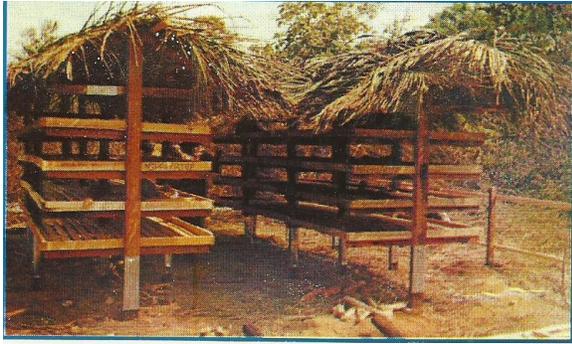


Fig 2 THE "SEED" YAM BARN

Ref. NSPRI

This is a structure developed for the preservation and storage of "seed" yam for retention of viability as planting materials. The barn is constructed such that it provides the physical environment needed for prevention of excessive moisture loss, rotting and loss of viability of the seed. In particular, the structure should ensure coolness of the immediate keeping environment, that is, low storage temperature. Ventilation of the tuber is enhanced to remove respiration heat emerging from them. Other desirable of the "seed" yam barn include:

- (i) Accessibility of the seed tubers for monitoring of sprout spoilage, infestation and infection.

- (ii) Ease of inspection during storage to discard possible rooted tubers.
- (iii) Prevention of access to rodent pests.
- (iv) Structural stability against weight of stored materials as well as wind forces.
- (v) Protection against termite attack.

### STEPS IN CONSTRUCTION OF SEED YAM BARN

In construction a seed yam barn, the following factors are important.

#### (a) Site Selection

The location for construction should be free from flooding. This requires that a depressed area should be avoided. A most appropriate location will be a level ground or an elevated site where rainwater will not settle but which remains dry shortly after the downpour. The land must, thus, be well drained.

A water-logged location will not be suitable for sitting a “seed yam barn. Although high humidity could prevent weight loss during yam tuber storage it may as the other hand increase the incidence of rotting if “seed” yam is not further protected. A termite-infested location should be avoided as this will cause structural failure of the wooden structure thereby reducing the life span of the structure. Natural shading such as by-standing trees will be advantageous as this can appreciably provide the much-needed coolness of the physical environment. However, the site must be clear of thick bushes, which may obstruct good ventilation of the tubers on the barn, and harbour rodents.

### **(b) Shape of the Barn**

The barn for seed yam should be of rectangular shape. The width should be between 120cm and 150 cm. This would facilitate manual handling of stored tubers during inspection and enhance good ventilation of the tubers on the barn. The length can be as long as may be required for the intended storage capacity.

The barn comprises four shelves vertically spaced 30 cm apart and jointly supported on a framework of vertical poles. Each shelf has a ventilated platform of slated wood with 2 3 cm horizontal spacing (Fig. 3)



## SIZE OF BARN

A 2-tonne capacity “seed yam barn consists of four rectangular shelves each of dimension 480 cm x 120 cm and spaced 30 cm. This gives overall dimensions of 480 long, 120 cm wide height of 210 cm (at roof ridge).

### (c) Choice of Materials

Construction materials for seed yam barn are chosen in consideration of durability (usually) by strength or resistance to weathering or insect damage. Choice of materials can also be influenced by the financial strength of the farmer as well as available in this case, two classes of materials can be considered, viz:

(i) Locally available materials: including farm wood, ropes of plant fibre, palm

fronds, palm leaves and other materials that can be sourced on the farm with little or no cost.

(ii) Purchased materials including sawn wood, nails iron sheet and other more durable materials that need be purchased.

### MATERIALS FOR CONSTRUCTION OF 2-TONNE “SEED” YAM BARN

S/N	MATERIALS	QUANTIT Y
1.	2 x 3 x 12 Sawn Wood	15pc
2.	2 x 2 x 12	36
3.	1 x 1 x 12	72
4.	1 x 3 x 12	18
5.	3 Nails	10 kg.
6.	2 Nails	20 kg.
7.	Wood preservative (Sorghum)	1 gallon

8.	Woven gross/palm fronds	Bulk	
9.	Fibre ropes	Bulk	
10.	Iron sheet (alternative to thatch)	1 Bundle	

#### (d) Construction Stages

Construction of the barn takes place in two basic stages:

- (i) Erection of the framework which carries the ventilated shelves.
- (ii) Fixing of the shelves of slated wood.

#### Procedure:

- Select a suitable site of a size to accommodate the barn dimension with extra open working space.
- Corner and lengthwise poles to carry the entire framework should be erected. Each pole should be let into the soil up

to 30 45 cm deep and stabilized with concrete cement or compacted soil solidly reinforced with stones. Length wise spacing of the vertical poles should not be more than 150 cm.

- Cut the side poles and ridgepoles to average all dimensions of 205cm and 235 cm respectively. Two longer poles of about 450 cm high are in the same manner, fixed at the mid point of each end of the barn, to support the ridge pole. More ridge supporting poles are fixed in-between opposite side poles.
- To construct the framework, horizontal poles, representing the shelves sized, are fixed by nails to the sides of the supporting poles. The horizontal poles are made to run along the outer edges, across the width and along ridge supporting poles.

By this, the basic framework for a rigid structure has been formed.

- To construct the shelves of slated wood, a series of horizontal wood (5 cm x 5 cm) pieces should be laid across the width and nailed to each pair of opposite side poles. These should be spaced 5 cm to form a ventilated platform.
- The periphery of each shelf is finally fixed by nailing with 1" x 3" (2.5 cm x 7.5 cm) wood to make the shelves into trays of 5 cm deep.
- The roof of raffia leaves (or grass, where more available) is then constructed in the traditional way. This is done by first constructing the roof framework with sawn wood (5 cm x 5 cm and 5 cm pieces) and then covering with the woven leaves. The roof can also be covered with asbestos sheets.

- Use of alternative materials: A set of alternative materials can be used where these can be entirely obtained locally, particularly on the farm, at little or no cost. These mainly include farm wood (for framework poles), and fibre ropes (for fixing joints and linkages) in place of nails.

## **SECTION 5**

### **STORAGE OF SEED YAM TUBER IN THE YAM BAN**

This section deals with pre-storage and during storage management of the seed yams.

#### **Preparation**

- (i) Seed yams to be stored should be of high quality such that they are apparently capable of retaining over an extended period of storage.
- (ii) The tubers should be made free of blemishes

and particularly retain the sprout head intact.

- (iii) Preparation of the tubers for storage may include treatment with appropriate pesticide (insecticide, fungicide and or nematocide mixture).
- (iv) Selection of tubers for storage should ensure freedom from cuts and abrasion, which may create surface openings for pest infestation or infection.

#### **Pre-storage Treatments:**

- Select seed yams (Fig 4) that are not less than 250gms in weight, without blemish, bruises and must still carry the crown.



**Fig 4: Seed Yam Tuber**

- Prepare the solution of wood ash (preferably ash from dogonyaro or palm bunch). Soak ash in bucket containing water by volume of 1:4 of ash and water by volume. Stir vigorously and allow to set. Stir again after 6 hours and decant the water, which by now should be golden yellow in colour and sliming. Add Actellic or Karate at the recommended dosage on the package of the insecticide. Mix the ash water and insecticide very well to volume.

- Put some of the “seed” yams in a crate (either plastic/raffia or wooden basket) dip in the mixture and allow to stay for about 2 minutes. Drain and air-dry.
- Arrange the air-dried treated tubers on shallow tray shelves in the ventilated seed yam barn to cure and store.
- Surface waxing has been tried to aid in the reduction of transpiration, which has also been found useful in “seed” yam tuber storage. Figure 5 shows some treatment trials being studied.

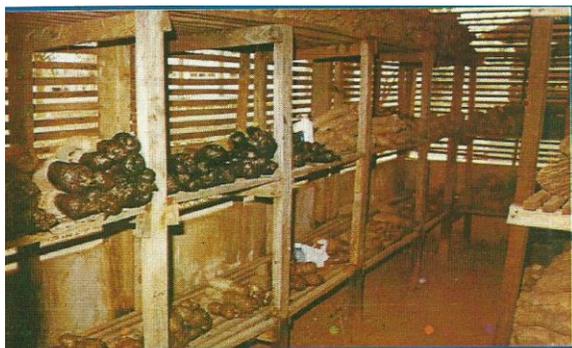


Fig 5 Seed Yam treatment Study

Ref. NSPRI

### Loading:

- (i) The seed yam tubers to be loaded on to the barn are

carried to the site in stackable containers such as wooden or plastic crates that prevent mechanical damage such as bruising, cuts and punctures.

- (ii) Loading is done by carrying the tubers gently by hand onto the shelves to avoid mechanical or physical damage. If the tubers are to be handled in larger numbers, violent pouring should be avoided. Much care will be required for gentle handling.
- (iii) The seed tubers should be loosely spread over the shelves preferable in single or double layers to avoid heats. Loading in deep piles may encourage product heating and impair ventilation.
- (iv) Arrangement of the seed tubers should be such that individual tubers are

visually accessible during follow-up inspection.

### **Storage**

- Inspect regularly in storage to remove rotten tubers and rodent damaged tubers.
- Protect against rodent and bird with guards at the feet of the shelves (see fig. 2).
- Make sure the yam barn is constructed where humidity and shading are adequate excessive ventilation.
- Note for sprouting. The initiation of sprouts is indication that planting can commence.

- If the yam cultivar breaks dormancy earlier than necessary, you can apply “spent” engine oil around the top part of the “seed” yams. This has been found to retard sprouting of yams.

### **Conclusion**

Seed yam production and storage for sale is very profitable and ensure large acreage for cultivation.

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