

# Integrated technology for coconut garden management in hot weather season

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## Coconut sector in Maharashtra

Coconut is a major irrigated horticultural crop of Konkan region of Maharashtra. The agro-climatic conditions are very much congenial for its cultivation in Konkan and Western Maharashtra. Maharashtra Government has launched an ambitious Employment Guarantee Scheme (EGS) for fruit crop cultivation in 1990, because of which the total area has been increased to 43320 ha with productivity of 4885 nuts/ha. Maharashtra occupies the 7<sup>th</sup> place in area under coconut and the 9<sup>th</sup> place in production with the annual production of 209.87 million nuts. Over a period of 33 years from 1986-87 to 2020-21, the area under coconut has increased from 6900 ha to 43320 ha and production from 76.32 million nuts to 209.87 million nuts. The maximum area under coconut is in Sindhudurg district followed by Ratnagiri districts.

**The coconut based multistoried cropping system studied under AICRP on palms and recommended by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli and developed at Regional Coconut Research Station, Bhatye is popular as “Lakhi Baug” among the farmers which generate income of Rs. one lakh from one acre per year.**



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District wise area, production and productivity of coconut in Maharashtra State				
Sr. No	Districts	Area (ha)	Production (Lakh nuts)	Productivity (Nuts/ha)
1	Sindhudurg	17929	1457.0	4845.0
2	Ratnagiri	5556.0	406.0	
3	Raigad	2248.0	107.0	
4	Thane	1161.7	8.0	
5	Palghar	1473.9	16.0	
6	Other	14852	96.0	
	Total	43320	2098	

(Source: Joint Director of Agriculture report.2019)

Regional Coconut Research Station, Bhatye, Dr. Balasheb Sawant Konkani Krishi Vidyapeeth, Dapoli situated in Ratnagiri district of Maharashtra is catering to the needs of coconut growers in this region through the network of All India Coordinated Research Project on Palm since its establishment in the year 1955. This research station has contributed to develop one variety Pratap and one hybrid Konkani Bhatye coconut hybrid (GBGD x ECT) and seven recommended varieties of coconut which are popularly planted by coconut growers in this region. The technology of coconut developed at this station is helpful for coconut growers. The coconut based multistoried cropping system studied under AICRP on palms and recommended by Dr. Balasheb Sawant Konkani Krishi Vidyapeeth, Dapoli developed at Regional Coconut Research Station, Bhatye which

is popular as “Lakhi Baug” among the farmers to generate income of Rs. one lakh from one acre area per year. Now, the hot summer season is approach and the growers need to be aware of the technologies to mitigate the hot summer issues.

### Agronomical crop management

#### 1) Clean cultivation

The clean cultivation of coconut was recommended as it was revealed that clean cultivation with frequent intercultural operations such as digging or ploughing had a beneficial effect on the growth and yield of coconut trees. The “no cultivation” treatment produced only 15 nuts/palm/year whereas the tree receiving three ploughing or digging produced 48 nuts per tree annually (i.e. 68.66% increase).

#### 2) Plant health management

Proper nutrition with timely irrigation management as per palm age and past yield history is an important consideration in plant health care during hot summer season.

#### a) Fertilizer application

A fertilizer dose of 1000g nitrogen, 500g Phosphorous and 1000g of Potash per palm per year in three splits (June, October, and February) was recommended for coconut cultivation in sandy soils of the Konkani region of Maharashtra state. Making the palm nutritionally strong and healthy will equip it to survive against hot summer.

Intercropping of lily flowers



### b) Fertilizer requirement for hybrid coconut

On the basis of cumulative yield and economics the following dose is recommended for coconut hybrid palms.

Sr. No.	Age	Quantity of FYM kg/palm	NPK kg/palm/year			
			N (g)	P <sub>2</sub> O <sub>5</sub> (g)	K <sub>2</sub> O (g)	
					Im-proved variety	Hybrid variety
1.	1st	10	200	100	200	400
2.	2nd	20	400	200	400	800
3.	3rd	30	600	300	600	1200
4.	4th	40	800	400	800	1600
5.	5th	50	1000	500	1000	2000

The dose should be applied in three splits. 1/3 N and K<sub>2</sub>O, full dose of P<sub>2</sub>O<sub>5</sub> and FYM should be applied in the month of June and remaining 2/3 N and K<sub>2</sub>O is in two splits (October & February).

### c) Fertilizer application through micro-irrigation technique

Application of 1 kg N, 0.5 kg P<sub>2</sub>O<sub>5</sub> and 1 kg K<sub>2</sub>O per palm per year (recommended dose) is recommended through drip irrigation in eight splits from October to May.

### d) Micronutrient application

Application of recommended dose (1:0.5:1 Kg NPK/palm/year) with 1.5 Kg Ormichem Micronutrient ( Zn 3.15 %, Mg 1.8 %, Cu 0.65 %, Fe 1.97 %, Mn 2 %, Mo 0.05 % and B 0.68 %) recorded the maximum yield (129 nut/palm/year) in coconut and also the percentage increase in yield was higher in post treatment period yield when compared with pretreatment period yield. Therefore the application of recommended dose of fertilizer with 1.5 Kg Ormichem micronutrient in three splits is recommended for adult coconut palm.

## 3) Irrigation management

### a) Effect of water quality on survival and growth of coconut seedling

An experiment was conducted to assess the influence of quality of irrigation water on growth of one year old newly planted "West Coast Tall" coconut seedling in coastal sandy soil. Irrigation with sea water had detrimental effects, at any growth phase throughout the duration of the experiment, due to primary salt stress, which was responsible for membrane disintegration and disturbance in metabolic process. The dilution of seawater with sweet water reduced the extent of primary stress injury but imposed salt injury causing decrease in uptake of mineral elements, which resulted into poor growth of seedling.

### b) Irrigation to coconut palm by drip method

The drip irrigation with 30 liters water/palm/day during October to January and 40 liters during Feb to May with six drippers placed at a distance of 1.25 mts away from the bole in the sandy loam soils of Konkan region is recommended for adult coconut palm.

### c) Fertilizer application through micro-irrigation technique in coconut

For getting higher yield in coconut, application of recommended dose 1 kg N, 0.5 kg P<sub>2</sub>O<sub>5</sub> and 1 kg K<sub>2</sub>O per palm per year is recommended through drip irrigation in eight splits from October to May.

## 4) Coconut based cropping system

### a) Intercropping of chilli in coconut

The cultivation of Chilli (variety "Jawala" and "Konkan Kirti") is recommended due to its higher yield and best net returns as inter crop in coconut orchard.





Intercropping of banana

**b) Intercropping of vegetables in coconut**

On the basis of economic returns obtained per man days per hectare, Dolichus bean could be rated as the most remunerative vegetable crop, whereas tomato cultivation provided better employment opportunities and gave attractive yield.

**c) Intercropping of rainfed vegetables in coconut**

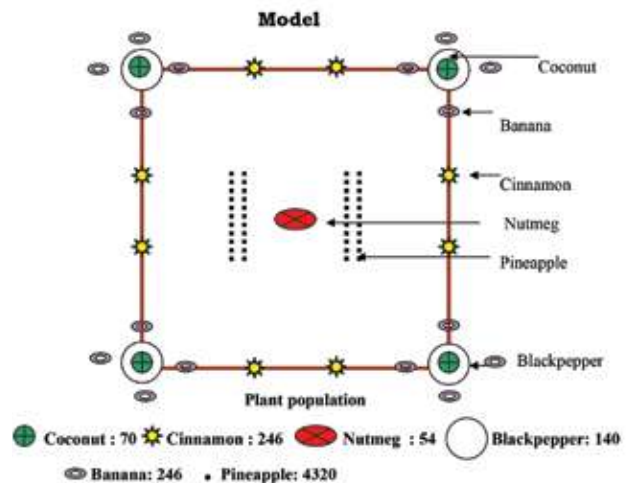
Rainfed vegetables such as ridge gourd, cucumber, snake gourd and bitter gourd is recommended in coconut plantation during rainy season.

**d) Mixed cropping of spices in coconut**

The excellent growth and good bearing capacity of cinnamon, nutmeg, black pepper and clove planted in coconut as intercrops proved that these crops can be cultivated on commercial scale in the Konkan region of Maharashtra. After planting spice crops as intercrops in coconut plantation the average yield of coconut per palm has increased from 25 to 93 percent at the end of 26<sup>th</sup> years as compared to the average yield of previous four experimental years. Nutmeg (at 22 years age) proved as the best intercrop in coconut plantation. Nutmeg and coconut together gave Rs. 1,23,970/- as net returns per hectare, whereas only nutmeg gave 47,240/-. Coconut as a monocrop recorded net profit of Rs. 31,349/- per hectare. On the strength of the net economic returns released, it is recommended to interplant nutmeg, cinnamon and clove in well spaced coconut garden in the Konkan region of Maharashtra state.

**e) Lakhi Baug:**

On the basis of mixed cropping experiment on spices, University has propagated the Lakhi Baug concept. That is intercropping of spices particularly Cinnamon, Nutmeg and Black pepper in the coconut



Regional Coconut Research Station Bhatye office

orchard and from one acre of this kind of system farmer can get one Lakh rupees, thus it is called as Lakhi Baug which includes model-I.

**f) Intercropping with fruits and spice tuber crops**

Four intercrops viz. turmeric, banana, pineapple and tapioca is recommended in coconut plantation in Konkan region of Maharashtra for getting more economic returns.

### g) Biomass collection and utilization in coconut based cropping system

The biomass productivity of coconut was ranged from 3.4 to 5.1 t/ha while it was ranged from 161 kg to 4450 kg/ha in different spices. The vermicompost productivity of coconut ranged from 2 to 3 t/ha where as it was 48 kg to 1.5 t/ha in different spice crops. Nutrient recycling rate of 43.62 kg N<sub>2</sub>, 9.64 kg P, 30.13 kg K, 21.81 Ca and 16.56 Kg Mg per ha. in coconut can be achieved through proper utilization of available biomass. In organic fertilizer substitution of about 33% N, 3.67% P<sub>2</sub>O<sub>5</sub> and 22.96% K<sub>2</sub>O is coconut and 20.40% N, 2.7% P<sub>2</sub>O<sub>5</sub> and 20.67% K<sub>2</sub>O in spice tree species can be achieved by organic recycling.

### h) Production of medicinal and aromatic plants in coconut garden

Considering the performance of different medicinal crops as an intercrop and market demand, the arrowroot, lemongrass, shatavari, adulsa and citronella have been recommended as a intercrops in coconut plantation for Konkan region of Maharashtra.

i) Mulching by dried coconut leaves, husk burial and the coir dust application is well known and is an adopted practice by most of the growers. This material acts as sponge and absorb water six times more of its weight.



Bordeaux paste application



Vermicompost application

available with palm grower based on their tradition and experience. This is nothing but the Indigenous Technical knowledge (ITK) that is unique knowledge to given circumstances. This knowledge is presented in table 3:-

## 5) Indigenous Technical knowledge (ITK)

Some knowledge based information regarding the management of palm against hot summer is

Sr. No.	ITK knowledge	Scientific reasons behind knowledge
1	Earthing up the palms regularly to prevent root exposure by making gentle slope in basin.	Palm is monocotyledon crop. It has fibrous root system, not tap root exist. If it is protected by proper soil covering, it develops better root nettings. This netting is much active for water and nutrients uptake, which ultimately improve productivity and palm growth. The root nettings remain active.
2	Surface irrigation/flood irrigation be given in binding mode and away 1.25 m from the root collar zone of palm	Many places the surface water moves and runs intact with palm root zone through channels. It develops intimate contact of fiber tissue and moisture which causes cracks and micro burning at root collar during hot summer from where entry point for pest like RPW and fungus. And during rainy season it leads to development of aerial roots which looks ugly and abnormal.
3	Digging of basin and creation of channel for surface water storage around	Digging of root nettings in basin area once in three year helps to cut old roots and develops new active root netting zone for better absorption.
4	Soaking of seed nuts in water one month before sowing for germination	During hot the water temperature is little more than normal, this helps to degradation of the husk, losses the tight husk cover and plumule can easily comes out with uniform growth and elite development.
5	Application of Bordeaux Paste 10% to palms trunks during summer hot.	It covers the basal trunk region 1.25 m from where entry of various fungus & insects get checked during hot summer. It works as protection layer to trunk against sun burning/ sunstroke scorching.

**Varietal interventions by Dr. Balasaheb Sawant Konkarn Krishi Vidyapeeth, Dapoli**

Sr. No	Name	Parents	Year of release/ recommended	Yield (nuts/palm/year)	Special features
<b>Released varieties</b>					
1	Pratap	-	1987	140-145	Age at 1st flowering (years) - 6-7 Average dry copra/nut (g) - 120-160 Oil percentage (%) - 68
2	Konkan Bhatye coconut hybrid 1	GBGD x ECT	2007	120-122	Age at 1st flowering (years) - 4.5-5 Average dry copra/nut (g) - 160-169 Oil percentage (%) - 67.10
<b>Recommended Varieties</b>					
1	Lakshdweep Ordinary (ChandraKalpa)	-	1985	146-150	Age at 1st flowering (years) - 6-7 Average dry copra/nut (g) - 140-180 Oil percentage (%) - 72
2	Kera Sankara (T x D)	WCT x COD	1989	135-140	Age at 1st flowering (years) - 4.5-5 Average dry copra/nut (g) - 170-190 Oil percentage (%) - 68
3	Philippines Ordinary (Kera Chandra)	-	1995	100-105	Age at 1st flowering (years) - 6-7 Average dry copra/nut (g) - 215-225 Oil percentage (%) - 69
4	Banawali	-	2007	80-150	Age at 1st flowering (years) - 7-8 Average dry copra/nut (g) - 100-195 Oil percentage (%) - 68-70
5	Chandra Sankara (D x T)	COD x WCT	2003	145-150	Age at 1st flowering (years) - 4.5-5 Average dry copra/nut (g) - 160-200 Oil percentage (%) - 68
6	Fiji (Kera Bastar)	-	2007	116-120	Age at 1st flowering (years) - 6-7 Average dry copra/nut (g) - 169 Oil percentage (%) - 67.10
7	Godavari Ganga	-	2007	96	Age at 1st flowering (years) - 4.5-5 Average dry copra/nut (g) - 230 Oil percentage (%) - 64.05

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