

Model Profile for 1.0 ha Coconut Cultivation

1. Introduction

Coconut (*Cocosnucifera*) plays a significant role in the agrarian economy of India. Apart from the importance of copra and coconut oil which is widely used in the manufacture of soaps, hair oil, cosmetics and other industrial products, its husk is a source of fibre which supports a sizable coir industry. The tender nut supplies coconut water, a popular thirst quencher of health and hygienic value. Virgin coconut oil (VCO), extracted from fresh coconut kernel without any chemical processes is abundant in vitamins, minerals and anti-oxidants, thus making it the 'mother of all oils'.



Coconut is a crop of small and marginal farmers since 98% of about five million coconut holdings in the country are less than two hectares. In the west coast of

India, the palm is an essential component in the homestead system of farming. While there is a concentration of coconut plantations in the coastal regions of the country, it is also grown in the hinterlands where the agro climatic requirements of coconut cultivation are met.

2. Scope for Coconut Cultivation and its National Importance

Coconut is grown in more than 93 countries of the world and Indonesia, Philippines, India are the major producing countries of the world. Coconut is grown in more than 18.95 lakh ha in the country with an estimated 16943 million nuts during 2010-11 with an average productivity of 8937 nuts per ha. Traditional areas of coconut in India are the states of Kerala, Tamilnadu, Karnataka, Andhra Pradesh, Orissa, Goa, West Bengal, Pondicherry, Maharashtra and Islands of Lakshadweep and Andaman and Nicobar. However, several states like Assam, Gujarat, Madhya Pradesh, Bihar, Tripura, Manipur, Nagaland and Arunachal Pradesh have emerged as non-traditional areas for the cultivation of coconut.

3. Technical Requirements of Coconut Cultivation

3.1 Agro - climatic requirements

Coconut is essentially a tropical plant but has been found to grow under varying agro climatic conditions. The mean annual temperature for optimum growth and maximum yield is stated to be 27⁰C with a diurnal variation of 6⁰C to 7⁰C and relative humidity more than 60 %. The coconut palm thrives well up to an altitude of 600 m above MSL. The coconut palm thrives well under an evenly distributed annual rainfall ranging from 1000 mm to 3000 mm. However, a well distributed rainfall of about 2000 mm is the ideal rainfall for proper growth and higher yield.

3.2 Soil

The coconut palm can tolerate wide range of soil conditions. But the palm does show certain growth preferences. A variety of factors such as drainage, soil depth, soil fertility and layout of the land has great influence on the growth of the palm. The major soil types that support coconut in India are laterite, alluvial, red sandy loam, coastal sandy and reclaimed soils with a pH ranging from 5.2 to 8.0.

3.3 Selection of Site

Soil with a minimum depth of 1.2m and fairly good water holding capacity is preferred for coconut cultivation. Shallow soils with underlying hard rock, low lying areas subjected to water stagnation and clayey soils should be avoided. Proper supply of moisture either through well distributed rainfall or irrigation and sufficient drainage are essential for coconut.

3.4 Preparation of land

Size of the pit depends on the soil type and water table. In laterite soils large pits of the size 1.2m x 1.2m x 1.2 m may be dug and filled up with loose soil, powdered cow dung and ash up to a depth of 60 cm before planting. In loamy soils, pits of size 1m x 1m x 1m filled with top soil to height of 50 cm is recommended. While filling the pits, two layers of coconut husk can be arranged at the bottom of the pit with concave surface facing upwards for moisture conservation. After arranging each layer, BHC 10% DP should be sprinkled on the husk to prevent termite attack. In laterite soils, common salt @ 2 kg per pit may be applied, six months prior, on the floor of the pit to soften the hard pans.

3.5 Spacing

In general square system of planting with a spacing of 7.5m x 7.5m is recommended for coconut. This will accommodate 177 palms per hectare. However, spacing of 7.5 to 10 m is practised in various coconut growing regions of the country.

3.6 Planting Material & Planting

Vigorous seedlings which are one year old, having minimum of six leaves and girth of 10 cm at the collar level should be selected for planting in the main field. Early splitting of leaves in the seedlings could be a criterion for selecting good seedlings. However, 18 - 24 month old seedlings are preferred for planting in water logged areas. Planting the seedlings during May with the onset of pre-monsoon rain is ideal.

3.7 Varieties

The tall varieties are extensively grown throughout India while dwarf is grown mainly for parent material in hybrid seed production and for tender coconuts. The tall varieties generally grown along the west coast is called West Coast Tall and along the east coast is called East Coast Tall. Benaulim is the tall variety grown in Goa and coastal Maharashtra. Laccadive Ordinary, Laccadive Micro, Tiptur Tall, Kappadam, Komadan and Andaman Ordinary are some of the tall varieties.

Chowghat Dwarf Orange, Chowghat Dwarf Yellow, Chowghat Dwarf Green, Malayan Yellow Dwarf and Malayan Orange Dwarf are some of the dwarf varieties grown in India. Gangabondam is a semi tall type grown in certain tracts of Andhra Pradesh. Details of some of the coconut varieties and hybrids released for cultivation in India are given in Table 1.

Table 1 : Details of coconut varieties/ Hybrids

S. No	Name	Area for which recommended	Annual nut yield/ palm	Copra (g/nut)	Oil content (%)
Varieties					
1	Chandrakalpa	Kerala, Karnataka, TN	97	195	70
2	Kerachandra	AP, Maharashtra	110	198	66
3	Chowghat Orange Dwarf	All coconut growing regions	Tender nut variety		

4	KalpaPratibha	West Coast region and peninsular India	91	256	67
5	KalpaDhenu	West Coast region and Andaman and Nicobar Islands	86	242	65.5
6	KalpaMitra	West Coast region and West Bengal	80	241	66.5
7	Kalpatharu	Kerala, Karnataka, TN	116	176	68
8	Kalparaksha	West Coast region and root (wilt) diseases tracts of Kerala	65	215	65.5
9	Kalpasree	West Coast region and root (wilt) diseases tracts of Kerala	90	96.3	66.5
10	Pratap	Konkan region	150	152	59
11	VPM-3	Tamil Nadu	77	191	66
12	ALR 1	Tamil Nadu	126	131	64
13	Kamrupa	Assam	101	162	64
14	KeraSagara	Kerala	99	203	67.8
15	KeraKeralam	Kerala, Tamilnadu and West Bengal;	109	186	67.8
16	KeraBastar	Andhra Pradesh, Konkanregion in Maharashtra and Tamilnadu	117	151	
17	Kalyani Coconut-1	West Bengal	80	154	
18	Gauthami Ganga	Andhra Pradesh	90	157	68
Hybrids					
1	Chandra Sankara	Kerala, Karnataka, Tamil Nadu	110	208	68
2	KeraSankara	Kerala, Karnataka, Maharashtra, Andhra Pradesh	106	198	68
3	Chandra Laksha	Kerala, Karnataka	109	195	69
4	KalpaSankara	West Coast region and root (wilt) disease tracts of Kerala	84	170	67.5
5	KalpaSamrudhi	Kerala and Assam	117	214	69
6	Laksha Ganga	Kerala, Tamil Nadu	108	195	70
7	Kera Ganga	Kerala	100	201	69
8	KeraSree	Kerala	112	216	66
9	KeraSowbhagya	Kerala	130	195	65
10	Ananda Ganga	Kerala	95	216	68

11	Godavari Ganga	Andhra Pradesh	140	150	68
12	VHC-1	Tamil Nadu	98	135	70
13	VHC-2	Tamil Nadu	107	152	69
14	VHC-3	Tamil Nadu	156	161	64.5
15	KonkanBhatye Coconut Hybrid-1	Konkan Region, Maharashtra	122	180	67.1

Source: Central Plantation Crops Research Institute, Kasaragod

3.8 Maintenance of Coconut Garden

Regular manuring from the first year of planting is essential to ensure good vegetative growth, early flowering and bearing and high yield. Organic manure at the rate of 30 kg per palm per year may be applied with the onset of south west monsoon when soil moisture content is high. Different forms of organic manures like compost, farmyard manure, bonemeal, fish meal, neem cake, groundnut cake, gingelly cake, etc. could be used for this purpose. Green manure crops like sunhemp, glyricidia, dhaincha, etc. could also be grown as intercrops to incorporate in the coconut basins later.

3.9 Manures and Fertilizers

Regular manuring right from the first year of planting is essential for good vegetative growth, early flowering and bearing and sustainable yield of coconut palms. The first application of chemical fertilizers should be done after three months of planting.

Particulars	Year 1	Year 2	Year 3	Year 4 onwards
FYM (kg/palm)	40	20	25	30
N (g/palm)	50	160	330	500
P (g/palm)	40	120	240	320
K (g/palm)	135	400	810	1200

Rock phosphate is recommended as source of phosphorus in lateritic and acidic soils. Fertilisers may be applied in two split doses during May-June and September-October for the rainfed palms and in four or more equal splits for irrigated palms avoiding the heavy rainfall period. In sandy soils with acidic nature, in addition to these fertilizers, 1 kg of dolomite may be broadcast during April-May in the basins and incorporated into the soil by forking.

3.10 Irrigation

Coconut responds well to summer irrigation i.e. summer irrigation @ 40 litres per palm per week will increase the yield of nuts by 50%. Under basin irrigation, 200 litres per palm once in four days will be beneficial. In areas where water is scarce drip irrigation system can be adopted. The quantity of water recommended for drip irrigation in coconut is 66 per cent of the open pan evaporation.

3.11 Interculture operations

Tillage operations like digging, ploughing, forming small mounds during August - September and spreading them in December - January, making shallow basins with a radius of 2m before the onset of monsoon and filling it up at the close of monsoon are beneficial to the trees. Regular inter cultivation needs to be adopted to keep weeds under control. In sandy soils, intercultivation may not be necessary.

3.12 Coconut based cropping systems

To maximise the utilisation of soil and sunlight in the coconut garden, intercropping can be adopted with a variety of crops like pineapple, banana, elephant foot yam, groundnut, chillies, sweet potato, tapioca etc. upto 8-10 years. During 10-22 years of age of the palms, crop like colocasia which can tolerate shade can be cultivated. In older plantations, perennials like cocoa, pepper, cinnamon, clove and nutmeg can be grown as mixed crops along with intercrops. Mixed farming by raising fodder grasses such as hybrid napier or guinea grass along with leguminous fodder crops in coconut garden has been found to be profitable which can support rearing of milch animals.

3.13 Harvesting

Coconuts are harvested at varying intervals in a year. The frequency differs in different areas depending upon the yield of the trees. In well maintained and high yielding gardens, bunches are produced regularly and harvesting is done once a month.

Coconuts become mature in about 12 months after the opening of the spathe. It is the ripe coconut which is the source of major coconut products. Nuts which are eleven months old give fibre of good quality and can be harvested in the tracts where green husks are required for the manufacture of coir fibre. Economic life of the coconut palm is about 60 years.

3.14. Utilisation of Coconut

Coconut industry in the country is mainly confined to traditional activities such as copra making, oil extraction, coir manufacture & toddy tapping. Coconut products such as virgin coconut oil, desiccated coconut, coconut water based vinegar, coconut water are also made. However, coconut milk based beverages, coconut chips, coconut based handicrafts, shell powder, shell charcoal and shell based activated carbon are manufactured in the country on a limited scale. Neera, coconut water based non-alcoholic health drink is now gaining momentum in many states like Karnataka and Maharashtra. Coir and coir based industry is one of the major segments using coconut by-products mainly the husk.

3.15 Linkages for Coconut development

Coconut Development Board has been set up by the Government of India with the mandate of integrated development of coconut in the country. Technology Mission on Coconut is being implemented by the Board to integrate various on-going Govt. Programmes and to ensure adequate, appropriate, timely and concurrent attention to all the links in the production, post harvest and consumption chain of coconut. The Board's schemes are either implemented directly or through the department of Agriculture/Horticulture of the states.

Financial institutions have also formulated coconut financing schemes in potential areas both for fresh coconut planting and intensive cultivation. Integrated coconut development schemes with farm infrastructure facilities like well, pumpset, fencing, drip irrigation system etc. have also been considered. For coconut based industries, support is also given by the banks for setting up new units which are also backed by the Coconut Development Board by way of subsidy.

The techno-economic parameters for the model project are detailed in **Annexure I**.

4. Financial Viability and Bankability

4.1 Project Cost

The cost of coconut cultivation in one hectare of coconut palm works out to Rs.2,33,800/-. The above costs are average indicative costs. Banks may adopt higher or lower than the average costs depending on local conditions and viability of the units. The cost of development of coconut garden is given in **Annexure II**.

4.2 Margin Money

The margin money / down payment prescribed are 5 %, 10 % and 15% for small, medium and other farmers respectively. The rest of the cost of development will be provided as bank loan. However, in the present model, 15 % of the unit cost i.e. Rs.35,100/ha has been considered as margin money.

4.3 Bank Loan

Bank loan of 85 - 95 % of the total cost of development shall be available from the financing institution. Bank loan considered in the model is 85%. It works out to Rs.1,98,800/ha in the model.

4.4 Rate of interest

Banks are free to decide the rate of interest within the overall RBI guidelines issued from time to time. However, the ultimate lending rate has been considered as 13 % for working out the bankability of the model project.

4.5 Security

Banks are guided by RBI guidelines issued from time to time in this regard.

4.6 Financial Analysis

Financial analysis was carried out for one hectare of coconut cultivation. For financial analysis, the income was assessed on a conservative basis. The productivity of an eleven year old coconut garden was considered at 70 nuts per tree. The detailed calculation of project's income and expenditure has been indicated in **Annexure III**. IRR, NPW and BCR for the model works out to 17.58%, Rs. 22,572/- and 1.11:1 respectively and the details are given in **Annexure IV**.

4.7 Repayment period of loan

The repayment period works out to thirteen years including seven years grace period for repayment of principal. Interest will be paid from the income realised through inter cropping in the initial years.

DISCLAIMER

The views expressed in this model project are advisory in nature. NABARD assume no financial liability to anyone using the report for any purpose. The actual cost and returns of projects will have to be taken on a case by case basis considering the specific requirement of projects

Annexure III : Income - Expenditure Statement

(Amount in Rs.)

Sl. No.	Items	Year								
		7	8	9	10	11	12	13	14	15
	Income									
1	Nut yield per tree (no.)	15	25	35	55	70	70	70	70	70
2	Nut yield per ha (no.)	2655	4425	6195	9735	12390	12390	12390	12390	12390
3	Income	19913	33188	46463	73013	92925	92925	92925	92925	92925
	Expenditure									
1	Manures and fertilizers	11410	11410	11410	11410	11410	11410	11410	11410	11410
2	Plant protection	1200	1200	1200	1200	1200	1200	1200	1200	1200
3	Manure and fertilizer application	2250	2250	2250	2250	2250	2250	2250	2250	2250
4	Pesticide application	450	450	450	450	450	450	450	450	450
5	Irrigation	1200	1200	1200	1200	1200	1200	1200	1200	1200
6	Interculture operations	1500	1500	1500	1500	1500	1500	1500	1500	1500
7	Harvesting	600	900	1200	1500	1800	2250	2250	2250	2250
8	Collection & Handling	970	1620	2270	3570	4540	4540	4540	4540	4540
	Total (rounded off)	19600	20500	21500	23100	24400	24800	24800	24800	24800
	Surplus	313	12688	24963	49913	68525	68125	68125	68125	68125

