

# Coconut and Cocoa – the best companion crops

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Cocoa is one of the most compatible inter crops suitable for cultivation in the partially shaded inter spaces of coconut gardens. Studies conducted at CPCRI and KAU has revealed that this combination is perfectly compatible. It is generally considered that any area suitable for cultivation of coconut is suitable for cocoa also. If we look into the demand and supply of cocoa in the country we can see that the demand for cocoa beans and cocoa products has been growing at a rapid rate of 15% to 20% per annum. At present there are 10 multi-national companies engaged with cocoa with the capacity to process 30,000 MT of dry cocoa beans per year. The current domestic production of

cocoa beans is 14,436 MT only which is not sufficient to meet 50% of the requirement. Thus, there is a wide gap in the demand and supply of cocoa in our country. India had to import nearly 15,000 MT of cocoa beans along with cocoa products to make up the short fall. Cocoa is also an export oriented commodity. India has gained foreign exchange of more than Rs.294 crores per annum by way of export of cocoa products. Due to high demand for cocoa in the market now farmers are getting remunerative price on sustainable basis since the last ten years. All these show that there is immense scope for expansion of cultivation of this crop in our country especially as inter crop in coconut gardens.

## Why Coconut gardens are suitable for cocoa cultivation.

Coconut as a mono crop does not fully utilize the natural resources such as soil and sunlight available in the garden. In scientifically planted coconut garden with a spacing of 7.5 m, 75 per cent of the planted area is left unutilized owing to the specific distribution pattern of the root system. Coconut palm, like other monocots has a typical adventitious root system. Under favorable conditions, as many as 4,000 to 7,000 roots are found in the middle aged palms. About 74 per cent of the roots produced by a palm under good management practices do not spread beyond 2m lateral distance and 82 per cent of the roots are confined to 30 to 120 cm depth of soil. Thus, the active root zone of coconut is confined to 25 per cent of the available land area and the remaining area could be profitably exploited for raising cocoa. The feeding roots of cocoa grows laterally from the tap root up to 1.2-1.5 meter around the plant at a depth of 15-20 cm. in the soil surface. Hence there will not be any competition for nutrients by roots, if cocoa is planted in the inter spaces of bearing coconut garden.

The space utilization of coconut is very low and plenty of sunlight infiltrates and fall on the ground remain unutilized. The venation structure of the coconut crown and the orientation of leaves allow part of the incident solar radiation to pass through the canopy and fall on



the ground. As much as 56 per cent of the sunlight is transmitted through the canopy during peak hours (10.00-16.00 hrs) in palms aged around 15 years. The diffused sunlight is ideal for growing cocoa in the interspaces. In India coconut is predominantly cultivated in small and marginal holdings. Cocoa also produces pods throughout the year which enable the farmers to earn regular income like coconut palm.

Cocoa tree produces large number of leaves and shed it on regular intervals. Besides, pruning is an essential operation in cocoa and this also helps to increase the availability of organic waste in the garden. This helps to increase the organic matter content in coconut gardens and help to improve health and nutrient status of soils of coconut gardens. A study conducted at the Cadbury-KAU Co-operative Research Project (CCRP) revealed that total annual litter fall from cocoa in partially shaded conditions will be 5.3 tones per hectare, which will add essential plant nutrients such as 66.72 Kg.  $N_2$ , 4.97 Kg.  $P_2O_5$ , 59.72 Kg.  $K_2O$  and 40.27 Kg.  $MgO$  to the soil. Deficiency of Potassium and Magnesium is now commonly noticed in most of the coconut gardens especially in the root will affected areas. Introduction of cocoa as a companion crop not only improve the health of the soil but also increase productivity of coconut by supplying these essential nutrients on sustainable basis in coconut gardens.

Cultivation of cocoa in coconut gardens help to reduce the weed growth in garden which is one of the serious problems faced by the coconut growers due to the high labour cost and non availability of labors. When cocoa is grown as an inter crop the canopy of cocoa closes in a span of about three years, after



which the extend of sun light reaching the ground becomes reduced considerably. This will provide a micro climate in the coconut garden with maximum conservation of water in the soil.

The cost of production of cocoa is very less compared to coconut. A farmer from Idukki district, Kerala made a comparison of labor cost of coconut with cocoa. According to him an amount of Rs.2000/- should be spent as labour charge for getting an income of Rs.20,000/- from a coconut while by incurring an amount of Rs.1000/- towards labour cost an amount of Rs.60,000/ can be earned from cocoa crop. Besides integrating coconut holdings with cocoa will provide gainful employment opportunities for the family labour throughout the year and generate sufficient income to meet the family requirement. Highly fluctuating price of coconut is one of the serious problems faced by coconut growers even though now they are getting ever recorded higher price for the last seven months. Mixed cropping with cocoa is one of the alternatives to protect farmers from price instability in coconut and

make coconut farming system viable and sustainable.

Out of 20.70 lakh ha of coconut gardens, 35% is under irrigation. Availability of such areas in the state like Kerala, Karnataka, Maharashtra, Pondicherry, Tamil Nadu, Andhra Pradesh, Orissa and West Bengal will therefore offer very good scope for its cultivation, where coconut is being cultivated under irrigated conditions. Therefore emphasis will have to be given on new areas for development.

Deficiency of potassium and magnesium is now commonly noticed in most of the coconut gardens especially in the root will affected areas. Introduction of cocoa as a companion crop in coconut gardens improves the soil health and thereby the productivity of coconut on a sustainable basis. The feeding roots of cocoa grow laterally from the tap root up to 1.2 to 1.5 meter around the plant at a depth of 15-20 cm. This prevents any sort of competition for nutrients. Thus, cocoa is a suitable crop which can be profitably grown in the interspaces of coconut.

## Planting cocoa in coconut gardens

In a coconut garden planted at 7.5m x 7.5m, spacing with an age of above ten years cocoa can be planted at a spacing of 3m between plants in a single row system in the middle of two rows of coconut palms. Besides, in between each coconut plant in a row one cocoa plant can also be planted. Thus about 500 cocoa plants can be accommodated in a hectare of coconut garden. Six month old forestero variety hybrid seedlings are generally recommended for planting. The best season for planting is during the month of monsoon season (June-July) but in places where irrigation facilities are available, planting can be done throughout the year. Pits of size 50cmx50cmx50cm should be prepared for planting at the onset of monsoon. The pits should be filled up with mixture of top soil, composts/farm yard manure just before planting and a small planting hole should be made at the centre of the pit. The planting hole should be at least the same size as to hold the basket or polythene bag in which seedlings are raised. While planting, care should be taken to plant the seedlings on the soil surface rather than in deep pits since the feeding roots of cocoa confine to the surface irrespective of the zone at which seedlings are initially planted.

## Care and management of cocoa plants in coconut garden

Application of organic manures will be useful in the early establishment period. It may not be necessary after about three to five years as cocoa litter will be the rich source of organic matter. An annual application of 100g N, (216g urea) 40g P<sub>2</sub>O<sub>5</sub> (195g rock phosphate) and 140g K<sub>2</sub>O (228g

Muriate of potash) per plant per year in two equal split doses is recommended. During the first year of planting the plants may be given 1/3<sup>rd</sup> of the above dose, while the second and third year 2/3<sup>rd</sup> and full dose of fertilizers applied. While applying manures and fertilizers, care should be taken to open only shallow basins around the plants (radius of 1.5m for adult cocoa) and to avoid serious damage to the surface feeding root systems. The radius of the basins should be proportionately smaller for young cocoa. Providing adequate irrigation helps in increasing the yield by about 30 % both in mono as well as in inter crop. Irrigation could beneficially be given once in a week in dry months.

Pruning is an important continuous operation in cocoa. Cocoa grows in a series of stories. The chupon or vertical branch of the seedlings terminates at the jorquette when four or five branches develop. Further chupon develops just below the jorquette and continues its vertical growth till another jorquette develops and so on. When the first jorquette develops at a height of 1.5m, the canopy will form at a height convenient for harvesting and other operations. It is desirable to limit the tree at that level by periodical removal of chupon growth when it is planted as inter crop in coconut garden. Operations like harvesting, spraying etc. will be easier if the height of the trees is kept at the first story level. Generally three to five branches develop at each jorquette. When more fan branches develop one or two weaker ones have to be removed. Similarly overlapping branches are also have to be removed for facilitating uniform light and penetration of every part of canopy. In coconut gardens, where cocoa is planted as stated above, the climate and soil,

allow a continuous growth cocoa trees and will form a jorquette within 6-9 months of planting, the canopies will meet at a spacing of 3 x 3m within 18 months and the 1<sup>st</sup> crop may be obtained towards the end of 2<sup>nd</sup> year or in 3<sup>rd</sup> year.

## Economic Analysis

On an average minimum 30 fresh pods per tree are obtained every year from a cocoa tree. Ten pods will give 1.0 kg wet beans and 3.0 kg of wet beans give 1.0kg of dry beans. The potential yield that can be obtained by adoption of scientific management practices will be 100-200 pods per tree. The average production per tree according to the cocoa farmers from Idukki district of Kerala is 3 kg. dry beans or 90 pods per tree. Trees producing up to 150 pods per year are also available. As per the present price of Rs.50/- per kg for wet beans and Rs.180/-per Kg. for dry beans, the minimum average additional income per acre of coconut garden of 4-5 years will be Rs 36,000/-. As per the experience of farmers the average regular income per acre per year of cocoa tree can be increased to 80,000 to 1, 00,000 by adoption of scientific management practices.

## Use quality planting materials only for planting

The Cocoa can be propagated through seeds and vegetative means through grafting. On account of the right plant architecture, easy in management, low cost and high degree of resistance to stress, seed propagation is preferred. The high genetic variability among the hybrid seedling progeny is generally acceptable as it is proved that the total yield from the unit area of hybrid cocoa plantation is on par with that of a clonal garden. Hence hybrid seedlings produced from seeds collected from bi-clonal or polyclonal seed gardens involving

self incompatible pre potent parent are recommended as planting material for cocoa cultivation. The general quality parameters recommended for seeds and seedlings are:

#### Quality standards - Cocoa seeds

Characters	Standards
Pod size and weight	Medium or large pods of not less than 350g.
Husk thickness	More than 1 cm.
Pod value (No. of pods required to produce 1 kg. wet beans)	Not more than 12
No. of beans per pod	Not less than 35.
Bean dry weight	Not less than 1g.

#### Quality standards - Cocoa hybrid seedlings

Characters	Standards
Age of the seedling	5-6 months
Number of leaves	5-6 pairs
Height of the graft	45-50 cm
Growth	Vigorous seedlings growing straight at the middle of the poly-bag.
Jorquetting	No jorquetting

The production of quality planting material can only be achieved through a regulated network of nurseries set up for production of certified planting material. Up gradation of existing nurseries to meet the accreditation requirement for enhancing their production potential also is being taken up by Directorate of Cashew and Cocoa development (DCCD) with financial assistance under MIDH. The accredited nurseries will be under the monitoring of DCCD, the National Accreditation Authority approved by the Ministry of Agriculture, Government of India. The nurseries will have to undergo an accreditation process involving application to the Authority for approval based on certain essential

and desirable criteria and granting of Accreditation for a year based on inspection by the Directorate. Details of guidelines, and application for accreditation nurseries is available in the website of DCCD.

#### Development programmes for promotion of Cocoa

High yielding hybrid varieties released by CPCRI, Vittal and Kerala Agrl. University, having potentiality for the expansion of the crop under irrigated coconut and arecanut gardens in the major states of India, availability of scientific technologies for improving the production of cocoa beans and Industrial demand for cocoa beans, adequate marketing facilities now provided by both cooperative and private firms with affordable price are the strength available for the development of the crop. However inadequate extension activities, negative attitude of farmers towards this crop due to the set back experienced in 1980's, lack of guaranteed procurement and

fluctuation of price for cocoa beans are the weakness in the expansion of cocoa. With the commencement of National Horticulture Mission in 2005-06 for the overall development of Horticulture in India, the development programmes of cocoa are being implemented by the State under State Horticulture Mission and the DCCD has been authorized to monitor the status of execution of those programmes. In addition to this, the programmes such as Front line technology demonstrations in public areas, publicity measures on cocoa promotion and pest and disease management have also been implemented under the direct control of DCCD. Area expansion is the major component implemented in the development of cocoa for the cause of cocoa. The states of Kerala, Karnataka, and Andhra Pradesh are the main states involved in the development programmes of cocoa under NHM since 2005-06 while Tamil Nadu has provided provision under NHM for the development of cocoa during the year 2007-08 onwards. The development programmes now implementing for the promotion of cocoa cultivation in India under Mission for Integrated Development Horticulture (MIDH) approved by the for implementation are; (i) New plantation development of cocoa with or with out integration with drip irrigation. Financial assistance @40% of the cost cultivation for 3 years limited to Rs40,00/-per ha. with integration and Rs.20,00/-ha (17,000/-central share and 3,000/-state share) without integration is extended under the scheme for a period of 3 years on 60:20:20 basis. ii) Rejuvenation, replanting and canopy management of existing cocoa gardens by extending financial assistance of Rs.20,00/-per ha. iii) up-gradation of cocoa nurseries to meet the accreditation requirement and iv) Intensive

technology transfer programmers etc. So far a total area of 45,519 hectares of coconut/areca nut gardens have been brought under cocoa cultivation with financial assistance under NHM in the states of Tamilnadu, Andhra Pradesh, Karnataka and Kerala and 1163 hectares of cocoa gardens are rejuvenated.

Implementation of intensive technology transfer programmes for promotion of cocoa is another major activity undertaken by the Directorate. Conducting technology demonstrations, seminars, field days, exhibitions, campaigns, exposure visits, training programmes for farmers are being organized by this Directorate in association with research institutes, SAUs, KVK, registered societies, farmers associations, NGO's etc. Financial assistance as per the norms of NHM is being extended for organizing these programmes.

There is immense potential of cocoa cultivation in the coconut growing areas of our country especially in irrigated coconut gardens. Such areas are available in the states of Kerala, Tamil Nadu, Pondicherry, Andhra Pradesh, Orissa and West Bengal. The present production of Cocoa in our country as per 2013-14 estimates will be 14436 MT only. Ten multi-national companies engaged in the field of cocoa industry in our country requires 30,000 MT of dry cocoa bean per year. If the cultivation of cocoa is taken up in 10% of coconut garden we can meet our requirement and self sustain in cocoa production and also sustain coconut farming by increasing the income from unit area of coconut garden.

#### References :

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## Directorate of Cashewnut & Cocoa Development

The Directorate of Cashewnut and Cocoa Development is a national agency primarily engaged in the overall development of cashew and cocoa in India. The major mandate of the Directorate of Cashewnut and Cocoa Development are: formulation and execution of various development programmes on cashewnut and cocoa in the country, monitoring the effective implementation of the development programmes in various states, functioning as a feed back agency for the Development and Research Institutes in the country for planning and execution of cashewnut and cocoa production, and other allied programmes, exploiting the waste lands for the development of cashew in public and private sector lands, rendering technical advice and suggestions to remove the bottlenecks, confronting execution of development programmes, shouldering the responsibility of reviewing the development programmes, adoption and dissemination of advanced techniques in respect of production and processing and marketing, functioning as a data bank on crop, area production, price trends, marketing and trade performance of export, import and internal situations, functioning as an advisory body to recommend, watch and monitor the various aspects of crop development and by-products utilization, maintaining close liason with state and central institutions and taking up technology transfer programmes such as organising national level training programme on cashew and cocoa to officers, extension workers of state government and other agencies involved in implementation of cashew and cocoa development programmes, publishing journals, booklets, books, pamphlets etc. and organization/participation in seminars and exhibitions.