

Research and Methods

The cultivation of cashew

Anacardium occidentale L.
Anacardiaceae

Cashew tree requirements

Temperatures and sunlight

Cashew is sensitive to cold and altitude and production decreases noticeably at over 600 metres. It is generally found in coastal plains and the adjoining low hills. It is a tropical tree that likes high temperatures, having spread from its original habitat to semi-arid regions where maximum temperatures can exceed 40°C. It can be considered that a monthly average temperature of about 27°C is the optimum. In most of the major cashew nut production regions, daily average minimum temperatures range from 15 to 25°C and average maxima from 25 to 35°C. Extreme minimum and maximum temperatures are 5 and 45°C respectively.

Cashew is well-suited to long dry seasons and fairly low relative humidity and performs best with ample sunshine all the year round.

Rainfall

Cashew grows under very varied rainfall conditions. In India, it is found in regions with annual precipitation ranging from 500 to 4 000 mm. The soil must drain perfectly when rainfall is heavy since the trees cannot withstand flooding, even for a short time. Its vegetation grows exuberantly in regions with abundant precipitation distributed regularly throughout the year but it flowers and fruits little. Furthermore, the quality of the fruits produced under these conditions is poor, with as much as 40% of the nuts affected by moulds during storage.

Good cashew fruiting requires annual rainfall of between 800 and 1 800 mm, distributed over five to seven months, with a well-marked dry season. Nevertheless, fruiting within this 800 – 1 000 mm range depends on droughts and may therefore be irregular. In other words, for this factor the 1 000 mm isohyet is the limit for obtaining regular harvests. The ground water level is the determinant factor in the behaviour of cashew in zones where the annual rainfall is 500 mm or less.

Relative humidity

Relative humidity should be low during the dry season. Indeed, trees exposed to a moist

climate throughout the year are usually in poor health (anthracnose, etc.). In zones with low rainfall (less than 800 mm), higher relative humidity during part of the dry season can reduce the water requirements of the trees. In contrast, dry winds accentuate normal dry season desiccation and cause the flowers to wither, resulting in substantial losses.

Soils

Cashew performs better on good soils than on poor soils, but its potential has hardly ever been tested by growing selected varieties on good soils. The best soils are deep, light, well-drained clayey-sandy soils with no hard horizons and with ground water at a depth of between 5 and 10 m. It also grows well in purely sandy soils, in spite of the risk of mineral deficiency. If it is not too compacted, laterite gravel allows penetration but roots by slows growth. In shallow soils, cashew competes for water with the surface vegetation during the dry season. Growth is modest under these conditions and may be completely inhibited if weeding is not carried out.

Varieties

The varieties are classified by size and the colour of the apple. Local names are based on the characteristics of the apple. Distinction is made between several local varieties in some countries, and especially in Brazil.

Valeriano (1972) determined two types of cashew—small and large—each being subdivided into different varieties characterised by two colours of fruit, red or yellow, and three apple shapes, round, pear-shaped and oblong. All the other intermediate colour, shape and size characteristics define sub-varieties.

The 'Jumbo' variety that originated in Brazil but is present in Côte d'Ivoire is reported to be much appreciated for the size of the nuts, especially in Trinidad.

In Brazil, the varieties *Amarelo Gigante* and *Vermelho* have been classified. Distinction is also made on the basis of the shape of the apple: *Redondo*, *Comprimido* and *Banana*. The island of Itaparica off the Bahia coast is famous for the *Manteiga* or *Butter* variety.

Description

Cashew originated in Brazil, just south of the Equator between the coastal plain and the *sertão*.

Cashew trees are 5 to 20 m in height, generally branched towards the base and usually have a rounded habit. The leaves are single, alternate, whole obovate or obovate-oblong, leathery and smooth on both faces.

The inflorescences in the form of terminal corymbiform panicles are 15 to 65 cm long and consist of a mixture of male and hermaphrodite flowers.

The fruits are kidney-shaped nuts 2.5 to 3 cm long and 2 to 2.5 cm wide. They hang on an enlarged peduncle (the cashew apple) that is generally more or less pear-shaped and yellow or red; this measures 4 to 8 cm long and 4 to 6 cm wide.

The taproots of cashew trees grow very fast under favourable conditions (80 cm after 4 months and 2 m or more after 2 years).

Research and Methods

In Colombia, some varieties (*Gigante del río Magdalena*, *Larga di Nazareth*, *Pequena del Meta*) would appear to be the result of natural crosses. The first variety also seems to be known by the names *Amirillo* and *Roja*.

Two varieties are reported in the Bataan region in the Philippines, one with yellowish fruits and the other with red fruits.

In Vietnam, distinction is made between two varieties on the basis of the colour of the apple. These are referred to as the bright red variety and the golden yellow variety and seem to correspond to the American varieties *Maranon rosado* and *Maranon amarillo*.

In Malaysia, the *Americanum* and *Indicum* varieties differ in the shape of the fruits.

In West Bengal, a variety with red fruits and high productivity is known locally as *Hajari*.

Creation of plantations

Soil preparation

Cashew seedlings are very sensitive to competition from weeds. Nevertheless, the vegetation should not be removed before sowing and while the trees are still young, especially on sloping land, in order to prevent risks of wind and water erosion. Bushes and grasses can be removed before planting in the zones less susceptible to erosion. Weeding is then performed around the trees and the growth of secondary vegetation is kept back while the trees become established.

Sowing

Sowing or planting is performed during the rainy season in non-irrigated zones. Sowing in the orchard with or without prepared plantation holes has long been recommended as a technique for large and small areas. It has the advantage of allowing the plant to develop its root system and especially the taproot. It is also the cheapest and fastest method. Its disadvantages are the risk of low germination percentage, the damage caused by animals to poorly protected seedlings and the difficulty of selecting the best plants, whereas this is possible in nurseries after sowing in polybags.

It is generally recommended that sowing should be performed with three seeds in 30 x 30 x 30 cm or 60 x 60 x 60 cm planting holes. The risk of the drying of germinated seeds can be reduced in climates with irregular rainfall and a short rainy season by soaking the seeds

in water, sowing them deeper (5 to 10 cm) and mulching to reduce evaporation.

Seeds germinate in the hilum side in the thickest part. The roots grow vertically downwards and the hypocotyl vertically upwards, bringing the cotyledons out of the seed coat. The best way of enhancing germination is to position the seed with the peduncle zone upwards so that the seed coat opens at the top.

Crop protection

Pests

Borers

- Coleoptera

Apate terebrans: reported in Brazil, Côte d'Ivoire and Mozambique. Symptoms: oily stain on the bark.

Heilipus sp. infests branches more than five years old, causing them to wither.

Mecocorynus loripes Chevrolat is the most common pest in Mozambique. After hatching, the larvae tunnel just below the bark and feed on the phloem.

Plocaederus ferrugineus L. has been observed on trunks and roots in India. The symptoms are small holes in the bark at the base of stems, exudation of gum and wood debris in the holes, leaf yellowing and fall and withering of shoots.

Control: infested branches are generally cut and burned. To prevent infestation, the base of the tree is painted with a contact insecticide such as HCH 0.1 % or aldrin.

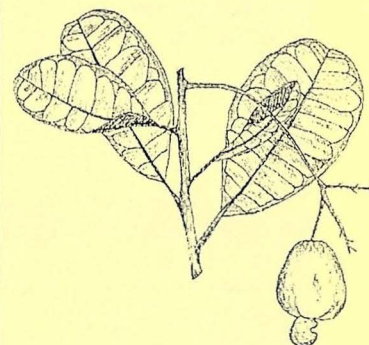
- Lepidoptera

Anthistarcha binocularis Meyrick causes very serious damage in Brazil ('*broca das pontas*' or top borer). The symptoms are similar to those of anthracnose. Control: dimethoate 40 EC 0,12 or 0.4% (dimethoate).

Anarsia epotias Meyr.: the larvae lodge in leaf stalks just after hatching and migrate to folds in bud leaves. Symptoms: withering of young shoots and exudation of gum.

'Cutting' insects

Paranaleptes reticulata Thomson: the most serious pest in Kenya. Symptoms: damage to branches 3 to 8 cm in diameter encircled by a V-shaped incision cut by the adult insect.



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Planting density

Planting distance vary considerably according to the producer country: 8 x 8 m, 16 x 16 m, 10 x 10 m. In practice, spacing generally varies between 10 x 10 m and 14 x 14 m.

General recommendations can obviously be provided but the ecological conditions must be taken into account at each location, using the numerous data available.

Research and Methods

Soil maintenance Weeding

There is a strong negative correlation between the soil depth and the need for weeding. The same applies to the relation between the age of the trees and the degree of weed growth.

Even under the best soil and climate conditions, cashew obviously grows better and more rapidly if weed management starts in the early stages.

The need for weeding results from competition for water and light. Weeding in a circle around each tree is sufficient in the first three years. The diameter of the circle can be limited to 1.5 m at first and then extended gradually to reach 3 metres in the third year.

Pruning

The trees are not usually pruned except for possible removal of the lower branches to allow light to penetrate the trees.

Fertilisation

Age of trees (yrs)	May to June in kg/ha			September to October in kg/ha		
	N	P.O.	K.O	N	P.O.	K.O
1	100	80		50	40	
2	50	40	30	50	40	30
3	100	60	60	100	60	60
4 and	125	60	60	125	60	60

Control: remove and burn all the dead wood that falls to the ground.

Analeptes trifasciata Fabricius: damage similar to that described above.

Leaf-eating insects

Crimissa cruralis Stal.: a serious pest (a red bug called 'besouro vermelho' in Brazil). Adults and larvae feed on leaves. Control: callathion 500g/kg (parathion-ethyl).

Popillia complanata Newm.: adults attack cashew during floral growth and feed on open and unopened flowers.

Insects attacking leaves, flowers and fruit

Helopeltis sp.: a sucking insect whose nymph and adult stages feed on the cell fluids and sap of young tissues of leaves, flowers and developing fruits. Symptoms on leaves: necrotic lesions along the main rib; on the petiole and flower stem: marked depressions with blackening of tissue and oozing gum. Control: Tecnufan 175 cc/hl (endosulfan).

Pseudaonidia trilobitiformis: impoverishment of the sap in the foliage, causing yellowing and falling. Control: as above.

Pseudotheraptus wayii: sucking insect causing stigmatomycosis. The insect develops during the formation of fruits which, on ripening, display small, deep lesions that decrease nut value. Control: treatment during flowering to control other insects reduce the populations.

Selenothrips rubrocinctus: a thrips that is widespread in the tropics. It is not considered to be a major pest since the attacks are always limited to small areas.

Acrocercops syngamma: one of the most harmful lepidopteran leaf-miners, appearing during the vegetative phase of the plant. Damage: caused by the boring of numerous tortuous tunnels that remove photosynthetically important portions of leaf tissue. Control: oil + parathion.

Termites

Present in many cashew producing countries, termites only occasionally cause defoliation resulting from attacks to the root system.

Mites (*Oligonychus coffeae*)

Zones between the leaf veins appear to have been cut and become bright red, then

changing into silvery patches, formed by substances released by the mites. Control: micronised wettable sulphur 80%.

Diseases

Anthracnose (*Colletotrichum gloeosporioides*)

One of the most widespread and harmful diseases of cashew. Its distribution area covers all production regions. The disease develops when temperature and relative humidity are high and is particularly virulent when the cashew flowering season coincides with heavy rainfall. It attacks all the plant organs and especially young leaves and flowers. The leaf edges and extremities display small necrotic spots that are first isolated and then tend to merge as infection progresses. Control: prophylactic measures such as pruning and thinning with the aim of aerating the plants to prevent the disease. Treatment: Dithane M45 200g/hl (mancozeb) Antracol 290 g/hl (propineb).

Cashew powdery mildew disease (*Oidium anacardii*)

This is enhanced by an alternation of rainy days and sunny days and a degree of environmental humidity. Leaves, shoots and inflorescences acquire a white floury coating. The leaf surfaces are slightly discoloured at the sites of the parasite. Chemical control: Microthiol 700g/hl (wettable sulphur 80%), Morestan 30g/hl (chinomethionat).

Stimatomyces of cashew

Stimatomyces is a serious disease caused by attacks of bugs (*Helopeltis* sp. and *pseudotheraptus*) whose pricks enhance fungal infection. Control: essentially preventive by destruction of weed growth that can harbour the pest and by treatment against the insect vector.

Pestalotiosis

Symptoms of the disease consist of leaf lesions in the form of rings that are first transparent and discoloured and then reddish brown, rounded and necrotic. The leaf lesions caused by *Pestalotiosis* attacks differ from the similar lesions caused by anthracnosis in their clear-cut edges and absence of cracking. Control: similar to that of anthracnosis.

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