POST-HARVEST HANDLING & MANAGEMENT

TRAINING OBJECTIVES

- Understand what post harvest handling is
- Importance of good post harvest handling in grains
- Understand post harvest handling activities
- Understand what post harvest losses are
- Post-harvest management in groundnuts
- Understanding post harvest handling in fruits and vegetables

What is Post-Harvest?

- This is the Handling or Management stage immediately following harvest.
- It is also the period between maturity of crop and it's time of final consumption

Post-Harvest?

- Solution to food security and poverty
- Enhances potential for exporting traditional crops
- Improves and increases a farmer's chances of making profits
- Makes produces to last longer –grain shelf life
- Incidences of food poisoning is lowered like aflatoxin
- Consumers get access to wider food varieties
- Adds value to farm produce and traditional food products
- Slows down undesirable changes

POST-HARVEST MANAGEMENT ACTIVITIES

1 Harvesting
- Collecting in the crop at the right time
- Avoiding bad weather
- Avoiding contamination with soil

2 Drying
- Give value add to the grains
- Retain maximum quality of crop
- Reduce moisture levels for safe storage

3 Threshing/Shelling
- Reduce required storage capacity
- Reduce grain susceptibility to pests

4 Cleaning/Winnowing
- Removing the foreign matter
- Increases purity and market value

5 Storage
- Protecting the grain with different store types
- Keeping the grain until a good time for market

6 What happens after farm
- Sale to different buyers
- Transport to warehouse

POST-HARVEST MANAGEMENT ACTIVITIES

HARVESTING

This is the process of collecting, gathering and plucking of mature crops from the garden. The goal of harvesting is to gather produce from the field at the proper level of maturity with a minimum damage and loss.

POST-HARVEST MANAGEMENT ACTIVITIES

HARVESTING

Maturity indices are the major aspects considered prior to harvesting

- Skin Color
- Optical methods, (light transmission)
- Shape
- Size
- Aroma
- Fruit ripening
- Leaf changes
- Firmness

POST-HARVEST MANAGEMENT ACTIVITIES

HARVESTING

Maturity indices specifically in Grains/Maize/Sorghum

- Yellowing of leaves
- Drying up of leaves
- Yellowing/drying up of husks
- Glossy surface of grains
- Cobs droop

POST-HARVEST MANAGEMENT ACTIVITIES

HARVESTING

Maturity indices in Grains/Maize/Sorghum

Black Layer Test

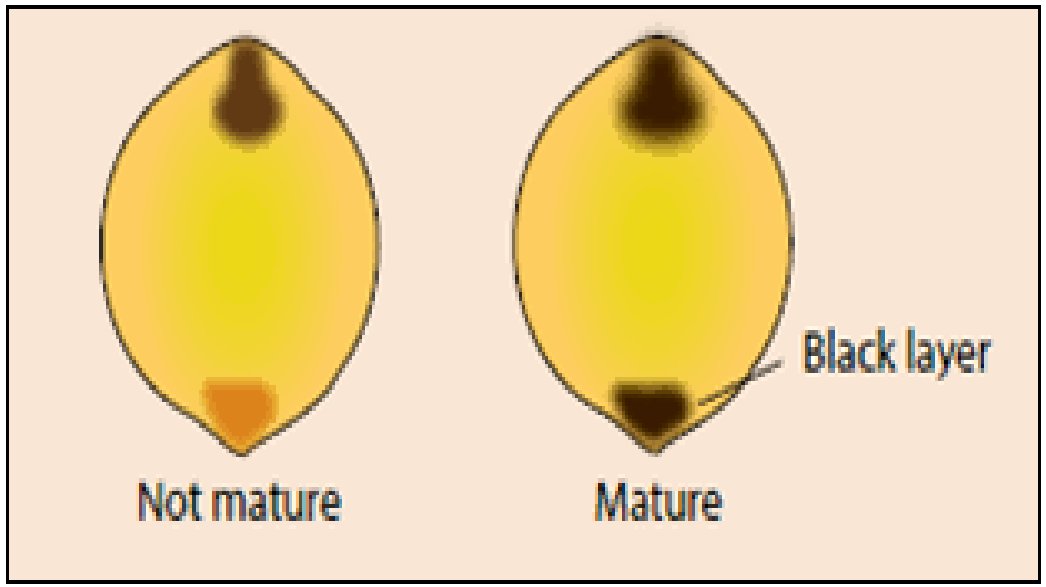
- ✓Random sampling of 10 maize cops/sorghum panicle, shell off the grain samples, mix the grains, peel 10 randomly selected grains, peel backwards the tip caps and observe the color of the tip scar, if they are black, the field is mature for harvesting

POST-HARVEST MANAGEMENT ACTIVITIES

HARVESTING

Maturity indices in Grains/Maize/Sorghum

Black Layer Test [SORGHUM]



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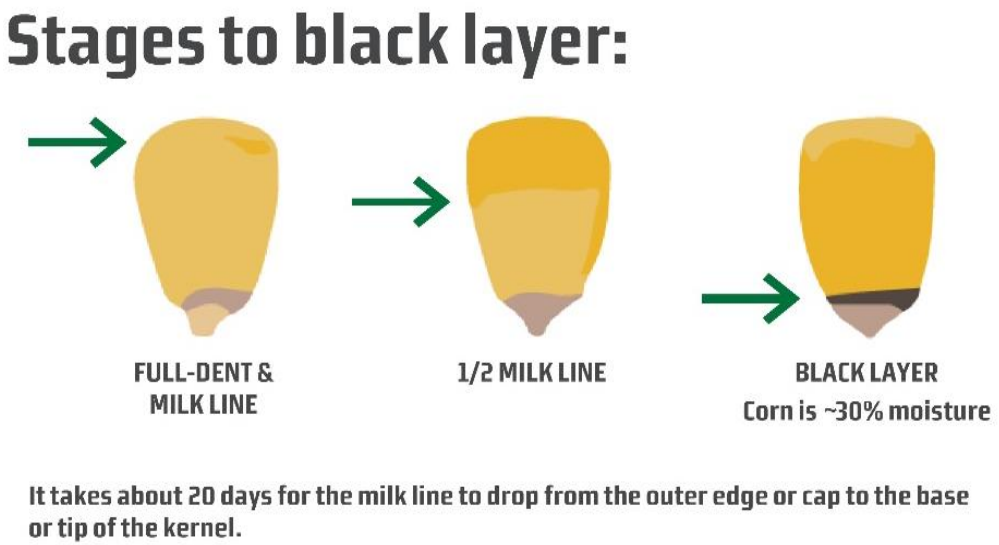


POST-HARVEST MANAGEMENT ACTIVITIES

DRYING

This is the process of reducing the moisture content of the harvested solid material or seeds

Methods of Drying

1. Natural drying techniques

This is the drying on mats, plastic sheets and rocks, hanging on trees, hanging above fireplaces. This is better than drying on the bare ground

2. Artificial drying (not common in our setting)

POST-HARVEST MANAGEMENT ACTIVITIES

DRYING

MONITORING DRYING GRAINS

This is done using simple methods such as,

- ❑ Shaking pods
- ❑ Biting grain between teeth
- ❑ Walking on dry pods
- ❑ Rattling grain in a tin//gourd
- ❑ Feeling grains, touching and smelling
- ❑ Pressing grain using thumbs
- ❑ Rubbing/walking on threshed grains
- ❑ Using salt test
- ❑ Observing physical appearance
- ❑ Using moisture meter

POST-HARVEST MANAGEMENT ACTIVITIES

DRYING

Advantages inadquate drying

- ❑ Reduces bulkiness
- ❑ Reserves viability of the harvested produce
- ❑ Reduces crop losses
- ❑ Reduces chances of mould and aflatoxin infections on seeds
- ❑ Increases shelf life
- ❑ Eases packaging and transport

POST-HARVEST MANAGEMENT ACTIVITIES

THRESHING/SHELLING

This is the process of removing/separating grain from the plant by either rubbing, impacting or stripping action. It is done manually or mechanically using machines.

Traditionally, beating grains to thresh them is common and use of hands to shell groundnuts, using motor to shell/thresh grains/pulses is also common

POST-HARVEST MANAGEMENT ACTIVITIES

THRESHING/SHELLING

General Principles of Threshing

- Reduce losses during winnowing by threshing on mats, cement blocks or smeared ground
- Thresh early to reduce crop exposure to birds, rats, and other pests in the field
- Dry thoroughly to reduce the moisture content of the grain before storage; (moisture content should be at 10 to 12 percent
- Sorting is very important, especially when maintaining some crops as seeds, or improving the quality for marketing
- The grain may be stored as un-threshed panicles (in the case of sorghum) or threshed before storage

POST-HARVEST MANAGEMENT ACTIVITIES

CLEANING/WINNOWING

Cleaning/sorting/Sieving, this is the removal of debris and other impurities to make grains pure and free from undesired, non consumable items.

Winnowing, this is the removal of impurities from threshed crops. This is done with the aid of blowing wind

POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

Proper storage of farm produce is very essential activity in postharvest handling as it preserves the shelf life of the crop produce. Farmers use various methods of storing their produce, this includes

- Granaries
- Clay pots
- Gourds
- Jute bags
- Metal drums and bins
- Baskets
- Underground pits
- Bins of stone or mud plaster

POST-HARVEST MANAGEMENT ACTIVITIES

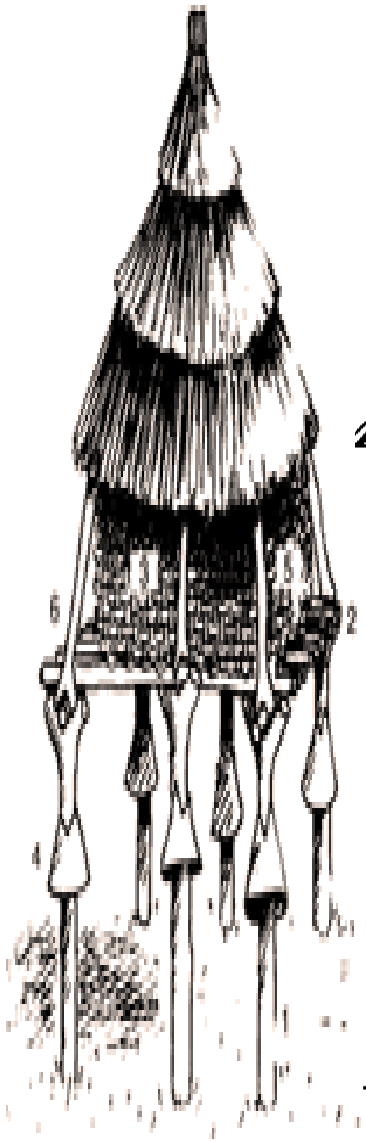
STORAGE

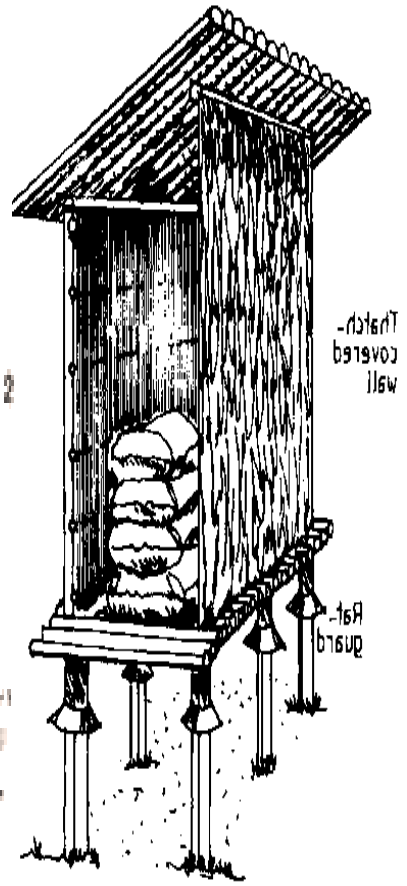
Factors that influence choice of granaries

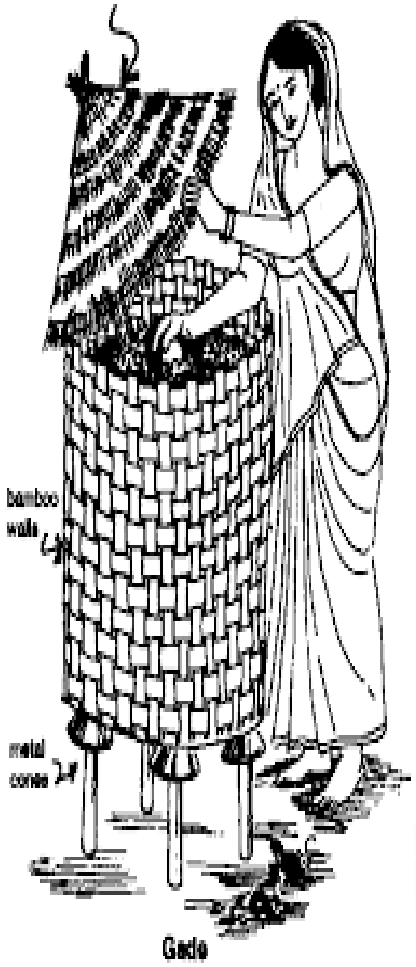
- The quantity of produce to be stored
- The period or duration of storage
- Availability of construction materials
- The cost of construction

POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

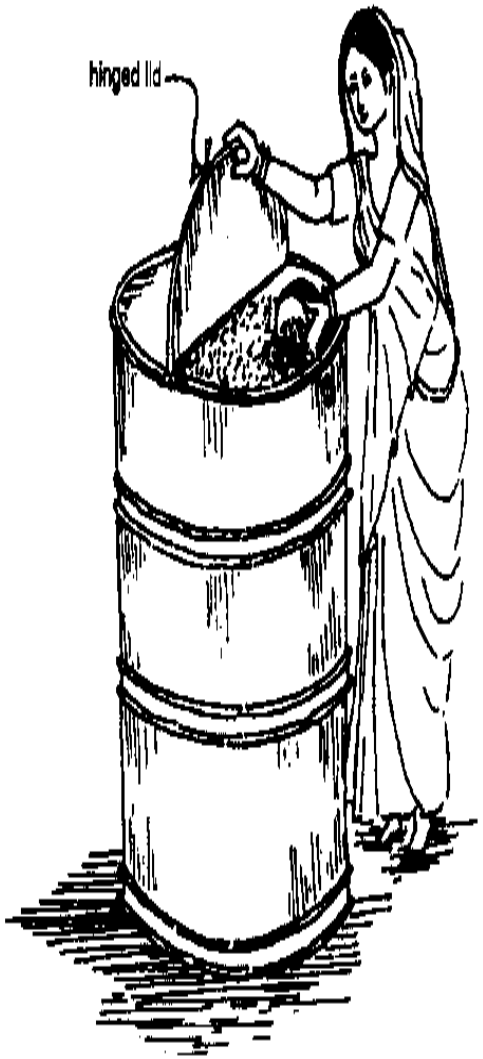


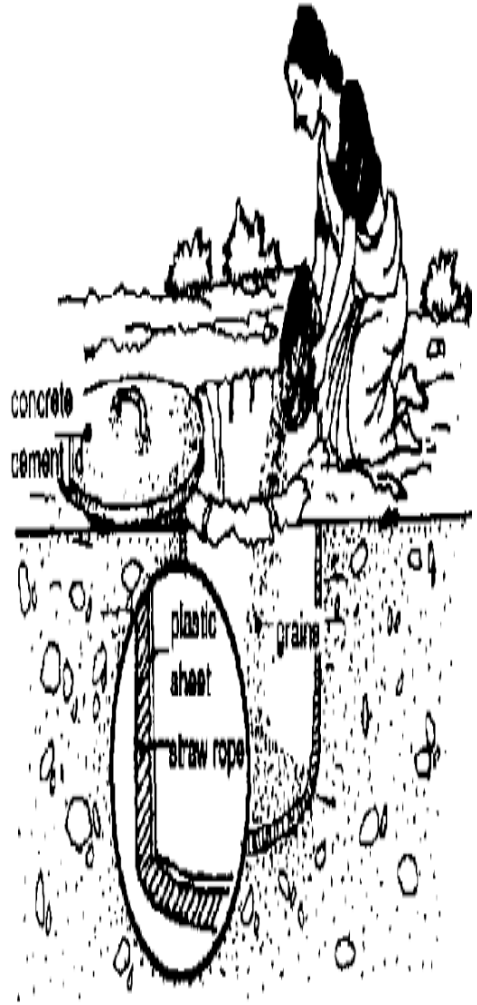




POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE





POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

STORAGE PRACTICES

The Four pillars of good Storage practice include,

Ensuring that the crop going into the store is in good condition

This is because

- ✓Good quality whole grain is less likely to suffer insect attack than poor quality damaged grain
- ✓The grain should be cleaned well, and any damaged grain removed
- ✓The grain should be well dried
- ✓The crop should be carefully handled once it has dried to ensure that grain remains intact

POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

Keeping the store in good condition

This is because,

- ✓A good store will keep the grain dry and cool. It should provide protection against rodents, birds and browsing domestic animals and poultry. It should be theft proof
- ✓Stores should be sited in areas that are not prone to flooding; the soil should allow water to drain away readily.
- ✓They should not be placed where high winds might damage the structure or near trees, which might provide access points from which rodents can jump onto the store roof or platform.

POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

- ✓ The store should have a roof to keep rain off the structure and to provide shade during the heat of the day.

In order,

- ✓To prevent groundwater soaking into the store, the structure must be raised off the ground.
- ✓The store must be kept in good repair to stop the roof leaking or the sides collapsing. At the beginning of the new storage season the empty store must be cleaned.

POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

Practicing good store hygiene

This means keeping everything as clean as is practically possible.

- ✓The store surroundings should be cleaned so that there is no vegetation or rubbish to hinder inspection or to provide breeding grounds for insects and rodents.
- ✓Livestock should be kept away from the store; they should not be allowed to browse or sleep under the store; droppings should be cleared up as they attract rodents.
- ✓Whenever the storage containers are empty, they should be cleaned. Secondhand sacks should be dipped into boiling water to kill any insects and then dried in the sun

POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

Practicing good store hygiene

- ✓ Grain residues should be removed from sacks by turning them inside out and thoroughly brushing them. Holes should be stitched.
- ✓ Grass should be burnt inside solid walled bins and mud plastered baskets to kill off insects and mould spores.
- ✓ Old grain should be stored separately from the new crop, and it should be used first.

POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

Pests can attack the store at any time, so it is important to inspect the store and crop regularly.

- ✓Store inspections should start as soon as the grain is put in store and then conducted routinely at weekly intervals. This is because insects may be brought in with the crop.

- ✓Even if the crop is insect-free at the start of storage, regular inspection is necessary to spot insects that might fly in from a neighbor's store, trees and vegetation or from grain purchased from the market.

POST-HARVEST MANAGEMENT ACTIVITIES

STORAGE

- ✓For shelled grain and pulses stored in bags, baskets or bins, the grain should be removed from store and adult insects removed by sun drying or sieving and winnowing the grain.
- ✓The store should be quickly repaired if it becomes damaged.
- ✓Good storage practice is the key to maintaining grain quality.

POST-HARVEST LOSS

Post harvest losses refers to quantitative and qualitative losses that occur to grains after harvesting due to series of operations grains undergo due to;

1. Inappropriate pre-harvest handling
2. Inadequate farming equipment
3. Poor grain handling
4. Poor grain drying systems
5. Poor grain storage

POST-HARVEST LOSS

1. **Quantitative Loss**, this is the reduction in weight of a produce. This maybe as a result of portion grains eaten by insect pest, rodents or spillage
2. **Qualitative Loss**, this represents damage or contamination of the grain
3. **Nutritional Loss**, this denotes a reduction of the food nutrient value of the crop as a results quantitative or qualitative loss
4. **Germinative Loss**, this is the reduction in the seed viability
5. **Economic Loss**, this denotes in reduction in the monetary value of the product as a result of quantitative or qualitative loss

POST-HARVEST LOSS

CAUSES OF POST HARVEST LOSSES

- Mechanical, this could cause bruising, cutting, breaking, and wounding
- Developmental/growth stages this could result to sprouting, rooting, seed germination which lead deterioration in quality and nutritional value
- Parasitic diseases caused by fungi, bacteria, insects and other organisms
- Physiological deterioration, some crops continue physiological changes especially due to enzymatic actions
- Inadequate preservation
- Poor storage facilities
- Lack of good infrastructures
- Poor planning

POST-HARVEST MANAGEMENT

GROUNDNUTS

Timing for harvesting

It is very important to harvest groundnuts at the correct time. If harvested too early, the seeds will shrink when drying which lowers the oil content and quality of the seed. Delays in harvesting will result in poor quality seed due to mould infections and subsequent aflatoxin contamination of the seeds/pods. Late harvesting also reduces yield because higher proportions of the pods are left in the ground due to the pegs being weak and the pods breaking off. Late harvesting also causes some non-dormant varieties to begin sprouting in the field resulting in yield losses

POST-HARVEST MANAGEMENT

GROUNDNUTS

Challenges of Early Harvesting

- ❑Drop in oil content
- ❑Not saleable, generating low income
- ❑Shrinkage of seeds
- ❑Weight loss
- ❑Poor/Low quality seeds

Challenges of Late Harvesting

- ❑Difficult to uproot as pods remain in the soil due to weakening of the pegs
- ❑ Sprouting of less dormant varieties
- ❑Low income
- ❑Mould infections of seeds/pods

POST-HARVEST MANAGEMENT

GROUNDNUTS

Indicators/maturity indices for harvesting timing

- A proper time to commence harvest is when a good number of pods are fully developed and are intact.
- Maturity of pods is achieved when the vines begin to turn yellow and leaf shedding starts
- It is recommended that a few plants (3-5) should be pulled up and the pods removed and shed. The insides of the shells should be examined, if majority of the pods (70% upwards) have dark markings inside the shell and the seeds are plump and the correct **color for that variety, then the groundnuts are mature and ready for harvest.**

POST-HARVEST MANAGEMENT

GROUNDNUTS

Mature Groundnut Field

POST-HARVEST MANAGEMENT

GROUNDNUTS

Harvest method

The actual method of harvest used depends upon the type of groundnut grown. In bunch types pod development is confined to the base of the plant and the pegs carrying the pods into the soil are thick and strong. Almost all the pods are recovered with the plants when they are pulled out of the soil. That is why the bunch type of groundnut is mostly harvested by pulling out the plants with manual labour. The spreading or semi – spreading groundnut types produce pods all along the running stem. This type of groundnut is harvested either manually or by using a blade harrow or ox-plough. The soil should be sufficiently moist for easy harvesting and without losing pods in the soil

POST-HARVEST MANAGEMENT

GROUNDNUTS

Spreading variety

Bunch Variety

POST-HARVEST MANAGEMENT

GROUNDNUTS

Stripping/Plucking

This is the process of removing pods from the plants. It is done manually by the small-scale farmers or using a simple plucking machine or with the aid of a stripper. The simple plucking machine is constructed of wooden frames covered with a stretched piece of chicken netting can speed up the process. The dried/wilted plants are held by the leaves and the roots/pods drawn across the stretched chicken wire. The pods get caught in the wire and are pulled off, dropping below the frame.

POST-HARVEST MANAGEMENT

GROUNDNUTS

Stripping/Plucking

POST-HARVEST MANAGEMENT

GROUNDNUTS

Cleaning

Shake off soil from the pods to discourage fungal growth

Removal of soil from the pods shortens length of drying period

Drying

The correct drying or curing of the harvested groundnuts is very important as poor curing can help induce fungal growth (producing aflatoxin contamination) and reduce seed quality for consumption, marketing and germination for the following seasons planting. For good storage and germination, the moisture content of the pods should be reduced to 6-8%. There are different ways of drying the pods, some of which are better than others. It is particularly important to note that if the pods are exposed to the sun for too long the seed quality can deteriorate considerably and germination can be affected

POST-HARVEST MANAGEMENT
GROUNDNUTS

Drying Ground nuts in windrows

If the harvested groundnut plant are left to dry on the soil surface where they have been lifted, the pod are likely to be in contact with the soil, which can contain moisture and be at a higher temperature. This method can easily affect the quality of the seed, particularly if there is rain during the drying period. If field drying is used, it is better to use windrows, where plants are laid in rows to catch the wind and dry more quickly. The drying of pods in windrows should produce the required level of moisture before the pods are picked or stripped. Excessive exposure to the sun can affect the quality of the seed

POST-HARVEST MANAGEMENT

GROUNDNUTS

Drying Ground nuts in windrows

POST-HARVEST MANAGEMENT

GROUNDNUTS

Drying Groundnuts on mats

The plants can be picked from the windrow and spread in a thin layer in the sun to dry, or mat for 2-5 days to achieve safe moisture storage. Pods should be covered or taken indoors during wet weather. They can also be picked immediately after lifting and then dried in the sun for 6-8 days. Always note that, excessive exposure to the sun can affect the quality of the seed

POST-HARVEST MANAGEMENT

GROUNDNUTS

Curing

This involves keeping the groundnuts away from direct sunlight, probably under shade an optimum atmospheric temperature

After 2-3 days of wilting, it is safe to begin natural curing. The following factors should be considered:

- Shade: Exposure to direct sunlight results in quality deterioration. It is recommended that plants be stacked with pods innermost and foliage outermost,
- Ventilation: Adequate air circulation is important to allow steady moisture loss,
- Drainage: Ensure good drainage to avoid windrows and cocks being spoiled by standing in water during wet weather

POST-HARVEST MANAGEMENT
GROUNDNUTS

Curing of groundnuts

POST-HARVEST MANAGEMENT GROUNDNUTS

Storage

- The best way to store groundnuts is in their shell,
- Store the groundnuts when the moisture content is between 7-8%,
- Never bag groundnuts for storage when the pods are still dump,
- Before storage remove broken, damaged, poor and fungus- infected nuts,
- Store in a well ventilated and cool place
- Do not store in plastic bags as they restrict air circulation, and this promote fungal infection if not well dried

POST-HARVEST MANAGEMENT

VEGETABLES & FRUITS

Good post harvest handling and management of fruits and vegetables is essential. This is because of their perishability once they are harvested.

Special considerations should be put on the maturity indices of various vegetables before harvesting

This indices include;

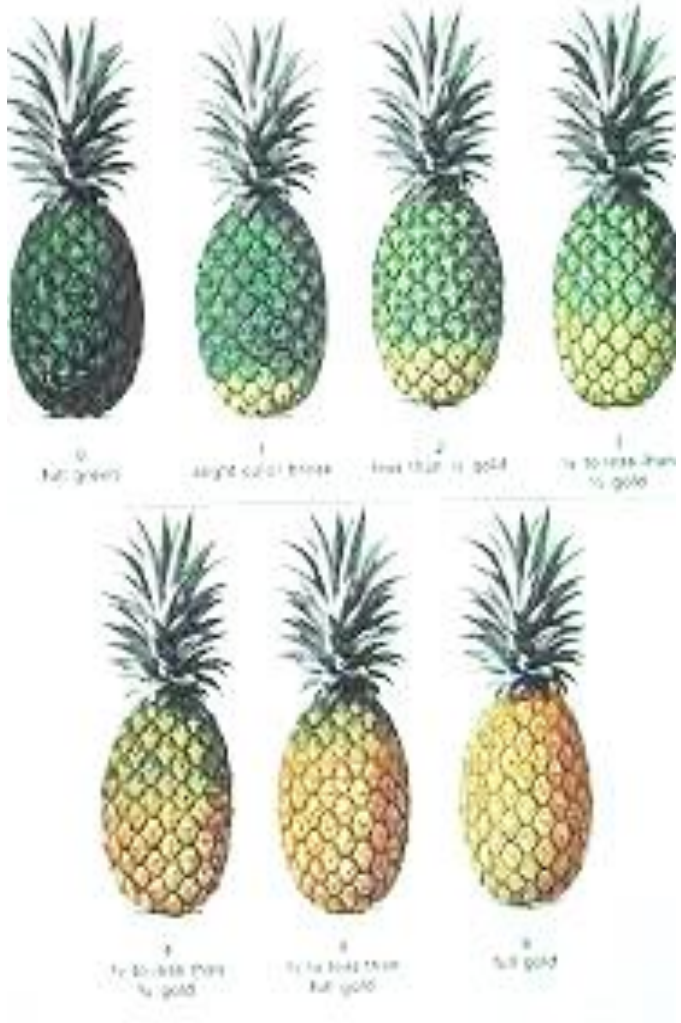
- → Size
- → Number of leaves
- → Color
- → Firmness
- → Aroma
- → Development of cuticles
- → Texture

POST-HARVEST MANAGEMENT

VEGETABLES & FRUITS

Stages of post-harvest handling

1. Harvesting
   - Harvest at cooler times of the day
   - Don't harvest during rain
   - Pick only mature fruits/leaves
2. Curing – ***this involves leaving a product in a shade for a while until desired period.***
   - This is specifically meant to reduce water loss for hardy crops like onions, garlic and potatoes. Curing provides protective film on bulbs to increase shelf life



POST-HARVEST MANAGEMENT

VEGETABLES & FRUITS

Stages of post-harvest handling

3. Cleaning

This is a treatment given to remove adhering dust, dirt, extraneous matter, pathogens etc from the surface of the produce. It sanitizes produce to avoid entry of undesirable contents. Both dry (dusting) and wet (washing) methods

4. Washing

Washing should be done with clean water mixed with neutral detergent of 0.1% (1ml/liter). This should take 3-5 minutes and room temperature.

5. Sorting & grading

Sorting is removing undesirable products like diseases, damaged, deformed. Grading is categorizing according size, weight, color maturity etc

POST-HARVEST MANAGEMENT

VEGETABLES & FRUITS

Stages of post-harvest handling

6. Packaging

Putting products in an enclosure is important. Packaging eases handling and transportation as well protection from further damages shrinkage etc to increase shelf life

7. Storing

Vegetables require different storage conditions . Most fruits and vegetables require cool environment mean while others like onions require moderate temperatures of about 15-21°C

8. Transport

Transport of vegetables and fruits contributes to much of post harvest losses especially market produces. Transport temperatures should be maintained normal good stacking should be done

POST-HARVEST MANAGEMENT

VEGETABLES & FRUITS

Sorting and grading of French Beans for Export

POST-HARVEST MANAGEMENT
VEGETABLES & FRUITS

PACKAGING OF FRUILTS & VEGETABLES IN PACKAGING MATERIALS

POST-HARVEST MANAGEMENT
VEGETABLES & FRUITS

POST-HARVEST MANAGEMENT
VEGETABLES & FRUITS

TRANSPORTATION

Thank you [Majora]