



Cashew growing guide



1. Introduction

Origin and Distribution

Cashew is scientifically known as *Anacardium occidentale*, and locally known as Mkorosho/mkanju (Swahili). The crop originated from Northern part of South America. The Portuguese introduced cashew to Mozambique where it flourished forming extensive forests; eventually it also spread in the East African region. It has spread for over 500 years either naturally or through small holder cultivation.

In Kenya, Cashew is grown along the coastal primarily in Kwale, Kilifi, Tana River and Lamu counties. Some production also takes place in Taita-Taveta and Tharaka-Nithi Counties.

Botany

The cashew nut tree is a first grower, it grows to a height of 10-12m tall, and its trunk is often irregularly shaped. The leaves are spirally arranged, leathery textured, elliptic to obovate, 4 to 22cm long and 2 to 15cm broad, with a smooth margin. The flowers are produced in a panicle or corymb up to 26cm long, each flower is small, pale green at first then turning reddish, with five slender, acute petals 7 to 15mm long.

The nut is attached to the lower portion of the cashew apple which is heart like or conically shaped. The cashew nut (seed) hangs at the bottom of the apple and is c-shaped or kidney shaped. The tree has an estimated economic life span of 45 years.



Uses

It is grown for its fruits as well as nuts. The kernel is obtained by shelling the roasted nuts. The shells yield oil which is used as medicine, preservative and water proofing agent. The oil is also used in the manufacture of insulating varnishes and acid proof cements, tiles and inks. The raw cashew apple is edible and is a valuable source of sugar, minerals and vitamins. Nutritive values of cashew apple and nut are very high. Cashew apple is a very good source of Vitamin C. It contains 12.3% carbohydrate and 10% phosphorus and calcium. Cashew nut (kernel) contain protein (21.2%) and fat 46.9%) and carbohydrate (22.3%). It also contains comparatively good amount of minerals, iron and phosphorus. The wood and shells are used as fuel.

2. Contribution to the Kenyan Economy

Kenya produces about 15,000 metric tonnes valued at 397.4m annually against a potential of 63,000 metric tonnes estimated to have a value of 1 billion. Most of the cashew produced is from small-holdings involving about 68,000 farmers.

The sub-sector has the potential to create employment through value addition and fetch the exchequer billions of shillings through exports.

3. Ecological requirements

Cashew does well in tropical climate with high and constant temperatures. It is frost sensitive.

Latitude

Cashew trees grow in a wide spectrum of climatic regions between 25°N and 25°S latitudes.

Altitude

It can be grown in elevations of between 0 and 1000 metres above sea level with an ideal elevation of 600 meters above sea level. Above the altitude of 1,000 meters above sea level, cashew trees do not tolerate low temperatures as this interfere with reproductive cycle of the tree and leads to delayed flowering and poor yields

Temperature

Cashew requires hot temperatures of between 24 and 28 degrees Celsius but can thrive even in temperatures of 40 degrees Celsius. The optimum monthly temperature for cashew growing is 27° C.

Rainfall

Rainfall should be between 800mm to 1600mm per year. Dry weather is required for the cashew plant to flower. A period of at least 4 to 5 months of dry weather after the rains is required for optimal yields. Excessive humidity leads to emergence of many fungal diseases for the cashew plant. Long days of sunshine are necessary for cashew to bloom and give a good yield.

Soils

Cashew prefers a deep (>2m) well-drained and light textured soil. Heavy clay (including dark cracking clays), compact and hard surface setting soils hardpans or with concretions within rooting zones are not suitable for cashew production. Cashew could be described as a sand loving plant. The optimum range of pH for cashew is between 4.5 and 6.5 and the minimum pH is 3.8. The tree is not tolerant to saline soils. It does not grow well in valleys, flood plains and swampy areas with poor drainage.

3. Varieties

Recommended varieties of cashew are A75/83, A100, A81 and A82. Cashew can either be propagated by seeds or grafted seedlings.

VARIETY	POTENTIAL YIELDS /Kg/Tree	<i>Kg/Acre</i>
A81	50	1400
A82	55	1540
A75/83	70	1960
A100	60	1680



4. Cashew propagation

Cashews are usually propagated through seed or grafted seedlings. In propagation by direct seeding 3 seeds are planted in the planting hole and two months after germination the weak seedlings are uprooted leaving the strong one to grow.

Propagation through grafted seedlings

Propagation through grafting starts by raising rootstock. Rootstock is raised from local cashew varieties. First step is visual selection of seeds to remove diseased or deformed seeds. The selected seeds are taken through flotation test in water. Seeds that sink are then planted in pre-germination beds.



Pre – germination beds



Cashew seeds on pre- germination bed



The pre-germinated seeds are transplanted into polythene bags when they produce 2.5 –3cm radicals (Tap root) after 7-10 days. The recommended soil media for cashew seedlings is in the ratio of 2:1:150 where :- 2 - is two buckets (debes) of soil, - 1 - is one bucket (debe) of well decomposed farmyard manure - 150 - is 150gms of DAP. The seedlings are transplanted in polythene bags of (6" X 9"). This composition is able to hold the plant for averagely three months after transplanting the pre-germinated seeds in them.

Seedling are ready for grafting when they attain more than two functional leaves and, preferably while the cotyledons are still attached to the young stem. Grafting is done 3-4 weeks after transplanting into polythene bags.

Scions for grafting are harvested from mother plants of the variety intended propagated. The following procedure for grafting is recommended:

- i) Cut and remove the actively growing part of the stock, leaving two functional leaves

- ii) Vertically cut down the stock between the two leaves to a depth of 2.5 – 3.0cm
- iii) Make a wedge cut of the scion of a similar length of 2.5-3.0 cm and sharpen it.
- iv) Insert the scion to the rootstock and tie them together.
- v) Cover the scion and the rootstock by wrapping with a grafting tape.
- vi) Wait for 2-3 weeks and unwrap the scion



Grafting tools: Tree pruner, Pruning saw, Secateurs- for harvesting scions, pruning

- Grafting knife and Grafting tape



The seedlings of cashew are grown under shade 60% and hardened off before planting in the orchard. It is very important not to disturb the root system during planting. Young trees should be supported for the first 2 to 3 years so that the wind will not blow the plants over.

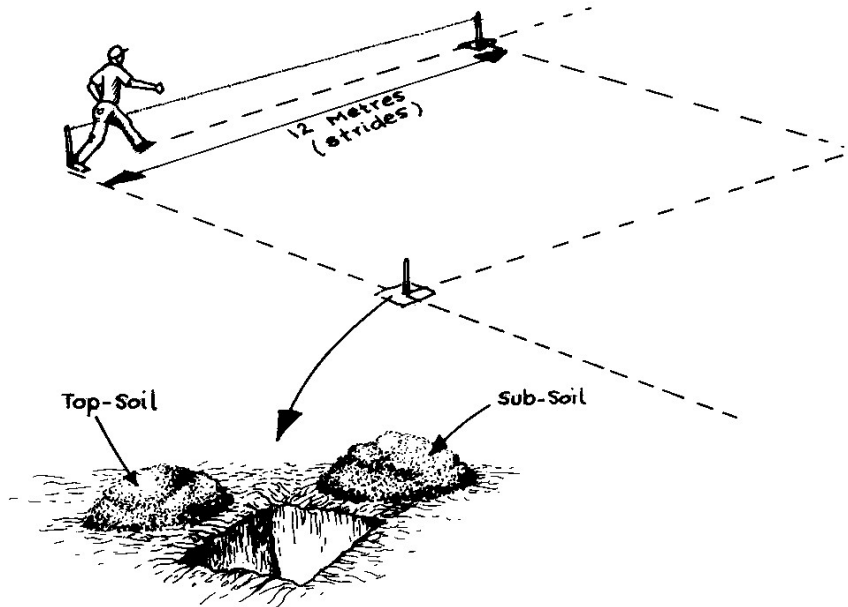


5. Planting

Cashew should be planted at the beginning of the rain season. The best time for planting will depend on available soil moisture. In the Coastal lowlands, the best time for planting is April to June.

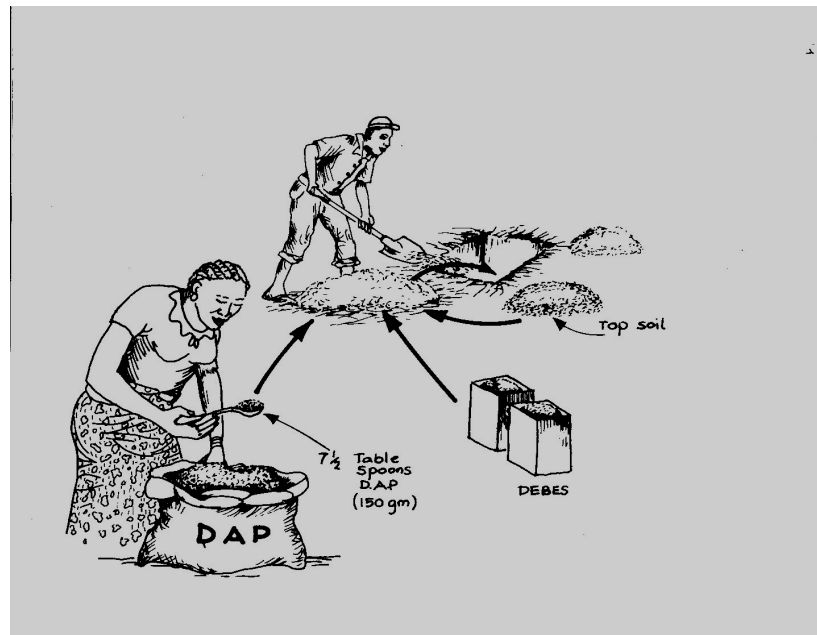
To establish a cashew orchard the following steps are recommended.

- Plough the land thoroughly, removing stems and roots
- Lay out the field by spacing holes 12m x 12m.



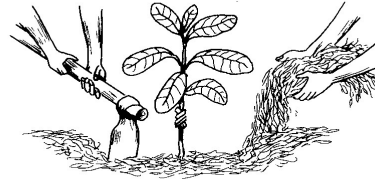
A Spacing of 6m by 6m can be adopted with intention of thinning to 12m by 12m at a later stage when the canopies start to overlap.

- Dig holes one or two months before planting. The depth should be 60cm x 60cm x 60 cm (2ft x 2ft x 2ft).
- Mix the top soil with two buckets of well decomposed farmyard manure and 150g (7.5 table spoonful) of DAP

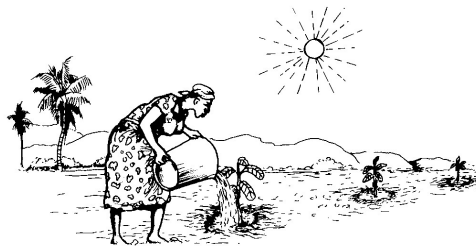


- Carefully remove polythene bag without disturbing the roots and plant at the centre of the hole. Plant the cashew seedling on the same soil level as that of the soil when the seedling

was in the polythene bag i.e avoid burying the graft union. Prepare a shallow basin and cover with mulch and water after planting.



- Water the plant every 3-4 days until it has properly taken.



- Intercrop with short duration perennials e.g pawpaws or food crops e.g maize, cassava, cowpeas
- -vegetables e.g tomatoes, melons, pumpkins, chillies, brinjals
- Ensure that the orchard is always free from all kinds of weeds

Management of young orchard

Formative pruning

Formative pruning is the training done on the grafted plants to make the tree grow upright to a height of 1.0-1.5 m. This work should be done within the first 5 years after establishment of the cashew tree and is important for continuous development of the tree.

Removal of suckers

Suckers are shoots growing from the rootstock. They compete with scions for food hence they should be removed. Lateral branches on the scions suppress upright growth of the scion material. When removing horizontal shoots/branches, ensure that leaves of the main stem are not removed. Desuckering should be done continuously in year one until the tree is 1 m high.

Fire breaks

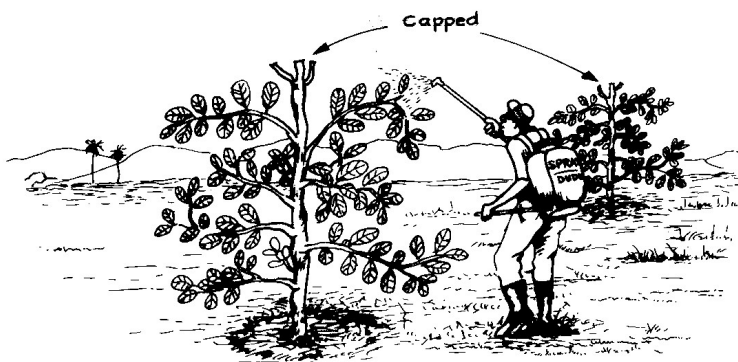
To avoid the risk of fire in the field, it is necessary to put fire breaks around the field soon after planting particularly during the dry season

Control of insects pests

Young cashew seedlings are susceptible to damages caused by cashew bugs and coconut bugs therefore it is important that the seedlings are routinely protected against the insect pests.

Shading

If drought conditions occur, shade or mulch and irrigation should be provided to the seedling.



Recommended fertilizers rates

Animal manure and compost are the most desired types of fertilizers for Cashew. However, if manure is not available or intensive production is carried out, chemical fertilizer DAP (Diammonium Phosphate, CAN (Calcium ammonium nitrate and Potassium Sulphate can be applied. The fertilizer and manure rates recommendation are as given in the table below.

Fertilizer and manure rates for Cashew

Year	Manure (10-15 kg tin)		DAP (g)	CAN (g)	
	Long rains	Short rains		Long rains	Short rains
I	2	1	150	180	180
II	2	1	520	360	360
III	2	2	780	540	540

Above III years	2	2	780	540	540
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Irrigation

Irrigation is important during establishment of young trees because it doubles the growth tempo of young trees in a dry season. Due to the deep root system the trees can survive several months without irrigation. Mature trees should receive 1800L of water per tree every 2 weeks.

Wind control

Grass strips in the inter-rows between the tree lines are ideal to prevent erosion and should be cut regularly.

Pollination requirements

Pollination is mostly carried out by insects and after the process, it takes 6 to 8 weeks for fruits to develop. Concentration of honey bee colonies during flowering would alleviate problem of poor fruit setting.

8. Managing old cashew orchards

The following options are available for improving old cashew orchards depending on their condition.

Pruning

Pruning is done to remove unwanted plant parts. It is best done immediately after harvesting the last nuts and before flowering to give an allowance for wounds to heal.

- Remove all the dead branches
- Remove intermingling branches that prevent light penetration
- Remove branches that have been attacked by pests and diseases.
- Remove all branches that are below 1 m from the ground level
- Protect the wound by painting
- Tools used: Pruning saws and secateurs

Selective thinning

This is removal of unwanted trees from the orchard.

- Remove trees that are too closely spaced
- Remove diseased trees
- Remove unproductive trees
- Remove undesired varieties
- Remove volunteer trees

Rehabilitation of old and unproductive trees

Pollarding

Pollarding is a pruning system in which the upper branches of a tree are removed, promoting a dense head of foliage and branches. In cashew severe pruning of the tree is done at a height of about 3m to reduce canopy to allow easier spraying and harvesting. Once the tree is pollarded the canopy grows again and the tree flowers the same year.

- Remove the whole canopy at a height of 2.5 to 3.5 m from the ground
- Pollard aged but productive trees with large canopies that are difficult to manage.
- Continue with normal pruning

Coppicing

Coppicing is cutting down the tree at a height of 0.5 m to 1 m to renew the canopy

- Coppice old trees
- Unproductive trees
- Low yielding trees.
- Cut the tree at a slope to avoid water settling on the cut surface.
- Allow 3 to 4 sprouts to grow into the new canopy





Top-working

Top working is grafting of sprouts from coppiced trees. Top-work 3-4 sprouts per stem when pencil thick.

9. Pests Management

The most notable insect pests for cashew are the cashewnut bugs (*Helopeltis anacardii*) that suck sap from the leaves and from the young cashew fruit. Other insect pests include stem borers, thrips, mealybugs, weevils, caterpillars and leaf miners. Diseases include Anthracnose and powdery mildew. The table below shows the main diseases and pests found in the coastal region and recommended control measures.

Pest	Damage	Pest management
<p data-bbox="115 235 451 292">Helopeltis bugs (<i>Helopeltis anacardii</i>)</p>  <p data-bbox="115 722 556 1088">Helopeltis bugs or mirid bugs are the most important pests of cashew. They are slender, delicate insects, about 7- 10 mm long with long legs and antennae. The females are red and the males brown to yellowish red. They lay eggs inserted into the soft tissue near the tips of flowering or vegetative shoots. Nymphs (immature bugs) are yellowish in colour.</p>	<ul data-bbox="577 235 1291 649" style="list-style-type: none"> • Adults and nymphs feed on young leaves, young vegetative and flowering shoots, and developing fruits. • Attacked leaves are deformed and show angular lesions, along the veins, which may drop off, so that the leaves appear as if attacked by biting insects. • Feeding on the stalks of the tender shoots causes elongated green lesions, sometimes accompanied by exudation of gum. • Severely damaged shoots die back. • Develop 'witches broom' • In case of serious infestations the trees may appear as if scorched by fire.  <ul data-bbox="577 933 1291 1079" style="list-style-type: none"> • Bug feeding on developing apples and nuts causes brown sunken spots • The growth of trees is seriously retarded and fruit formation of attacking flowering shoots is reduced. 	<p data-bbox="1333 235 1711 267">How to manage Helopeltis bugs:</p> <ul data-bbox="1333 276 1942 738" style="list-style-type: none"> • Monitor the crop regularly. Helopeltis attack occurs very suddenly and great vigilance is very important to control this pest, particularly during the rainy season or when water is available leading to flushing (production of young shoots) when Helopeltis populations normally build up. • Conserve natural enemies. Weaver ants build nests on cashew trees providing good protection against this and other bug pests. • Do not interplant cashew with crops that are host for Helopeltis bugs, such as cotton, tea, sweet potato, guava and mango.

Coconut bug (*Pseudotheraptus*



wayi)

Adult bugs are reddish brown in colour and 12 to 14 mm long. Nymphs are red brown to green brown in colour and have long antennae.

Bug feeding causes necrotic bruise-like depressions; a hard lump develops, which can be easily removed when the fruit is peeled. The bug sucks on the developing fruits causing pockmarks. The kernels are also affected showing spots, which lower their market value.



- Use of synthetic pyrethroids
- ***Conserve natural enemies. Weaver ants nest on cashew trees deterring and feeding on coconut bugs.***



The cashew weevil (*Mecocorynus loripes*) The cashew weevil is large weevil, about 20 mm long, and of a knobbed appearance. It is dark grey-brown in colour.



The female weevil lays single eggs in small holes in the bark of the trunk or branches. The larvae are legless grubs, whitish in colour with a brown head. They bore through the bark and move downwards tunnelling under the bark while feeding on the sapwood.



Brown-black seen on the branches. trees become damaged eventually plantations severely

gummy frass is trunk and main Heavily attacked ringed by sapwood and die. Neglected are likely to be attacked. Fully-grown larvae pupate in a chamber about 2 cm below the bark.

- Cut away bark from damaged areas of lightly infested trees and kill the larvae and pupae underneath. Repeat this every month for a further six months if required.
- Destroy severely infested trees. First collect and destroy all adult weevils; then fell the tree and remove the bark to expose all larval galleries; kill all larvae and pupa and burn the tree.




Red-banded thrips (*Selenothrips rubrocinctus*)

Adults of the red banded thrips are dark brown or blackish. Nymphs are pale yellow with a broad transverse red band on the dorsal side of the abdomen. Thrips attack older leaves, flowers and shoots. Attacked leaves drop off leaving bare shoots with few young leaves at the tip. Infestation of flowers causes poor fruit formation. Locally limited infestations may cause considerable damage

- Conserve natural enemies. Anthocorid bugs are important in natural control of thrips.

<p>Mealybugs (<i>Pseudococcus longispinus</i>)</p> <p>The long-tailed mealybug (<i>Pseudococcus longispinus</i>) attacks shoots, inflorescences, apples and nuts)</p>	<p>Affected parts appear completely white. Trees infested during the flowering stage fail to produce fruits, whereas those infested at the nut swelling stage produce discoloured nuts, which result in a lower grade. However, cutting tests showed no difference in kernel outturn between clean and discoloured nuts.</p>	<p>Conserve natural enemies. Mealybugs are usually controlled by a wide range of natural enemies. However, use of pesticides may kill these natural enemies leading to mealybug outbreaks.</p>
<p>Cashew stem girdler (<i>Paranaleptes reticulata</i>)</p> <p>Adults are a long horn beetles, with a body length of 25-35 mm and with antennae longer than the body. The head and the thorax are dark brown; the wing cases are orange with large black blotches giving them a reticulate appearance</p>	<p>. Adult beetles girdle branches from 3-8 mm in diameter leaving a V-section cut; only a narrow, central pillar round the pith zone is left, which eventually breaks off. Female beetles lay elongated eggs in transverse slits made in the bark of the girdled branch at points above the girdle. Larvae are yellow, in colour and reaches a length of 45 mm when fully grown. They mine in dead wood of the girdled branches. Pupation takes place in the dead wood. The lifecycle takes one year. This beetle is a common but usually minor pest of cashew in the Coast Province of Kenya. However, neglected plantations may be severely damaged.</p>	<p>Once a year (in November or December) collect and burn all girdled branches should be collected and burned. Only the dead or dying part of the branch above the girdle needs to be collected.</p>

10. Disease Management

Disease	Damage	Disease management
<p>Cashew powdery mildew (<i>Oidium anacardii</i> Noack). It is a major disease problem in Kenya. May cause crop loss of 70 – 100%. Mildew develops best during the dry season. Loves cold nights which are followed by warm daytimes, leading to mist and fog conditions in early morning. The optimum condition for development of mildew: Temperatures 26-28°C, Relative humidity of 80-100%. Loves poorly ventilated canopies. It is spread by wind.</p> 	<p>Mildew infection is characterized by the formation of an ash-white powdery coverage on the surface of the attacked organs. The fungus infects young and tender tissue on most aerial parts of the tree: shoots, leaves, flowers and fruits (apples and nuts). Flowers may be attacked even before opening. Heavily infected flowers become necrotic and unable to open. They often drop down. Crop loss is due to flower attack. The fungus attacks on both sides of leaves. Heavily infected leaves become necrotic and fall down. Older leaves are rarely affected. Apples appear deformed and shriveled. Cracks develop as the apple tries to enlarge. Apples remain small in size. Heavily infected nuts may abort and those which manage to mature, remains rough, dirty and under grade.</p>  	<p>Cultural control: physical removal of off-season sources of inoculum (water shoots, off-season flowers) This delays on-set of disease and saves fungicide for control. It can be one through thinning i.e physical removal of some of closely planted trees to provide adequate space to the remaining trees.</p> <p>Pruning: removal of some branches/shoots within a tree to provide adequate aeration and ventilation to the tree.</p> <p>Chemical control: Use of recommended fungicides</p>



Anthracnose
(*Colletotrichum gloeosporioides* Penz)

- Attacks young tender parts of cashew (shoots, leaves, flowers and fruits)
- Black spots appear on attacked parts
- Concentric rings on apples
- Infected organs dry out and cling on, do not fall down, thus referred to as “hanging nuts”.



Cultural control
Removal and burning of infected organs before start of cashew season
Chemical Control: Copper based fungicides

<p>Black mould <i>Pilgeriella anacardii</i></p>	<p>Chlorotic spots on upper surface of leaves which spreads to lower surface as infection progress. Dark brown to black fungal patches on leaves.</p> <ul style="list-style-type: none">• Leaves shriveling and dropping from plant <p>Damage most severe on dwarf cashew varieties</p>	
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<p>Angular leaf spot <i>Septoria anacardii</i></p>	<p>Angular cream colored lesions with dark-brown margins on leaves of seedlings. Angular black lesions with chlorotic halos on mature trees. Defoliated seedlings</p>	<p>Currently no control measures are used</p>
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		<p>Monitor crop regularly for signs of damage; conserve populations; avoid interplanting cashew with other crops which are hosts for helopeltis bugs such as tea and cotton.</p>
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11. Harvesting of Cashew and post-harvest handling

Cashews planted by using seed are usually ready for harvesting 3 to 4 years after transplanting seedlings.

Nuts should be harvested as soon as possible, especially under wet conditions and should be dried before storage.

Grafted seedlings can yield within 2 years. Depending on age and maturity of plant, a tree can give between 10 to 100 kilograms of unshelled nuts per year. One hectare can give between 2000 to 5000 kilograms of unshelled nuts per year. Harvesting can continue for 40 to 50 years. Commercial harvesting is done for 35 years.

The cashew nuts do not mature at the same time. The duration of harvest extends from 45-75 days and the nuts should be collected daily during this period. November to May is the harvesting period, November to January is the peak harvesting period. To get good quality nuts, clear the area beneath the tree, collect fallen fruits, detach the nut from the apple and dry the nuts under the sun for about 2 hours. The nuts can be graded into Fair Average Quality (FAQ) and Under Grade (UG). FAQ are well matured nuts and they should be full and well dried (12% moisture content). The colour should be grey or pale brown. They should neither be wrinkled nor spotted.



FAQ Cashew nuts

UG are well dried and mature nuts. They can be spotted but not wrinkled.

Other grading systems can be used depending on the buyer.

