Handling fresh mango, watermelon, banana and leafy vegetables and immature flower heads
HANDLING FRESH MANGO

Latin name: Mangifera indica L.

Mango is considered the apple of the tropics and one of the most commonly eaten fruits in tropical countries around the world.

Harvesting

Harvesting maturity. Mangoes normally reach maturity in 4 to 5 months after flowering. When the first large fruits start showing a yellow-pink color on the tree, all the fruits of the same size or larger are ready and have to be picked. Harvesting must be repeated when the remaining fruits, which in the meantime have grown in size, start coloring. When the fruit is fully grown and ready for picking, the stem will snap easily with a slight pull. If a stronger pull should be needed, it means that the fruit is still immature and should not be harvested. In the red varieties an additional indicator of maturity is the development of a purplish-red blush at the base of the fruit.

Harvesting method. When harvesting by hand from the ground is not possible the picker should use a long pole with a cutting blade and a small bag under the blade which holds only a few fruits. For bigger trees the pickers should climb the branches with cotton or fiber bags that they fill and lower to the ground. Fully mature fruits will detach easily at the natural abscission point, whereas half-mature fruits will not. Optimum picking should be done with shears and cutting the stem 1 to 2 cm away from the fruit. This technique permits the reduction of latex exudation and staining of the skin and the entrance of fungus diseases.

The quantity of latex flow depends on:

- Fruit maturity: younger fruits exude more latex;
- Time of the day of harvest: in early morning harvest more exudes;
- Level of rainfall: more latex flows when harvesting after rain;
- Length of stem at harvest: if fruit is picked with the stem, latex flow is minimal.

Unfortunately many pickers harvest mangoes by simply knocking them from the tree, dropping or throwing to the ground; this causes bruises, punctures and cracks and later the fruits spoil. When low fruits are harvested with clippers, it is desirable to leave aprox.1 to 2 cm of stem to avoid the spurt of the milky sap that exudes if initially the stem is cut close.
**Field assembly.** Place the field crates with no more than two to three layers of fruits (separating each layer with sponges to avoid bruises and scratches) and baskets with liners in a sheltered or shaded area of the field or under the shade of the tree. Exposure to the sun of fruits with stains provoked by the latex may be corrosive for the skin. After harvest, latex should be allowed to drain away from the fruit by placing the mangoes with the stem downward on grass below the tree, cutting the stem 1 to 2 cm away from the fruit. When quality of the harvested fruits is very good, in field selection, grading, sizing and packing can be done. Fruits should be freed from debris, and cleaned of soil and eventual leaked latex separated with a clean and soft cloth.

**Post-harvest**

**Treatments.** Wash/clean the fruits or use a clean soft cloth if latex stains and/or residues of chemical treatments are present on the surface of the fruit. In India, it is a habit at the beginning of the harvesting season to artificially ripen mangoes. In the south of the country mangoes are picked at a quite green stage to avoid bird damage and reduce damage during long transport of badly packed produce, on roads which are in a bad condition. On arrival in the final market dealers layer them with paddy straw, covered with plastic, often burning calcium carbide to increase underneath the quantity of acetylene and induce surface color and ripening, which will take place within 5 to 7 days at 15 to 20° Celsius. In developed countries ripening of mangoes prior to shipment is conducted in ripening rooms with controlled atmosphere, temperature and humidity. Treatments with chemicals (such as ethephon which produces ethylene and calcium carbide which produces acetylene) are used in a air tight rooms for 24 hour at 20 to 25° C and 90 - 95% of relative humidity and an adequate air circulation. The treatment causes green mangoes to develop full color in 7 to 10 days, depending on the degree of maturity, whereas untreated fruits require 10 to 15 days.

**Selection/Grading.** Select out all immature, ripe, damaged, scarred or otherwise damaged fruits. In accordance with quality specifications required by the purchaser fruits should be graded in each carton according to variety, size and maturity.

**Packaging.** Mangoes for export or sophisticated internal markets such as supermarkets should be packed in cardboard boxes in single layer and the stem end facing downward or slightly on one side to avoid the latex contamination and with separators Ventilation holes are recommended to improve air circulation.

**Storage**

Mangoes ripen within 4 to 6 days, after harvest at the mature green stage. The ripe fruits have a shelf life of 2 to 4 days. Storage at 10 to 12° C and 85 to 90 % of relative humidity, will maintain fruits in acceptable conditions for up to 4 weeks and fruits will then ripe satisfactorily at higher temperature. These conditions will however depend on the variety, maturity at harvest and time of harvest.
Post-harvest losses

- Chilling injuries. Storage below 10° C for a few days will result in this damage.
- Anthracnose. Consists of small, black, circular spots on the skin which increases with the ripening of the fruits. Post-harvest applications of specific fungicides (imazalil or thiabendazole) may assist in disease control. Dipping in hot water (at 50° C for 5-10 minutes, depending from the fruit size in combination with the fungicide) is also utilized.

HANDLING FRESH WATERMELON

Latin name: Citrullus Lanatus T.

Harvesting

Harvesting maturity. Ripeness in watermelons is difficult to determine because the fruit remain attached to the vine, rather than ‘slipping off’. Harvesting generally begins about 30 days after full bloom and continues with periodical cuts at 3 to 5 days intervals. The most recommended method for timing the harvest of watermelons is to cut a few representative fruits in the field. However, also the following indicators of ripeness will help:

- The tendrils of the leaf closest to the fruit attachment become dry;
- Change in ground spot colour from greenish-white to pale yellow;
- The rind becomes hard to pierce with the fingernails;
- Blossom end “fill out”; and
- The sound of a fruit, when thumped with a finger, is a muffled, dull tone if it is ripe.

Harvesting method. Watermelons are harvested in the afternoon by cutting the stem with a sharp knife rather than pulling the fruit out. Afternoon harvest may reduce the risk of cracking if the field has received abundant water during the previous night. If plants are not too turgid field heat can be minimized by harvesting in the morning. Watermelons do not ripen off the vine. However holding them for 7 days and over at room temperature will improve flavour and colour in seeded varieties. Take care of the wet and dirty soil; if watermelons get dirty clean them with a wet and clean cloth.
Field assembly and packaging. After harvesting, watermelons are stacked in the field itself, on the side rather than on end to reduce the risk of cracking. Placing them in a shaded area will allow to minimize the build up of heat and avoid quality reductions. Packaging in fibreboard boxes or bulk loaded in bins in the field itself taking care to load only dried rather than dew-covered fruits.

Post-harvest

Cleaning and packing is done in the field itself, when the field is easily accessible.

Storage

At 10 to 15° C and 90% relative humidity the fruits can be kept for 2 to 3 weeks after harvest. Prolonged storage will be responsible for reduction in crispness and colour.

Post-harvest losses

Chilling injuries (the pit in the ring will be invaded by micro organisms) will take place after storage below 5° C.

HANDLING FRESH BANANA

Latin name: *Musa* spp.

Include: Plantains ; traditionally grown for cooking as part of the staple diet, or for processing into more durable products, such as flour, which can be stored for later food use. Bluggoe ; uses are similar to plantains as a locally consumed staple food. Dessert; includes Gros Michel and Cavendish types, widely grown for export to temperate countries. The ripe fruit is also eaten where it grows, but in some countries it is cooked in the immature stage or in the mature green but unripe stage as a starchy staple.

Harvesting

Harvesting maturity. Published recommendations of maturity standards for export dessert bananas do not generally apply to bananas grown for local consumption. Many types of bananas are grown for local use in different countries. When bananas are to be sent to distant urban markets they are best harvested in hard mature but unripe green state, which reduces the risk of deterioration during transport.
**Harvesting method.** The method of harvesting will depend on the height of the plant. Low-growing varieties can be harvested by cutting through the bunch stalk about 30 to 35 cm above the top hand. With taller varieties, the stem of the plant will be partly cut through to bring the bunch down within the harvester's reach, and then the bunch stalk can be cut through. Harvested bunches are best carried on a foam-padded tray to reduce damage during carrying.

**Field assembly.** It is customary in most banana-growing countries to transport the fruit to market on the bunch. This practice injures the fruit during handling and transport, and it is not recommended. Bananas for urban markets will suffer less damage and look better if they are de-handed and packed in suitable boxes.

**Post-harvest**

**Selection and grading** Bananas which are very immature and small, badly damaged or decaying should be discarded. Size and quality grading will depend on the demands of the market. In the more sophisticated urban markets (e.g. supermarkets), size-graded and good-looking fruit may command a higher price.

**Packing.** All harvested bananas should be kept dry and in the shade before and after packing. Packing is best done in or as near to the field as possible. There must be facilities for keeping the fruit and packaging dry.

As soon as the hands of bananas are cut from the stem, they should be laid, curved side uppermost, across the midribs of fresh banana leaves. This will prevent latex from the cut crown contaminating the fruit. Latex flow should stop in 12-15 minutes, after which the banana may be packed into wooden or, preferably, cardboard boxes, which can be of the slotted or telescopic type. Whole hands of bananas can be divided into clusters of four or more fruit which can be packed more compactly to give a greater weight of fruit per box.

The hands or clusters should be packed in the boxes with the curved side uppermost, making sure that the crowns of the upper hands do not damage the bananas underneath. Boxes should be full but not over-packed, otherwise the bananas will be damaged because the fruit itself and not the walls of the boxes will be supporting the upper boxes of the stack.

**Post-harvest treatments.** No special post-harvest treatments should be necessary for bananas sold locally or for those which will be sold to consumers in urban markets within four or five days. If sales are to be delayed for a greater time and the fruit sold in a ripening condition, it may be necessary to wash and then dip or spray them with a fungicide before packing.

**Storage**

Bananas have a very short post-harvest life at ambient conditions. This is four to ten days when mature green and two to four days when ripe. Both green and ripe
bananas are sensitive to cold and are damaged by temperatures less than 13° Celsius.

**Ripening**

Bananas harvested in the mature green stage will normally ripen under the local ambient conditions in which they are grown, but some types will not develop their full ripe skin color. Where urban high-value markets demand fully colored fruit, ripening under controlled conditions is best carried out on a large scale at the urban distribution point. The operation requires special equipment, good management and technical skills. Where the ripening operation is to be undertaken locally, advice should be sought from specialists.

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**HANDLING FRESH LEAFY VEGETABLES AND IMMATURE FLOWER HEADS**

**Latin names:** Brassica spp, Beta sp., Spinacea sp., Apium sp., Lactuca sp., Allium.

Include cabbage, Chinese cabbage, kale, rape, mustard, broccoli, chard, spinach beet, spinach, lettuce, celery, green onions.

**Harvesting**
Harvesting maturity. All are harvested in the immature state before the plant has developed to the point of seed production. The older parts of these commodities become fibrous or woody.

Harvesting method. The parts of the plant harvested vary with the crop:

- Cabbage, Chinese cabbage, lettuce, celery and green onions form more or less compact heads; the entire head is harvested at one time;
- Kale, rape, mustard. young shoots, with or without immature flower heads, are picked by hand-breaking; can usually be harvested over a period of time as long as new shoots continue to develop; and
- Chard, beet and spinach are harvested as individual young leaves; sometimes young shoots of spinach are harvested; harvesting is repeated as new leaves continue to develop.

Those crops forming a head, such as cabbage, are cut with a sharp knife. Young shoots and leaves are broken off by hand. Celery and green onions are either pulled by hand or dug from the soil. They should be harvested under dry conditions when soil can be readily shaken from the roots. The roots are then trimmed with a sharp knife.

Field assembly. All these commodities are damaged easily if subjected to pressure. They should be packed loosely in field containers, which must not be overfilled or the produce will be damaged when the containers are stacked. The harvested produce must be kept free from contamination by soil. Leafy vegetables and immature flower heads deteriorate very quickly after harvest because they lose water fast and produce a great deal of heat. The following care is necessary to keep losses to a minimum:

- They must be packed loosely in well-ventilated plastic field containers; if they are piled in a tight mass, the heat they generate cannot escape.
- They must be kept in the shade and not exposed to direct sunlight.
- They must not be exposed to drying winds or they will lose water quickly and become wilted and soft; at the same time there must be enough ventilation to disperse the natural build-up of heat.
- There must be the shortest possible delay between harvest and sale or consumption because leafy commodities have a very short post-harvest life under ambient conditions.

Post-harvest

Selection, grading and handling. All produce which is damaged, decaying wilted or infested by insects or other pests must be discarded. Size-grading is not normally necessary for local and internal marketing. Size-grading may be needed to supply supermarkets.
**Post-harvest treatment.** It is essential to keep these commodities free from contamination by soil or decaying plant material. Do not wash them. Washing them may remove gross soil contamination, but it will also spread any decay through the whole bulk and result in heavy losses. Shading the produce and keeping it in a moist atmosphere helps to keep it cool, reduces water loss, and delays wilting and yellowing of leaves.

Chemical treatments to control decay are not acceptable because they are not very effective and they leave high residue levels because of the characteristic high surface area of these products in relation to their volume.

**Packaging.** For local rural markets traditional containers are likely to remain in use. It is important, however, that containers should not be too large to be carried by one person. Rough handling of heavy packages results in damage to produce. Packaging of leafy vegetables and immature flower heads for urban markets will vary with the type of commodity.

The following are examples:

- **Cabbages:** woven sacks, net bags or field crates of 20-25 kg capacity are suitable.
- **Lettuce:** one layer wooden plastic crates or ventilated cardboard boxes each containing 24 heads of lettuce.
- **Celery:** wooden crates holding 20-30 heads of celery.
- **Green onions:** normally tied in bunches by the grower; they are best transported in small wooden crates holding 10-15 kg.
- **Chard and spinach:** crisp, brittle and easily broken by rough handling; they are best packed loosely in cardboard, wooden or plastic field boxes of 5-10 kg capacity; over-packing will cause crushing of leaves and bruising and rapid discoloration of stems.
- **Kale, rape and leafy brassicas:** may be tied in bunches or packed loose; they can be marketed in nets, cardboard or wooden or plastic field crates of 5-10 kg capacity.

**Storage**

Leafy vegetables and immature flower heads have a very short post-harvest shelf-life, especially under ambient conditions. Even under refrigeration most remain in good condition only up to two weeks. Ideally, they should reach the consumer within two days of harvest.
HANDLING FRESH TOMATO

Latin name: *Lycopersicon esculentum*

Harvesting

**Harvesting maturity.** If tomatoes are to be used in the ripe condition, they should be picked at the earliest when they are at least mature green. Immature tomatoes do not ripen after harvest. The actual stage at which they should be picked depends upon local preference and custom in each country. Tomatoes have reached the mature-green condition when they are fully rounded and have changed from dark to medium or light green, and the skin develops a waxy gloss. As ripening is initiated, the fruit shows a pale pink or yellow tinge, which develops through a definite pink to full red. Most tomatoes are harvested at the early ripening or pink stage, depending on market preference and the time they take to reach the retailer. Tomatoes to be consumed immediately can be harvested when fully ripe.

**Harvesting maturity.** Tomato fruit stalks have a natural break-point. Mature fruit readily breaks away from the cluster when pressure is placed on this point while lifting the fruit upwards. Tomatoes are best harvested into plastic buckets (pails) and transferred if necessary to plastic field crates holding not more than 20 to 25 kg weight.

Post-harvest

**Selection and grading.** All decaying, damaged, undersized and sunburned tomatoes should be discarded. Size-grading for the local market is normally done by retailers. Internal urban markets, including supermarkets, may have differential prices for size grades as against un-graded fruit. Catering and institutional buyers do not normally demand size-graded fruit.

**Post-harvest treatments.** Only those tomatoes which are in good condition are marketed, there should be no need for any post-harvest treatments. Tomatoes produced on a large commercial scale may be subjected to artificial ripening; but in countries where production is mostly on a small scale, this is not necessary since tomatoes are normally harvested at maturity and ripen naturally.

**Packaging.** For local markets tomatoes can be packed in baskets or other traditional containers assuring careful handling, i.e. rigid enough to protect the contents from being crushed. For urban markets cardboard telescopic boxes or wooden or plastic trays with capacities of not more than 10 kg, should be used. Size-graded tomatoes can be pattern-packed in 2 layers for green produce and one
layer for ripe red produce to make best use of the box. Un-graded tomatoes are jumble-packed to a given weight.

**Storage**

Tomatoes have a relatively poor storage capability. Green mature fruit can be held for up to two weeks at 18-20° C and 90-95% Relative Humidity, but for less time under ambient tropical temperatures. Fully ripe tomatoes have only 4 to 7 days' storage life, at 13-15° C and 90-95% Relative Humidity.

**HANDLING FRESH CARROT**

Latin name: Daucus carota.

**Harvesting**

**Harvesting maturity.** Carrots are ready to harvest about 90 days or more after seeding, but continue to grow and enlarge them. Size is the best maturity index. Harvest when the roots are of good size, but still tender.

**Harvesting method.** They may be harvested manually or mechanically. The crop is mowed or preferably the roots are pulled out. The root is separated from the green top with a sharp knife.

**Field assembly and handling**

Carrots should be cleaned by immersion in water tanks. Separation of the soil is facilitated by soft scrubbing with a brush. Final washing in clean water may be needed. If it is the case add chlorine at 1%. Carrots should be packed in plastic or wooden field boxes. Sack should be avoided to reduce handling and transport damages.

**Storage**

If carrots are left too long in the soil or allowed to over-mature, the roots become tough, woody and start cracking. At optimal storage conditions mature carrots can be stored at 0° C and 95-98% Relative Humidity up to 6 to 9 months.
HANDLING FRESH PUNGENT AND SWEET PEPPER

Latin name: Capsicum Sp.

**Harvesting.**

**Harvesting maturity.** Sweet pepper fruits usually are picked when they have stopped increasing in size, are firm to the touch and in the green turning yellow/red stage. Hot varieties are harvested either immature (green) or mature (yellow/red) stage for fresh use or processing.

**Harvesting method and field handling.** All peppers are harvested by hand, with approximately 1 to 2 cm of stem attached, and introduced into baskets that are then emptied into field boxes for delivery to the pack-house or in single layer cardboard boxes for the market. Harvesting of wet peppers should be avoided. Considerable mechanical damage can occur during picking and handling if care is not taken to minimize scuffing and impact.

**Post-harvest handling**

Harvested peppers should be placed in the shade immediately after harvest and cooled, if refrigeration is available, as soon as possible to lower the field-heat. The use of perforated film carton liners or perforated plastic bags increase storage life, although it may inhibit proper cooling and may encourage diseases. Before final packing for market peppers should be selected for uniform maturity, color, shape, size and for freedom from defects (sunscald, mechanical or insect damage or decay).

**Cooling and storage**

Immediately after harvesting, peppers should be cooled to 7° C. If they are allowed to remain at high temperature for more than 1 to 3 hours they will begin to show signs of shriveling, shrinkage, softening, accelerates ripening and color changes.
Peppers are also sensitive to chilling injuries. If kept at temperatures below 4°C, they may show signs of softening, pitting and a predisposition to decay. Peppers are sensitive to ethylene gas produced, as a natural by-product of ripening, by some fruits and vegetables (such as tomatoes, apples bananas and avocados) which never should be stored and shipped together with peppers.

**Post-harvest losses**

Peppers in addition to the chilling injuries described above, are subject to a number of problems: diseases, insects, weather and other environmental factors.

**HANDLING FRESH SWEET POTATO**

**Latin name: Ipomoea batatas**

Sweet potatoes are grown widely throughout the tropics as a basic or subsidiary staple food crop in subsistence economies. They are also widely used as animal feed and in some countries as an industrial raw material.

**Harvesting**

**Harvesting maturity.** Sweet potatoes are considered ready for harvest when the leaves begin to yellow. A further test of readiness to harvest is said to be that of cutting mature tubers; the cut surfaces do not discolor. In some countries experienced growers harvest at a specified time after planting. This has to be based on careful observation and long experience since there is a difference in the maturity period of the various cultivars.

**Harvesting method.** Harvesting is carried out either progressively or all at one time. Subsistence growers tend to harvest progressively, often from the same plants over a long period. Sweet potato crops grown on a commercial scale are usually harvested all at one time.

The preferred harvesting tools for most small-scale producers are pointed wooden sticks or metal bars, or machetes (cutlasses, bolos, pangas), especially where progressive harvesting is practiced. These tools are said to cause less damage to the roots and enable a few roots to be harvested from a plant on each occasion. When the whole crop is harvested at one time, growers tend to use pronged rakes, hoes or digging forks.
**Field assembly.** On no account should the roots be thrown, whether into field and storage containers or at any other time during their handling. Great care must be taken to avoid damage to the skin of sweet potato roots since they are very subject to post-harvest decay under tropical conditions. For this reason it is recommended that the harvested roots be gathered into baskets, boxes or crates in which they can remain throughout their post-harvest life without disturbance, through curing and storage if necessary. Harvested tubers which have damp soil adhering to them at harvest may be left in the field for an hour or so to dry, but not long enough to suffer sun scorch. The soil can then be carefully removed.

**Post-harvest**

**Selection and grading.** All decaying roots should be discarded. Slightly damaged roots can be used for immediate consumption, and those which are undersize or badly damaged may be fed to animals. Tubers which are to be stored should be fully mature and free from visible injury. Most sweet potatoes are size/graded by the retailer if necessary.

**Post-harvest treatments.** Curing of those roots which are to be stored after harvest is the only treatment necessary for sweet potatoes.

The roots should remain in the containers into which they were harvested and in which they will be stored. The containers can be placed in the storage structure and covered with straw. Ventilation should be restricted to allow a buildup of heat and moisture in the store, to give the correct conditions for storage, which are: 27 to 34° C, 85-90% Relative Humidity for a curing time of 15 to 20 days.

Curing is a process of healing by the formation of new skin on damaged areas of sweet potatoes, and also of the maturing and hardening of the whole skin of the roots. The length of time required for curing cannot be forecast since it has been shown to vary even under identical environmental conditions. Indications of maturity are said to be thus: when the skin can no longer be rubbed off easily from a sample root and when small buds appear on the roots.

**Storage**

Sweet potatoes are subject to very rapid deterioration after harvest at ambient tropical temperatures. There are reports in the literature of storage of sweet potatoes for four months or more. In most reported instances of successful storage for such a time the storage temperature has been in the low range of 10-18° C. Even at the higher end of this range sprouting of the roots has been a problem. At temperatures below 10° C sweet potatoes suffer chilling damage.

The storage structures used have been either custom-built ventilated stores, with or without refrigeration, or sunken or underground chambers, protected by a building above. Conditions required for successful storage are as follows:
• The roots must be fully mature and well cured before storage;
• They must be handled carefully at all times and only sound roots should be stored;
• The best temperature range for storage is 10-15°C Celsius; and
• The relative humidity should be 85 to 90 percent.

If there is any indication of free water on the roots or in the store, more ventilation should be provided to remove the excess moisture. If the air gets too dry the floor of the store can be lightly sprinkled with water.

These conditions can be achieved at higher altitudes in the tropics at those times when night temperatures fall to within the required range. In a well-insulated ventilated store, the tubers can be cooled at night by full ventilation and heat rise can be slowed during the day by closing the store. It is unlikely that sweet potatoes can be stored at ambient tropical temperatures for more than three weeks without heavy losses from decay and sprouting.

**Packaging.** The best form of packaging for long transport is either wooden crates or cardboard boxes holding not more than 25 kg. The roots should be packed firmly to prevent movement within the boxes or crates during handling and transport. Sweet potatoes should not be packed in 50 kg sacks, which are difficult to handle and, when dropped, cause heavy damage to the roots.

**HANDLING FRESH YAM**

**Latin name:** Dioscorea *spp.*

Yams are grown principally as a subsistence crop and for internal marketing.

**Harvesting**

**Harvesting maturity.** Yams are ready for harvest when the above-ground parts of the plants have died off. The Greater and White Yams can be left in the ground for a time after maturity. Yellow Yams, which have a very short dormant period, should be lifted as soon as mature.

**Harvesting method.** Yams is normally harvested by carefully scraping the soil away from the tubers in order to avoid damaging them. Wooden digging sticks or spades are less likely to cause damage to the tubers than are metal forks or hoes.

**Post-harvest**
Selection and grading. Heavily damaged or decaying yams should be discarded. Those which are slightly damaged may be consumed immediately or subjected to a curing process before storage. Size-grading is not always practiced. It is mainly done when there is an advantage to be gained in the packaging for marketing.

Post-harvest treatments. Where yams are cut or deeply injured, a new skin can be formed on the damaged surfaces by curing the tubers at high temperature and humidity. Curing has been shown to be effective in Yellow and White Yams, but its effectiveness in other types is not known. Injuries caused by skin abrasion or bruising tend to dry out rather than form replacement skin.

A method recommended in West Africa for curing yams which are to be stored is given below. This provides the necessary conditions for raising the temperature and moisture content of the air to suitable levels by restricting ventilation.

The conditions found to be effective in promoting the curing of Greater and White Yams are: 32 to 40° C, 90-95% Relative Humidity.

Curing, which will be done in 1 to 7 days, should be carried out immediately after harvest at the location where the yams are to be stored.

Yams stacked in this method to cure skin damage should be covered with grass to keep the canvas or jute cover from touching the yams. The curing pile should not be exposed to direct sunlight and the cover should be removed after four days.

In humid areas of West Africa yams may be stored in 'barns’ whose side poles have taken root and are growing leaves to provide shade. Inside walls of yam barn are vertical frames to which yams are tied.

Packaging. Yams being sent to local markets may be carried in bulk by vehicle, in ordinary baskets or in plastic or wooden field crates. When they are carried in bulk, the floor and sides of the vehicle should be padded with sacks loosely packed with straw, or with grass mats or plastic foam covered with polythene sheet. Whether the yams are carried in bulk, in crates or in baskets, the vehicle must not be overloaded and should be driven with care. For internal urban markets the tubers are best packed in wooden or plastic field crates or ventilated cardboard boxes. These containers should not be over-packed and must be handled and transported carefully.

Storage

Greater and White Yams in good condition can be stored for several months under appropriate conditions. Yellow yams have poor storage potential due to their very short dormancy period. Although yams may keep in storage for several months, they shrink over such a period owing to water loss and to natural living processes which use up stored dry matter (starch). There may also be additional losses because of decay caused by moulds. There are many different storage practices in
various countries. Owing to the generally non-commercial nature of yam production and limited resources of growers, most storage uses low-cost methods. Yams are generally stored during the hot dry part of the year when the provision of ventilation and other conditions which help to reduce their temperature are key factors. Yams kept in the ground and harvested progressively when needed are subject to attack by insects and other pests. They are also exposed to attack by moulds. Yams kept undug may also tie up limited land resources. The tubers can be piled in small numbers in shaded situations or in well ventilated huts built of local materials, in which case they are best stored on racks or shelves. In West Africa, yam "barns" are a common method of storage. They are vertical frames to which individual yams are tied. The uprights supporting the frames are bush poles up to two or more meters in height. The use of poles which will take root and provide a protective canopy of leaves to shade the yams is of benefit. Such growing poles are also less likely to decay or be attacked by termites. The stored frames of yams may be protected by a fence to keep out rats.

**HANDLING FRESH DASHEEN**

Latin name: *Colocasia esculenta var esculenta*.

**Harvesting**

**Harvesting maturity.** Maturity is based on corm size, harvested 8-12 months after planting, depending mainly on desired corm size and on market conditions. Maturity is also indicated by wilting and drying of the older
outer leaves. Length of growth period and senescence of leaves are therefore indicators that the root is fully mature. A few roots should be lifted to ensure that the dasheen is well-formed, evenly shaped, round to oval and brown in color.

**Harvesting method and field handling.** Harvesting is carried out using a fork or a cutlass, and the corm gently removed from the ground. The corms and the roots should be left attached to the corm, the surrounding soil gently broken away from the dasheen, preliminary selection executed (under-sized, damaged, soft, insect damages or infested corms should be removed) and packed into 20-25 kg wooden or plastic field crates. Sacks should be avoided to reduce breakage of the corms, bruising and other damages to the corms. Packing should be executed within the 12 hours of harvest. On arrival at the packing facilities, the dasheen if not cleaned in the field, is cleaned to remove excess soil, preferably by hand and repacked in smaller containers. If handled correctly, dasheen can be stored up to 2-3 weeks. Dipping in water should be avoided in order not to reduce shelf-life. Dasheen for export market could be dipped in a chemical solution (such as Redomil) to control fungal infections. 15 g of chemical should be mixed with 30 liters of water and corms dipped for 5 to 10 seconds. Solution should be changed when water becomes dirty. Drainage is required to remove excess liquid. Corms are packed in “banana “type boxes before becoming fully dry.

**Storage**

Dasheen should be stored at 10-12° C and 80-90% Relative Humidity. If handled correctly corms should remain in good conditions for up to 4 weeks.

**Post-harvest losses**

- Mechanical damages;
- Micro-organism infections; and
- Chilling injuries.