

Cocoa as a potential intercrop in coconut in the root (wilt) disease prevalent tracts



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Cocoa (*Theobroma cacao* L) also known as 'Food of god' or 'Chocolate tree' is a tropical perennial, outbreeding crop belonging to the Malvaceae family. It is native to Amazon Basin and was introduced into Africa by Spanish and Portuguese seafarers. Today, cocoa is widely cultivated in most of the humid tropical regions of the globe. However, African countries contribute about 70 per cent of global cocoa production. Cocoa was introduced into India way back in 1798 at Courtallam in Tirunelveli District of the Old Madras State (Tamil Nadu) by East India Company. Cocoa was distributed then in the agro-climatic region covering Western Ghats and Plains of Malabar (Kerala) and Mysore (Karnataka) states, having more rainy days and short dry periods. However, cocoa as a commercial crop, has gained importance in India from early 1970s. From the traditional hilly regions, cocoa production has shifted and expanded to coconut gardens of non-traditional areas of Tamil Nadu and Andhra Pradesh states utilizing the 50% shade available in the gardens and irrigation.

In Kerala, most of the farmers belong to small and marginal category and the income derived

from such small holdings is not sufficient to sustain even the small families. The net income per unit area in coconut plantation need to be increased. This can be achieved by increasing land use efficiency with inter cropping. Among the different crops, cocoa is one of the best suited intercrops for coconut to exploit natural resources like sun light, land and water. The cocoa industry in the country has expanded to a considerable extent in recent years. At present, more than 15 industrial entrepreneurs and firms existing in the field demand nearly 40,000 tonnes of cocoa beans, of which the present availability is only around 45 percent. Cocoa products are being exported and India had a foreign exchange earning of nearly Rs. 1108 crores during 2020-21. Considering the market growth in the chocolate segment in India, which is about 20 percent per annum, cocoa, has great potential to develop in the coming years.

Why as intercrop in coconut garden?

Coconut is amenable for different types of coconut based farming system models with various crop combinations in intercropping, mixed cropping, multi-storeyed cropping etc. As a

Intercropping

Intercropping is a technique to utilize the natural resources like soil, water and sunlight available in the garden. In a scientifically laid out garden with a spacing of 7.5 m x 7.5 m, 75 % of the planted area remains unutilized due to specific distribution pattern of the root system. The active root zone of coconut is confined within 25% of the available area since the active root region is concentrated within a radius of two meter around the base. The space utilization of coconut is very low and plenty of sunlight infiltrates and falls on the ground. As much as 56% of the sunlight is transmitted through the canopy of coconut crown of 15 year old palms. Therefore, intercropping does not affect the growth of the palm and hence any crop can be integrated in coconut garden for maximum returns.

Why Cocoa?

The combination of cocoa and coconut has been found to be the most remunerative and mutually beneficial among the different crop combinations.

- Climatic requirement of cocoa (inter crop) and coconut (main crop) is almost similar
- Cocoa, being a shade loving plant that can be grown in 40-50% shade, is quite ideal in coconut gardens where the shade cast by the adult palms is optimum for its growth.
- There is no competition for water and nutrients as these two crops are having different type of root systems spread across varying depths of soil.
- Coconut is a monocot while cocoa is a dicot. This situation is again favourable in nutrient utilisation as there is a difference in the preference for certain nutrient elements by dicots and monocots.
- Pest and disease problems in both the crops won't affect each other.
- Field operations like pruning and harvesting doesnot interfere with each other.
- Cocoa is a 'women friendly' crop as it does not involve heavy physical labour and pruning, harvesting and post harvest operations can be done by women
- Cocoa adds lot of leaf biomass to soil which improves soil organic matter. Cocoa adds 5.3 tonnes of leaf litter per ha per annum.
- Leaf litter acts as mulch for soil moisture conservation and also for weed control
- It also improves soil micro climate and increases the microbial activity in the soil

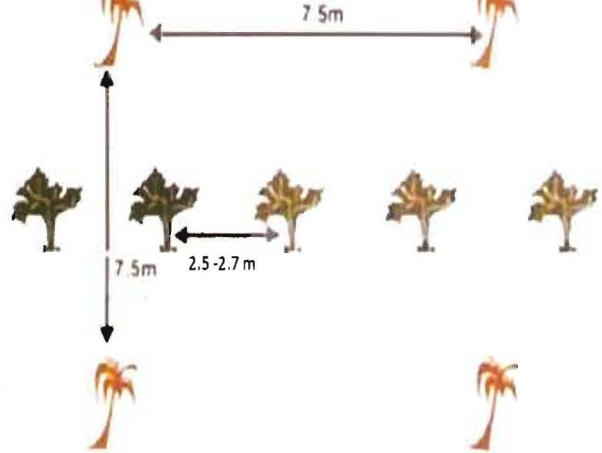


Fig 1. Cocoa as intercrop in coconut- Single hedge system

- Good yield potential and highly remunerative crop
- Assured marketing facilities and export potential of cocoa beans
- Create round the year employment, particularly for women
- Feasibility for processing and value addition on small scale

Earlier, marketing of cocoa beans was considered as one of the major problems in cocoa cultivation. However, today the situation has changed drastically. Many international companies have taken notice of procuring Indian cocoa. They are also willing to procure at a price higher than the international market price. The changed circumstances are the hope of the cocoa farmer today. Therefore, it is imperative to promote scientific cocoa cultivation.

Cultivation and care

Climate and soil

Cocoa is normally cultivated at altitudes upto 1200 m above MSL with an annual rainfall of 1000 mm to 2000 mm and a relative humidity of 80% with maximum 35°C and minimum temperature of 15°C. It is predominantly grown on red laterite soils. It thrives well on wide range of soil types with pH ranging from 4.5- 8.0 with optimum being 6.5- 7.0.

Varieties

There are three varietal types in cocoa namely Criollo, Forastero and Trinitario. Forastero types are known to perform well under Indian conditions. ICAR- Central Plantation Crops Research Institute, Vittal has released VTLCC-1, VTLCS-1 and VTLCS-2 and five hybrids namely VTLCH1, VTLCH2, VTLCH3, VTLCH4 and VTLCH5 (Netra Centura). Kerala Agricultural University has released seven improved clones of Forastero types namely CCRP-1, CCRP-2,

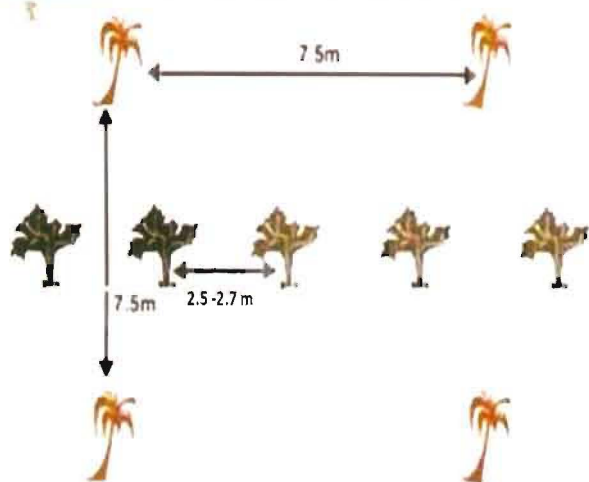


Fig 2. Cocoa as intercrop in coconut- Double hedge system

CCRP-3, CCRP-4, CCRP-5, CCRP-6 and CCRP-7 and 3 hybrids CCRP-8, CCRP-9, CCRP-10.

Propagation

Cocoa can be propagated by seeds. Seeds are to be extracted from pods. Cocoa pods take 150-170 days from pollination to attain the harvest stage. The stage of maturity is visible from the change of pod colour from green to yellow (Forestero) and red to yellow (Criollo). Collection of seeds from biconal or polyclonal seed gardens involving superior self-incompatible parents is recommended to ensure genetic superiority of planting materials.

Selection of planting material

When seedlings are used as planting material, select vigorous and healthy seedlings from polyclonal garden. The planting material should be 4-6 month old seedling or grafted or budded plant.

Planting

Time of Planting : May- June (with onset of monsoon)

Spacing

Cocoa is generally grown as an intercrop in coconut, arecanut and oil palm plantations in India. The general recommendation is single hedge system i.e., planting one row of cocoa at a spacing of 2.5- 3 m in between two rows of coconut spaced at 7.5 m x 7.5 m (Fig. 1). Double hedge system of planting (ie., planting two rows of cocoa in between two rows of coconut) can also be adopted (Fig. 2). Thus, about 500-600 cocoa plants can be accommodated in one ha of coconut garden.

Pit size : 60 cm x 60 cm x 60 cm

Method and time of application of nutrients

Fertilizer application : N: P: K - 100:40:140 g/ plant/year

(Source: Cocoa Notebook, Technical Bulletin No.144, ICAR-CPCRI, 2019)

Majority of the feeding roots of cocoa are concentrated on the surface and horizontally they traverse from 1.0 to 1.5 meters. Thus nutrients have to be applied on the surface of the soil in the cocoa basin and mixed in the soil without damaging the roots to prevent the nutrient losses. The basin size will be smaller for young cocoa plants. The fertilizer should be applied when the soil has sufficient moisture. The time of application is decided by the moisture availability in the field and stage of the crop. In unirrigated crop fertilizers can be applied just before monsoon coinciding the months of May- June and after monsoon (September- October). When the crop is irrigated the pre-monsoon application can be advanced to February- March. As far as possible the fertilizers should be applied before main flush period, before flowering and two months before the peak of the main harvest. Cocoa in the first year of planting should be given $\frac{1}{3}^{\text{rd}}$ of the recommended dose of fertilizer for adult tree. In the second year $\frac{2}{3}^{\text{rd}}$ of the recommended dose and from third year onwards, full dose of fertilizer should be given.

Irrigation

Cocoa is generally a rainfed crop in the traditional cocoa growing countries. In India it is grown under coconut and arecanut as an irrigated crop. As rainfall occurs only from June to October, the remaining period remains dry. Hence, irrigation is essential for performance of the crop during post monsoon season.

Pruning

Pruning is an important operation in cocoa especially when it is grown as an intercrop. The main objective of pruning is to maintain the shape of the cocoa plant to make it more productive and efficient. Formation pruning and maintenance pruning are the two types of pruning generally practiced in cocoa.

Formation pruning

This is practiced for the young cocoa plants. The objective of pruning is adjustment of height of the first jorquette and control of vertical growth. Generally first jorquette is formed at a height between one and two meters. For easy operations in the field the preferable jorquette height is 1.5 to 2.0 meters. Normally the height at which the jorquette is formed depends upon the shade condition of the garden. Low shade intensity leads to jorquette formation

at lower height. When the jorquette is formed at lower height it will be removed at an early stage to facilitate upward growth. The jorquettes have five fan branches. Cocoa plants derived from fan branches tend to produce low and brushwood like canopy. Under such circumstances, the best formation pruning method is to leave 3-4 branches low down. The decision to control vertical growth depends upon the cropping system and the convenience of the farmer. Generally the vertical height is restricted to first jorquette. All the chupons arising from below the jorquette have to be cut regularly to maintain the height (Fig. 3)

Maintenance pruning

This pruning is done on mature trees to maintain the health and vigour of the tree by cutting all the diseased and unproductive branches, which is called sanitary pruning to maintain the structure of the tree. Sanitary pruning includes removal of all unnecessary chupons, dead branches, epiphytes, climbing plants, ant nests, diseased and rodent damaged pods and over riped pods.

Harvesting

Cocoa produces flowers from the second year of planting onwards and the pods take about 140-160 days to ripen. On an average, minimum 30-50 fresh pods per tree are obtained annually from a cocoa plant from the third year onwards. Average production per tree is 90 pods per tree. Generally Cocoa gives two main harvesting in a year i.e., April-June and September- January, though off- season crops may be seen throughout the year especially under irrigated condition. Ripe pods are to be harvested without damaging the flower cushions by cutting the stalk with the help of knife. The harvesting is to be done at regular intervals of 10- 15 days. The damaged and infected pods are to be separated to ensure better quality of beans after processing. The harvested pods should be kept for a minimum period of two days before opening for fermentation; however, the pods should not be kept beyond four days. For breaking the pods, wooden billet may be used. After breaking the pods crosswise, the placenta should be removed together with husk and the beans are collected for fermentation

Major diseases : Charcoal pod rot, cherelle wilt, Pod disease, Stem canker, Vascular

Streak Dieback

Major pests : Tea mosquito bug, Aphids, Mealy

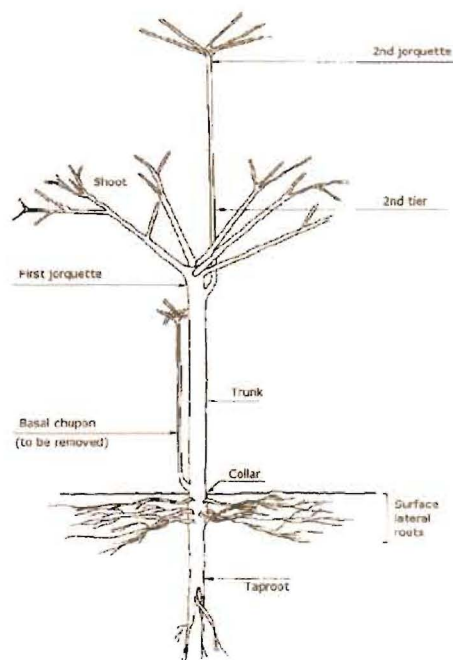


Fig 3. Schematic representation of the cocoa tree (adapted from Mossu, 1995).

bug, Stem borer, Rats, Squirrels

Our experience of cocoa as intercrop in coconut in root (wilt) disease prevalent tract

As part of multi location trial, promising cocoa clones from ICAR- CPCRI, Regional Station, Vittal and Cocoa Research Station under Kerala Agricultural University are being evaluated as intercrop under coconut at ICAR-CPCRI, Regional Station Kayamkulam. The initial performance of cocoa under coconut is promising and the average productivity ranges from 50 to 120 pods per tree. The pest incidences noticed were mealy bug infestation and cherelle wilt at very low frequencies. The low productivity of coconut in the root (wilt) disease prevalent tract is a matter of concern and farmers are reluctant to invest in cultivation of intercrops which need more of investment and manpower. Our experience clearly shows that farmers can introduce cocoa as a suitable intercrop in coconut gardens in the root (wilt) disease prevalent tracts. Considering the additional income from cocoa and assured market for the produce, without any hesitation, farmers can plant cocoa as intercrop in coconut gardens.

Marketing

In newly cultivated areas, marketing is a problem faced by farmers. In Central Kerala, Cocoa Producers Cooperative Society, Mooleplavu, Manimala (Kottayam-686543) has procurement facility and offers reasonable price to farmers.

Hindi Fortnight 2021



Inauguration of Hindi Fortnight by Shri. R. Madhu, Secretary, Smt. Beena S, AD(OL) and Smt. Deepthi Nair S, Dy. Director are seen

Address by Shri. R. Madhu, Secretary, CDB during the valedictory function. Shri. Sadandinu Das, Chief Consultant and Shri. Hemachandra, Director are seen

Coconut Development Board observed Hindi Fortnight from 14th to 28th September 2021. The valedictory function was held on 05th October 2021. Shri R. Madhu, Secretary, CDB chaired the function. Shri Hemachandra, Director, CDB and Shri Saradindu Das, Chief Consultant, CDB were present on the occasion.

Shri R. Madhu, Secretary, CDB delivered the presidential address. Felicitations were delivered by Shri Hemachandra, Director, CDB and Shri Saradindu Das, Chief Consultant, CDB. Prizes were distributed to the winners of the various competitions conducted for the Officers and staff of CDB during the Hindi Fortnight. Prizes were also distributed to the children of the officers and staff of CDB who secured the highest marks in Hindi in the Tenth and Twelfth examinations in the State Board/CBSE / ICSE streams. Prizes were also distributed to the winners of the various competitions conducted for the children of the officers and staff of CDB. Smt. Beena S., Assistant Director (Official Language), CDB welcomed the gathering and Smt. Sangeetha T.S., Senior Translation Officer, CDB proposed the vote of thanks.



Interested farmers may contact Mr. K.J. Varghese, President, Cocoa Producers Co-operative Society @ 9447184735

Conclusion

The combination of cocoa and coconut has been found to be the most remunerative and mutually beneficial among the different crop combinations. Growing cocoa as a profitable crop is possible when intercropping is done scientifically. As Indian beans are found to be best in the world, multi-nationals are looking Indian cocoa beans to make premium quality chocolates and cocoa products. Since scarcity of cocoa has been predicted on a global level, multi-national companies are investing in the cocoa plantations in India to avoid the scarcity. Thus, there is definitely huge potential for good profit margins from cocoa planted as intercrop in coconut.

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