Coconut in Konkan

A team of Senior Officials from CPCRI, CDB and Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, State Department of Agriculture, Maharashtra conducted a roving survey in Konkan region. Thomas Mathew, M., Hameed Khan , H. and Shivapuje explain the situation of coconut in this region in Maharashtra. Konkan region, comprising the districts of Thane, Raighad, Sindhudurg and Ratnagiri which accounts for 92 per cent of the total area under coconut in the state. Benaulim Tall is the main cultivar used for planting in this area. The authors identified that the present level of production can be enhanced by adopting appropriate multistoried cropping systems.

Introduction

Coconut is a traditional plantation crop grown in India for the last 30 centuries. The crop has significant role on the national economy besides its influence on the economic, social and cultural lives of millions of small and marginal farmers who form the backbone of the coconut culture and industry of the country. It acts as an enormous source of raw material for various small, medium and large-scale industries, particularly in those states where this crop is largely grown. It also provides livelihood security to millions of people in the country. Though the crop is grown in most of the States and Union Territories of the country, there is distinct difference in the pattern of distribution of the crop. Except Kerala where the crop is distributed evenly through out the state, cultivation of coconut is concentrated mainly on coastal areas in other parts of the country. In Maharashtra, the Konkan region accounts for 92 per cent of the total area under coconut in the state. Coconut farming and allied activities are the main source of livelihood to a major sector of the people in this region. The climate and the soil of the region favour abundant cultivation of coconut and healthy growth of the crop.

Origin

The history of coconut cultivation in Maharashtra is not possible to trace in the absence of clinching evidences. However, it can be presumed that its place of origin in the state is from Goa, as the main cultivar used for the planting is identified as the Benaulim Tall, which is originated from the Benaulim Taluk of Goa[iv]. Even though coconut culture in the state has a history of more than a century, the scientific cultivation has been practiced in consequent to the implementation of Horticultural Plantation Programme through Employment Guarantee Scheme of the State Government, which was initiated in the year, 1990-1991.

Benaulim Tall - The familiar cultivar in Konkan region.

Economic Importance

In Maharashtra, coconut is used for edible, social and religious purposes. It is used as tender coconuts as well as mature nuts. About 95 per cent of the total production of coconut in Thane District goes for tender coconut trade in Mumbai. The traders, mostly from the Malabar area of Kerala, take the plantation on lease basis for a period of 15 months at any one time contract. The nuts are harvested at 45 days interval and sold through their outlets in Mumbai. In Raigad and Ratnagiri districts about 80 per cent of the production is used as mature nuts for edible, religious and social purposes and 20 per cent is used as tender nut. Toddy tapping is also popular in the region mainly carried out by the people from Malabar. The toddy is reported to be traded mainly in Mumbai city. Coconut is the third important crop in this region after mango and cashew nut accounting for 4.1 per cent of the total area under horticultural crops in the state. The productivity of coconut in Maharashtra is considered as the highest in the country.

Distribution

Konkan region comprising the districts of Thane, Raighad, Sindhudurg and Ratnagiri are the major coconut growing belts of Maharastra. About 92.34 per cent of the

total area and production of coconut in the state is concentrated in this region. Konkan region is the coastal plain of Maharashtra State in the western India with Arabian sea on the west and western ghats on the east. The region composed of Thane, Raigad, Ratnagiri, Sindhudurg districts and greater Mumbai has hilly terrain and extensive sea coast of 720 kms. Among the major four coconut growing districts, Sindhudurg accounts for 58.44 per cent of total area under the production of coconut in the state. The crop is raised in cluster units and hence is not observed on a contiguous manner. Even though the history of coconut cultivation in the state is more than 100 years, most of the plantations are less than 50 years old.

High Density multispecies cropping in Konkan need reorientation management.

Soil and Climate

The lateritic soils of Ratnagiri and Sindhudurg districts are acidic, less fertile, having low moisture retention capacity, whereas the medium black soils of Thane and Raigad districts are comparatively better in fertility and moisture retention capacity. The climate and soil of the Konkan region is ideal for coconut cultivation. The soil where coconut is cultivated is mainly alluvial with a high mineral and organic matter content. Most of the gardens in Thane district are irrigated and hence appeared satisfactory for high yields of coconut and many other crops raised as intercrops. The higher water table in the area seems to be one of the reasons for the satisfactory performance of the varied crop combinations in the coconut garden. The climate is warm and humid almost throughout the year. The region receives heavy rainfall ranging from 2000 to 4000 mm annually mostly during the months of June to September.

Table 1. Area and production of coconut in Konkan region

(Area in ha' in '000nuts)

Districts	Total area	Percentage Share	Yielding Area	Percentage to respective dist. area	Production	Percentage Share
Thane	3,398	12.64	2,102	61.86	36179	18.67
Raigad	3,415	12.70	1,512	44.28	48688	25.12
Ratnagiri	4,361	16.22	2,968	68.06	27079	13.97
Sindhudurg	15,710	58.44	8,932	56.86	81858	42.24
Total	26,884	100	15,514	57.71	193804	100

Source: District-wise Agricultural Statistical Information of Maharashtra-Part-II, Commissionerate of Agriculture, Pune.

Area and Production of Coconut in Konkan Region

Majority of the population in Konkan region is engaged in agricultural activities except in Thane District, which is considered as the industrially advanced district of the state of Maharashtra. Coconut cultivation in the state received attention and better patronage after the establishment of the Indian Central Coconut Committee in 1945, having its Headquarter at Kochi, Kerala and had the mandate of intensifying the developmental programmes on coconut including the coconut research in the country. Since then various coconut development projects were implemented in the country to boost the production as well as to spread the scientific cultivation to new areas. The Indian Central Coconut Committee established a Regional Coconut Research Station at Ratnagiri in Bhatye village of Ratnagiri district in 1955 to conduct research on coconut cultivation problems pertaining to the Konkan region. Later on Konkan Krishi Vidyapeeth, Dapoli took over the control of the station w.e.f. 1972 (Nair, et al.(1996)[2]. With the setting up of a Coconut Directorate in 1966 after dissolving the Central Government Committee, crop development became an important agenda in both Central and State Government Plans. The establishment of the Coconut

Development Board, in 1981 was an added fillip to coconut culture and industry in the state too. Various programmes for the integrated development of the coconut culture and industry have been implementing in all the coconut growing states of the country since then. The Konkan region of Maharashtra has been largely benefitted from these developmental efforts. With the implementation of Employment Guarantee Scheme (EGS) like Horticulture Scheme since 1990-91, coconut cultivation in the state has become more scientific and has been increasing steadily. The present status of the coconut area and production in the region is given in *Table 1*.

From the table it could be seen that only 57.71 per cent of the total area under coconut in the region is yielding. The balance being young plantations or due to high density cropping system do not yield well or perform well. Among the four Konkan districts, Sindhudurg ranks first in the area under and production of coconut accounting for 58.44 per cent in area and 42.24 per cent in production of coconut. (*Fig. 1 and 2*).

Harvested tender coconuts ready for transportation to Mumbai

Even though Sindhudurg and Ratnagiri districts rank 1st and 2nd in area and production of coconut, the productivity of coconut in the region is highest in Thane followed by Raigad district. The productivity of coconut in Sindhudurg is the lowest in the region and is only 55 per cent of that of Thane (*See Fig.3*). The productivity of coconut is 82 nuts per tree in Thane district whereas it is only 45 nuts in Sindhudurg. The fertile soil, assured irrigation and symbiotic benefit from the complementary intercrops are considered as the factors responsible for the higher level of productivity.

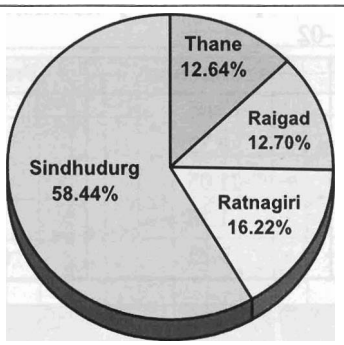

Fig. 1. Districtwise share in area under coconut (2002)

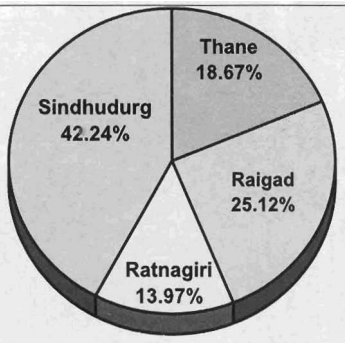

Fig. 2. Districtwise share in production of coconut (Konkan Region, Maharashtra - 2002)

Trend in Area, Production and Productivity of coconut in Konkan Region

The trend in the area, production and productivity of coconut in Konkan region is given in *Fig. 4* to *6*. It could be seen from the *Fig.4* that the trend in area under coconut in Konkan region was steady, till 1995-96 and then there was an increasing trend with a sudden increase in 1995-96. The same pace of growth was seen in all the districts of the region. The area under coconut in the region has reached 16,789 ha in 2001-02 from 7000 ha in 1985-86 recording a compound growth rate of 5.28 per cent per annum. Among the districts, Thane district recorded the highest rate of growth of 20.24 per cent in area under coconut and the Sindhudurg had the lowest growth rate of 2.71 per cent. Similarly trend in the production and productivity of coconut in the region is given in *Fig.5* and 6 and *Table-2*. From the figures, it could be observed that though the trend in the production of coconut in the region shows an increasing growth, the productivity shows more or less a declining trend. While the production was increasing at compound growth rate of 5.25 per cent per annum the productivity recorded a negative growth of 0.03 per cent.

It was mainly due to the sharp decline of productivity in the year 2001-2002 coupled with the cyclical variations in the production and productivity of coconut. Among the districts, Thane recorded a highest growth rate of production and productivity. The annual increase in the production was 23.05 per cent and that of productivity was 6.6 per cent. The major reasons attributed to these significant growths in area, production and productivity of coconut in the district was due to the steady demand and price for tender coconut from the Mumbai market. About 95 per cent of coconut in Thane district is traded in the form of tender

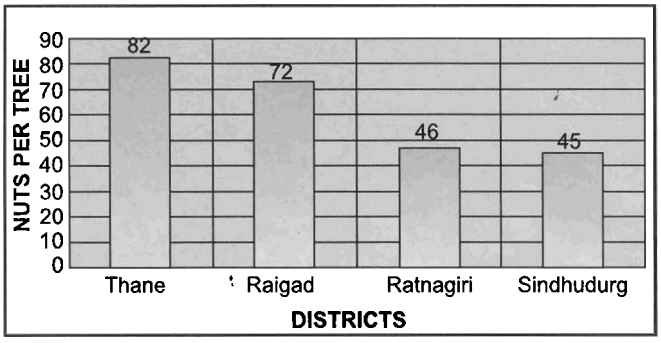

Fig. 3. Productivity of coconut in Konkan region (2002)

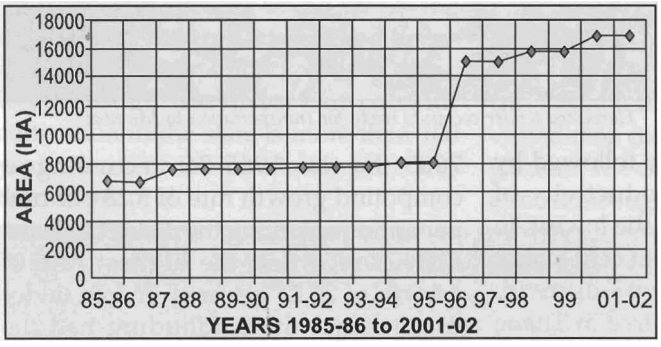

Fig. 4. Trend in area under coconut in Konkan region

coconut. The demand for natural drinks particularly tender coconut water, which has nutriceutical and pharmaceutical values, has been increasing steadily among the health conscious populace, which in turn promote the trade in tender coconut to a great extent.

Among the districts, Sindhudurg recorded a lowest growth in production and productivity. The productivity remains stagnant in all the districts except Thane where the productivity of coconut was increased to 15,771 nuts per ha in 2001-02 from the level of 5320 nuts in 1985-86, which is 196.44 per cent more than the base year. The adoption of integrated farming systems in the coconut gardens involving floriculture as the inter crop in coconut garden **helped to a great extent** for the proper maintenance of the main crop which in turn enhances the coconut yield.

Districts' Features

I. Thane District

Thane district accounts for 13.67 per cent in area and 18.64 per cent in production of coconut in the region. In Thane district, coconut is largely grown in Vasai, Dahanu and Palghar Taluks, which account for 86 per cent of the total coconut area in the district. Among the three taluks, Palghar ranks first in total area and yielding area of coconut. The total area under coconut in Thane District is about 2235.72 ha in which only 70 per cent are yielding. The taluk-wise distribution of the crop is presented in *Table 3*.

II. Raigad District

Raigad district accounts for 13 per cent of the area and 25 per cent of the total production of coconut in Maharashtra. Coconut is cultivated in the district mainly for production of mature coconut utilizing for edible, social and religious purposes. About 80 per cent of the total production of the coconut is used for edible, culinary, social and religious purposes and the remaining goes for tender coconut. The coconut cultivation is practiced in the traditional way where coconut is planted along with arecanut as a mixed crop at closure spacing. The total area under coconut in the district is 4,361 ha

Table 2. Growth rate in area, production and productivity of coconut in Konkan region 1985-86 to 2001-02

Districts	Area	Production	Productivity
Thane	20.24	23.05	6.6
Raigad	8.19	9.32	1.04
Ratnagiri	9.451	11.05	1.46
Sindhudurg	2.71	1.38	1.29
Konkan Region	5.28	5.25	(-)0.03

Cultivation of spices, nutmeg and clove in coconut garden

Need further refinement in Vanilla and floriculture as intercrops

out of which only 68 per cent is productive. The taluk-wise productive area under coconut in the district is given in the *Table 3*. Among all the taluks in the district only Alibag, Murud and Shrivardhan are the important coconut growing belts, which account for 68 per cent of total area and production of coconut in the district.

Table 3. Taluk wise area under coconut in Thane District

Name of Taluks	Area (ha)	Yielding area (ha)	Talukwise share of total area in %	Talukwise share of yielding area in %	Production '000 nuts
Vasai	625.00	363.88	27.96	23.23	5222
Plaghar	1016.70	1009.00	45.48	64.43	14479
Talasari	49.07	30.50	2.19	1.95	438
Dahanu	247.69	162.75	11.08	10.39	2335
Jawhar	41.95	Nil	1.88		
Mokhada	1.12	Nil	0.05		
Wada	72.68	Nil	3.25		
Bhivandi	44.53	Nil	1.99		
Kalyan	41.96	Nil	1.88		
Ulhasnagar	52.62	Nil	2.35		
Murbad	17.50	Nil	0.78		
Shahapur	24.87	Nil	1.11		
TOTAL	**2235.69**	**1566.13**	**100**		**22474**

III. Ratnagiri

Based on the physical features, Ratnagiri district is divided into three parts viz., Hilly areas of Sahyadri and its offshoots, Plateau surface and coastal plain. Coconut and arecanut is cultivated in coastal plains. Over 85 per cent of the land in Ratnagiri district is hilly. Soil is acidic and fairly well supplied with nitrogen and organic matter. The soil type in the coconut belt in Ratnagiri district is coastal alluviam. The coconut cultivation is mainly concentrated in the taluk of Ratnagiri, Dapoli, Chiplum, Guhagar and Rajapur. The average annual rainfall in the district is 3787 mm. Nearly 91 per cent of the rainfall is received in four months i.e., June-September.

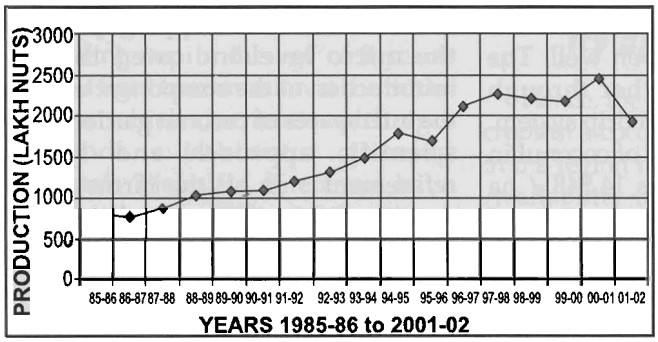

Fig. 5. Trend in production of coconut in Konkan region

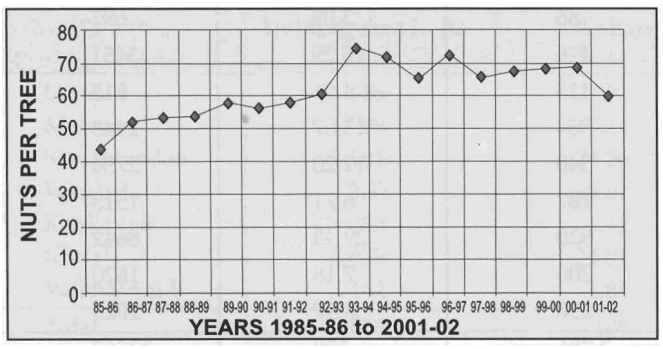

Fig. 6. Trend in productivity of coconut in Konkan region

Rajapur (4616 mm) and Sangmeshwar (4785 mm) are the high rainfall receiving taluks of Ratnagiri district. Though coconut is cultivated in all the taluks of the district about 30 per cent of the area is concentrated in the taluk of Ratnagiri. The total area under coconut in the district is 4,361 ha and only 2,786 ha is productive area. The taluk wise productive area under coconut in the district is furnished in the *Table 4*. Even though coconut is cultivated largely in all the taluks of the district, Ratnagiri taluk accounts for 30 per cent of the total area under coconut.

IV. Sindhudurg

Sindhudurg district ranks first in the area under and production of coconut among the various coconut growing districts of Maharashtra. About 60 per cent of area under and 45 per cent of production of coconut in Konkan region is contributed from this district. Coconut is grown in all the Taluks of the district. Though the coconut is cultivated in an area of 15,710 ha only 60 per cent of area is reported to be the yielding area.

Cultivation practices

The source of coconut seedlings that are being used in the region are mainly those raised seedlings by the farmers. Dr.Balasaheb Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri District in Maharashtra State also produce annually about 25,000 seedlings of "Prathap" the variety released by the University and distributed to the farmers apart from the production and distribution of one lakh seedlings of the local cultivars. The seedlings are usually planted in a shallow pit and hence generally all gardens are seen surface planted. The farming practices followed are only a blanket application of inorganic fertilizers mainly Suphala 15:15:15 @ 2 kg per tree and organic fertilizers.

Production constraints

Coconut is the mainstay of majority of the people in the region. Even though coconut is susceptible to more than 170 species of pests and ample number of diseases, the Konkan region is seen

Table 4. Talukwise area under coconut in Raigad District

Taluks	Yielding area in ha.	% Share	Production '000 nuts
Alibag	1,032	33.84	13003
Pen	82	2.69	1033
Murud	482	15.8	6073
Karjat	126	4.13	1588
Khalapur	81	2.66	1020
Panvel	88	2.89	1109
Uran	69	2.26	869
Mangoan	139	4.55	1751
Roha	158	5.18	1991
Sudhagad	63	2.07	794
Mahad	50	1.64	630
Poladpur	3	0.1	38
Mhasala	117	3.84	1474
Shrivardhan	560	18.36	7056
Total	**3,050**	**100.01**	**38429**

devoid of such incidences, except occasional and sporadic incidence of rhinoceros and red palm weevil. However, until recently the incidence of coconut mite was reported from various parts of region. The incidence of black headed caterpillar, *opisina arenosella* walker is also rampant in localized patches.

Cropping System Management in Konkan

Generally the coconut plantations in the region is raised at a spacing, ranges from 6m x 6m to 6m x 7.5 m in square and rectangular type of planting intercropped with perennial crops like areca, nutmeg, pepper and annuals like banana, cowpea, coloccasia, yam, ginger and turmeric. Coconut gardens in Thane district is unique where intercropping is done with floriculture and vegetable cultivation. Mumbai market, a major market for consumer goods including vegetables and flowers is easily accessible to Thane district and hence this change in the cropping pattern. Cultivation of roses, gerbera, orchid, gladiolus, bird of paradise, chrysanthemum, lilium etc., are very common in coconut plantations. It has been estimated that the gross income from floriculture in coconut gardens is to the tune of Rs.35000-40000 per acre by way of selling cut flowers, foliages, etc., @ Rs.50 per bundle. Cultivation and trade of cut flowers, cut foliage, potted plants and items made of foliage and flowers are important enterprises among all the farmers in the region.

All gardens are irrigated and the source of irrigation is open well. The method adopted are either through flood irrigation or through drip system. Even though productivity of coconut in Maharashtra is as high as 14,548 / ha there is a decline in the productivity of coconut in Konkan region. During a survey in the region to assess the coconut mite intensity, it could be observed that the average productivity of coconut in most of the surveyed gardens was less than 60 nuts per tree.[ii] It could also be observed that only 50-60 per cent trees in a holding bear fruits. The balance, being weak or due to densely populated, are non-yielding. The major reasons attributed to the decline in the productivity would be due to the light and nutrient competitions between the main crop (coconut) and the intercrops. Hence, coconut in Konkan region needs reorientation in cultivation management for a sustainable production. The peak production of coconut in Konkan region is harvested during June-October period and the lean production is coincided with the summer period of March-April. In a year about 6-8 harvests are done at 45 - 60 days interval.

Need for Cropping System Management

Although the farmers in the region have adopted an integrated cropping system in coconut holdings, close observations on the cropping systems at the micro level indicated that the introduction of the component crops in the interspaces of coconut gardens need scientific approach and further refinement. In all the farms a high density multi species cropping system was seen adopted without considering

Table 5. Taluk-wise area under coconut in Ratnagiri District

Taluks	Yielding area in ha '000 nuts	% Share	Production
Mandangad	86	3.09	697
Dapoli	426	15.29	3451
Khed	113	4.06	915
Chiplun	364	13.07	2948
Guhagar	340	12.20	2754
Devrukh	187	6.71	1515
Ratnagiri	820	29.43	6642
Lanja	200	7.18	1620
Rajapur	250	8.97	2025
Total	**2,786**	**100**	**22567**

the growth habit of the palm, rooting pattern, canopy coverage, the amount of light transmitted through its canopy and the life span of coconut palms. The objective of increasing rate of return from unit holdings through high density multiple cropping system and its complimentary effect on soil flora and fauna which are responsible for the retention of soil health and sustainability of coconut production was not seen fulfilled. An appropriate coconut based farming system, based on the growth habit of the palm and considering the amount of light transmitted through its canopy will have positive influence and would stimulate the natural resistance of the palm against pest and disease causing pathogens and soil borne factors apart from enhancing the rate of return from the unit holdings (Sivaraman et al 2002). Such type of coconut based farming system will have salutary effect on farm level income. In order to have an economic feasibility of coconut based farming systems, it is necessary to understand the life span of coconut palm, which could be divided into three distinct phases from the point of view of intercropping (Annon 2001).

- Seedlings up to the age of 8 years: Good light transmission at the initial stage which decreases with age. Periods suitable for growing annuals/biennials. Intercrops have minimal competitions with coconut palm for ecological factors.
- Young palms from 9 years to 25 years : Maximum ground coverage (80 per cent) and low canopy due to shorter trunk; poor light availability; not suitable for growing other crops in the interspaces.
- Grown up palms of more than 25 years : Gradual increase in the magnitude of light penetration to the ground; decrease in apparent ground coverage of canopy; taller trunk; ideal for raising annual and/or perennial crops.

Betelvine as intercrop in coconut

Though intensive cropping pattern is adopted, the coconut gardens in Konkan region need reorientation and appropriate crop diversification to sustain high rate of growth in the production of coconut and its allied crop mix.

Hence, the selection of the subsidiary crops in a coconut based farming system in the region needs microlevel planning. Availability of resources like finance, labour, rainfall, irrigation facilities, soil characteristics, farmers need and market demands are the important factors to be considered while selecting the crop combinations in a coconut based cropping system. Crop should be selected according to the soil type, rainfall pattern, irrigation facilities and climatic conditions. Konkan region provide an ideal situation for the introduction of any compatible crop and hence the subsidiary crop should not grow as tall as coconut, do not cast shadow to the main crop and should not compete for light and nutrients. The coconut-arecanut crop mixes already established in the region do not perform well due to these reasons. Similarly, most of perennial horticulture crops raised in coconut gardens are seen competing for light and in many cases the canopy of the intercrops intersect with the canopy of the main crop.

Hence, the selection of the crop according to their shade tolerance and amount of solar radiation available is an essential pre-requisite for the successful introduction of coconut based cropping system. By adopting appropriate production technology, the coconut gardens in the Konkan region can be improved further. The present level of production can be further enhanced and the rate of return from the unit area can be increased by intercropping and adopting appropriate multistoried cropping systems.

Table 6. Taluk-wise Area under Coconut in Sindhudurg District

Taluks	Yielding area in ha	%Share	Production '000 nuts
Devgad	685	7.91	5394
Malvan	1,709	19.74	13458
Sawantvadee	2,101	24.26	16545
Vengurla	1,560	18.02	12285
Kankavali	383	4.42	3016
Kudal	2,079	24.01	16372
Vaibhavwadi	142	1.64	1118
Total	**8,659**	**100**	**68188**

(Source of data:Horticullture census report, Dept of Agriculture Pune)

Concluding Remarks

Coconut is primarily a small holders plantation crop in Konkan region. It is cultivated as an allied crop in a varied

crop mix. The coconut culture is being practiced in the form of a cluster farming i.e., the coconut is grown not on a contiguous manner but in scattered clusters. Traditional type of farming systems and practices are adopted in all the gardens where surface planting of coconut are found predominantly followed. Among the four Konkan districts, Sindhudůrg ranks first in area and production of coconut. However, Thane district accounts for the highest productivity of 82 nuts per tree per annum against the lowest productivity of 45 nuts in Sindhudurg. Though intensive cropping pattern is adopted, the coconut gardens in Konkan Region need reorientation and appropriate crop diversification to sustain high rate of growth in the production of coconut and its allied crop mix. The cultivation of new species like vanilla, spices like nutmeg, clove, pepper, etc., in the interspaces of the coconut gardens need technical and extensional support backed by processing and marketing support.

Notes:

1) The interaction with the traditional farmers revealed that coconut cultivation in Konkan has more than 100 years of history and has its genesis from Goan Heritage.

2) A team consisting of Project Co-ordinator (Palms), CPCRI., Kasaragod, Scientists and Senior Officers from Krishi Vidyapeeth, Dapoli, Department of Agriculture and CDB., conducted a roving survey in Konkan region and found that coconut gardens in Konkan Region, particularly in Thane District has mild and sporadic incidence of mite infestation.

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[iv] The interaction with the traditional farmers revealed that coconut cultivation in Konkan has more than 100 years history and has its genesis from Goan Heritage.

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