



Coconut Research Institute of Sri Lanka



Advisory Circular No C 2

INTERCROPPING COCOA IN COCONUT LANDS

Cocoa is well adapted for cultivation in coconut lands in the wet zone. Being a shade loving plant, cocoa benefits from the shade of coconut (Picture 1). Shade is particularly important during the seedling and establishment stage. Also, cocoa improves the soil thereby increasing the coconut yield.



Picture 1: Inter-cropping Cocoa in coconut lands

1. Selection of coconut lands

1.1. Rainfall

Most coconut lands in the wet zone (rainfall exceeding 1875 mm) in the administrative districts of Colombo, Gampaha, Kegalle, Kalutara, Galle, Matara, Kurunegala (Polgahawela, Dodangaslanda, Mawatagama, Katugampola, Dambadeniya, Kurunegala and Kuliypitiya electorates) and Puttalam (Wennappuwa and Nattandiya electorates) are suitable. In the Wet Intermediate Zone (rainfall 1500-1875 mm) cocoa would require supplementary irrigation during dry months, especially during the seedling and establishment stage.

1.2. Soil

Cocoa needs deep soils. Shallow soils or those with a hard pan are unsuitable. Both sandy soils with low water retention capacity and hard clayey soils with poor drainage are not suitable. A deep well drained loamy soil (> 1 meter) with organic matter would be ideally suited.

1.3. Light

Coconut palms should be over 20 years old. Plantations younger than this are not suitable as the available light is insufficient.

2. Varieties

The drought tolerant local variety, Millawana is recommended. The high yielding variety NA-32 is suitable in areas where moisture stress for periods longer than two months, is not encountered. The other varieties belong to Forestro group (green colour pods) are also recommended.

3. Planting material

Growers can obtain recommended planting materials from nurseries managed or approved by the Department of Export Agriculture. They can also raise their own seedlings as follows.

Extract seeds from ripe, undamaged, healthy pods of selected vigorous mother plants and should be washed to remove all adhering mucilage. Plant seeds within two days after extraction in 15 x 20 cm poly bags filled with a mixture containing equal amounts of top soil, compost, sand and coir dust. Water and leave in the shade to germinate. The seed germinates within 4 - 5 days. Select seedlings when 50% of the seeds have germinated. However, seeds, which have germinated after 10 days of sowing, should not be selected. Reject the balance. Seedlings with 4 - 5 pairs of leaves are suitable for planting in the field.

4. System of planting

The following general guidelines should be considered.

1. Avoid competition, cocoa should be planted at least 2.5 m away from coconut.
2. Cocoa rows should be laid in the east- west direction.
3. In order to allow movement of carts and tractors, it is advisable to have an avenue free of cocoa every five or six rows of coconut.

Note: When intercropping is practiced in coconut lands, particularly less-fertile lands, it is necessary to ensure that coconut is not adversely affected due to moisture stress and nutrient deficiency. Fertilizer should be applied to both crops regularly. The growers are requested to read the Advisory Circular No.C1 for some general guidelines for intercropping in coconut lands.

4.1. Double row system

In this system two rows of cocoa is planted in 2.5 m apart between two rows of coconut. The cocoa plants should be 3.0 m apart in the row and arranged in a triangular pattern (830 plants/ha).

The double row system is a intensive form of land use and is more suitable for small units located in areas where soil moisture would not be deficient.

4.2. Single row system

In this system one row of cocoa is planted in the centre of two rows of coconut at a spacing of 2.5m (520 plants/ha). This is more suitable for medium and large coconut holdings.

The double row system of planting cocoa is more productive and yields approximately 40 - 50% more per hectare than the single row system.

5. Planting

Planting should be done with the onset of monsoon rains in Yala. Avoid planting in Maha as the risk of casualties is much greater. The planting holes should be 0.5 m x 0.5 m x 0.5 m in hard soils and 0.3 m x 0.3 m x 0.3 m in loose soils. The planting holes should be filled with top soil mixed with dry cowdung, about 60 g of saphos phosphate and few coconut husks before planting. The pits should be filled upto 5 cm below the soil surface. The polybags should be removed before planting and ensure that the tap root is not damaged. After planting, the seedlings should be protected from direct sunlight. The soil should be mulched with weed trash or coconut husks until the plants are about 3 years old.

6. Training

The main objective of training is to develop a tree with a main trunk, free of side branches up to 1.5 m. If the plant branches at a lower level, remove them leaving a stump (Fig. 3) A new vertical shoot will develop within 2,3 weeks. If branching takes place again before the main shoot reaches 1.5 m, those branches should be removed to allow the growth of a vertical shoot.

7. Fertilizer application

It is important to apply fertilizer to cocoa in addition to coconut. The following mixture is recommended for cocoa (The ingredients should be mixed on the farm just before use).

| | |
|---|---------------------|
| Urea (46% N) | - 4 parts by weight |
| Saphos phosphate (28% P ₂ O ₅) | - 5 parts by weight |
| Muriate of potash (60% K ₂ O) | - 3 parts by weight |
| Keiserite (24% MgO) | - 1 part by weight |

| The rate and time of application | | | |
|----------------------------------|----------------------|----------------------|----------------------------------|
| Season | 1 st Year | 2 nd Year | 3 rd Year and onwards |
| Yala | Application 1 - 75g | 250 g | 350 g |
| | Application 2 - 75g | | |
| Maha | Application 1 - 75 g | 250 g | 350 g |
| | Application 2 - 75 g | | |

Remove fallen leaves and apply fertilizer when the soil is wet and more rain is expected. Since cocoa readily responds to fertilizer, split application is recommended whenever possible. In the first year fertilizer should be broadcast in a circular band 5 cm wide, 15 cm from the stem. From the second year onwards it should be broadcast in a circular band extending from 30 cm from the stem up to half the radius of the canopy. Fertilizer should be forked in and the area mulched using fallen cocoa leaves.

8. Weed control

Bushy weeds in the coconut land should be removed. An area of 100 cm around the plant should be clean weeded and mulched. Weeds in the other areas should be slashed. Once the cocoa plants are about 3.4 years the weeds will be naturally controlled.

9. Diseases

9.1. Pod rot

Pod rot is caused by the fungus *phytophthora palmivora*. Black patches appear in the lower portion of the pod and will spread over the entire surface. Mechanical damage and capsid bug damage (*Heliopenthis ceylanicus*) favour fungal infection. Control of the capsid bug, and destruction of affected pods are important. Planting material should be obtained from resistant trees. The disease can be controlled by spraying Bordeaux mixture.*

9.2. Swollen shoot disease

Swollen shoot disease is caused by a virus and is prevalent in Katugastota and Kundasale areas. Symptoms are swelling of tender shoots and yellowing of the interveinal areas of the leaf. The disease reduces the yield considerably. Planting materials should be obtained from disease-free areas.

10. Pests

10.1. Capsid bug (*Heliopenthis ceylanicus*)

The Capsid bug resembling a mosquito, sucks juice from pods making small black spots on them. When immature pods are attacked, bean production is reduced and the pods become vulnerable to pod rot. Sucking of juice from tender shoots causes wilting. 5% B.H.C. powder could be dusted early morning to control this pest. Exposure of pods to sunlight also helps to reduce the pest damage.

10.2. Stem borers (*Bazura spp*)

This pest bores into the branch causing them to break. The damage is prevalent during the dry season, Kerosine oil may be poured into the holes to kill the grubs.

10.3. Cockchafer beetle

This pest is prevalent in the coconut triangle. It is more active during the night and attacks leaf buds and young leaves, leaving a skeleton of veins. Spraying of a systemic insecticide on leaves and nearby soil twice at 14 day intervals is recommended.

10.4. Mealy bug and scale insects

These insects suck the sap and thereby spread the swollen shoot virus. These pests could be controlled by spraying a systemic insecticide.

10.5. Damage caused by squirrels and rats

Squirrel and rat damage should be avoided by keeping the plantation clean. Squirrels do not eat the beans, which could be collected for processing.

11. Pruning

Upright branches (water shoots) arising on the main branches or side branches should be removed while they are tender. Branches that are dead or damaged should also be removed. Branches should not be allowed to spread any closer than 2 m from coconut palms. Cut ends of the branches should be dressed with coal tar to avoid infection.



Picture 2: Harvesting of Cocoa

12. Harvesting

Generally, the recommended varieties of cocoa as an intercrop flowers in two years and bears fruit in three years. Optimum yields are obtained by the fifth year. A mature tree would yield about 1 kg of processed cocoa beans per year. Depending on the system of planting, it is possible to obtain yields of about 500 - 800 kg of processed cocoa beans/ha.

13. Processing

Well ripened pods are harvested and cracked open with a club to obtain the beans. Avoid using a knife as it could damage beans. The beans are placed in cane baskets lined with banana leaves and allowed to ferment for 3 - 4 days. The beans are then washed in water and sun-dried for 4 - 5 days.



Picture 3: A close view of harvested pods

14. Rejuvenation pruning

After about 15 - 20 years, the branches may become weakened resulting in reduced yield. It is then necessary to rejuvenate the plant by pruning. The trunk should be cut 15 cm above ground and one vertical shoot should be allowed to grow and trained as before.

Bordeaux mixture is prepared as follows: (Use earthenware or plastic vessels)

| | | |
|-------------------|---|-----------|
| Copper Sulphate g | - | 200g |
| Quick lime | - | 200 |
| Water | - | 25 litres |

Dissolve Copper Sulphate overnight in 5 litres of water (suspend in a bag to facilitate dissolving). Suspend lime separately in 20 litres, and strain through a fine cloth. Add Copper Sulphate to the lime, stirring.