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STUDY
ON
COCONUT IN INDIA



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COMMITTEE ON NATURAL RESOURCES
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FOREWORD

In the series of studies that are being made under the aegis of the Committee of the Standing Committee on Natural Resources, a study on coconut was conducted.

Coconut is an important crop largely of southern and eastern India. India is the second largest producer of coconuts in the world with an area of 17 lakh acres under this crop and an annual production of 4,600 million nuts, but it still imports copra and coconut oil to the value of about Rs. 11 crores from Malaya, Ceylon and Singapore.

The object of the present study is to analyse the measures taken so far in the production of coconuts, how far they have succeeded and how far they have failed to achieve the set objectives. This study was discussed at the meeting held in the Planning Commission on September 2, 1963 with the representatives of the Ministry of Food and Agriculture as well as the Indian Central Coconut Committee.

The study has indicated that there are potential areas for expansion of coconut cultivation in Madras, Orissa, Gujarat and the Islands of Andaman, Nicobar, Laccadive and Minicoy. There is also extensive scope for the cultivation of coconuts along the banks of canals, bunds of fields as well as in saline waste lands in the coastal belt.

Long-term measures have special importance as it is a tree crop. The study has indicated that the nursery programme should be considerably enlarged. The study has further indicated an immediate need for survey of potential areas where coconut cultivation can be extended. I hope the recommendations made in this study will receive careful consideration in the preparation of the Fourth Five Year Plan.

27th September, 1963.

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INTRODUCTION

Coconut is an important food and industrial crop of India. Kerala State with an acreage of 11.7 lakh acres is the largest producer of coconuts in India. The States next in importance are Mysore, Madras and Andhra Pradesh. Out of the total production of coconuts 43 per cent are used for edible purposes, 52 per cent for soap-making and toilet preparations and about 5 per cent for illuminations, lubrication, biscuit manufacture, etc. On account of rising standards in living the use of soap has been on the increase. In fact the use of soap is an important barometer for measuring the rise in the standard of living of the people.

In this study a number of useful recommendations have been made which, if adopted and implemented, will help in increasing production of coconuts and in achieving self-sufficiency.

I acknowledge with thanks the valuable work done in the preparation of this Report by Dr. Vidya Sagar, Senior Research Officer in the Agriculture Division of the Planning Commission, Shri N. P. Chatterjee, Agricultural Marketing Adviser, Ministry of Food and Agriculture, Dr. P. J. Gregory, Secretary, Indian Central Coconut Committee, Shri C. R. Seshadri, Director of the Agriculture Division, Planning Commission, and Dr. V. Nath, Deputy Secretary (Natural Resources), Planning Commission.

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CHAPTER I

CLIMATE, SOIL AND VARIETIES

Coconut is one of the most important oil bearing tree crops of the tropics. Practically every part of the tree is used.

The raw nut and edible copra are important articles of food and indispensable items in Hindu religious ceremonies. Coconut oil is utilised in cooking, and in industry for the manufacture of vegetable ghee, soaps and toilet articles. The cake is extensively used as cattle feed on the West Coast. The water of the tender nut is a refreshing drink. The husk gives coir fibre out of which a variety of products such as yarn, mats, brushes etc., is manufactured. The shell is burnt and converted into charcoal, which is used in the manufacture of gas masks. Spoons and ladles and decorative articles are made out of the shell. The trunk of the palm is useful as timber and the leaves are used in thatching roofs, making baskets, mats, brooms, etc. The sweet juice obtained by tapping the unopened spathe is an invigorating drink when fresh or may be converted into jaggery.

Some of the parts of the palm are recognized to have exceptional nutritive and medicinal properties. The coconut water is reported to have laxative and diuretic properties.

There are innumerable other uses to which the various parts of the tree are put. It is no wonder that the tree is called "Kalpavriksha" (Tree of Heaven).

Climate

Coconut is a tropical palm. Philippines, India, Indonesia, Ceylon, South Sea Islands and Malaya which together account for over 90 per cent. of the world's total acreage and production of the crop, lie in the tropical zone between 20°N and 20°S latitudes. The palm is being grown even beyond this region between 23°N and 23°S, but not on an extensive or commercial scale or with much success.

Rainfall and temperature appear to be the most important factors affecting coconut cultivation. The palm can grow and bear fruit with a well distributed rainfall of 100 cms, but for profitable cultivation, rainfall of 100 cms to 255 cms per annum, evenly distributed throughout the year, is necessary. It can stand much higher rainfall if the soil is well drained. It cannot thrive in regions with long and pronounced dry spells during which the water table goes down considerably. On the other hand, too high water table is equally harmful. The coconut palm can tolerate a fairly high degree of salinity. This is why coconuts are grown extensively in coastal areas.

The palm requires an equable climate, neither very hot nor very cold. The optimum mean annual temperature for best growth and maximum yield is 27°C with a diurnal variation of 6°C to 7°C.

Other requirements for successful growing of the palm are warm and humid conditions and plenty of sunlight.

Soils

Though essentially belonging to the humid regions of the tropics, the coconut palm is very adaptable and can tolerate a wide range of soil conditions. Based on the soil, climate and certain other conditions under which coconuts are grown in India, the area can be grouped into the following well defined zones:

- (1) The coastal sandy tract, with fairly high water table (1 to 2½m), on the West and East Coast of the Peninsula lying mostly in Kerala, Madras, Andhra Pradesh, Orissa, Maharashtra, Gujarat and West Bengal;
- (2) the clayey reclaimed areas of the backwaters of Kerala with high water table (1m);
- (3) the midland or the upland region lying between the coast and hill slopes of South Kanara and the Kerala area with sandy soil and low water table (about 6m);
- (4) the laterite and loamy soils of hill slopes of the West Coast with varying percentages of gravel and sand and low water table (about 6 m to 9 m);
- (5) the loamy soils of Tanjore (Madras) with high water table during rains and low water table during summer;
- (6) the alluvial deltaic soils of the Godavari, (Andhra);
- (7) the loamy soils of Mysore, lying at an elevation of about 600m to 840m and having a rainfall of 50cms to 100 cms but with a fairly good supply of subsoil moisture, and
- (8) the forest soil of the Andamans and the coral soils of the Laccadives.

Soils lacking in water holding capacity and suffering from excessive dryness or improper drainage are unsuitable for coconut cultivation. The stem bleeding disease is common in tracts where the drainage is poor. Palms standing on bunds of rice fields give a good yield because under these conditions sufficient aeration of roots, adequate supply of water to the plants and good amount of light to the leaves are assured.

Varieties

The planters recognise several varieties of coconut based on variations in colour, shape and size of the nut, fullness of the crown, etc. The two most important varieties are the 'tall' and the 'dwarf'. In the tall variety some of the distinct types are New Guinea, Cochin China, Java, Siam, Laccadive Ordinary or Small.

The variety largely cultivated in India and the other coconut growing countries is the 'tall' one. It is also known as the 'West Coastal tall'. It is a long lived, hardy palm, which commences to bear fruit after 8 to 10 years of planting, and has a life of as long as 80 years. It is fairly resistant to diseases and pests. It

is generally cross-pollinated, although in summer months there are chances of self-pollination. The nuts mature in a period of 12 months.

The dwarf palm, as the name indicates, is small in stature, has nuts of small size, and yields copra of inferior quality. It begins to yield in 3 to 3½ years after planting, but has a short life of 30 to 40 years. The variety is grown mainly in favoured localities for its earliness and the attractive yellow or orange colour of the nut.

Successful experiments have been conducted by cross-breeding the two varieties. The progeny combines the early bearing nature of the dwarf variety and the good yield of nut qualities of the tall parent, a feature which makes the hybrid palm quite promising and economic.

CHAPTER II

AREA AND PRODUCTION

The total world acreage under coconut is estimated at 8.6 million acres and production at about 18.834 million nuts. Its distribution among important coconut producing countries of the world is given in Table I below. India occupies the second position both with regard to area and production. But inspite of this large production, India is an importer of coconut products, especially copra.

TABLE I

Area under and Production of Coconut in the important Countries of the World (1958)

Country	Area (million acres)	% of total Production (million nuts)	% of total Yield (nuts per acre)
Philippines	2.48	30	32
India	1.69	20	25
Indonesia	1.50	17	17
Ceylon	1.00	11	12
Malaya	0.60	7	5
South Sea Islands	0.60	7	4
Others	0.70	8	5
TOTAL	8.57	100	100

Collection of data on acreage and production of coconuts is beset with a number of difficulties. The palm is usually grown in gardens mixed with a variety of other trees. The number of trees in an acre, the proportion of bearing trees among these, as well as the number of nuts produced per acre in the different areas are all varying factors. Besides, there is lack of uniformity in the manner of collection of data in the different coconut producing countries. As a result the above figures are best considered as estimates.

Production within India

Figures of area and production of coconut since 1948-49 are given in the following table:—

TABLE 2
Area, Production and Yield per acre of coconut in India

Year	Area (1000 acres)	Produc- tion (million nuts)	Yield (nuts per acre)
1	2	3	4
1948-49	1,461	3,148	2,155
1949-50	1,472	3,448	2342
1950-51	1,536	3,582	2,332
1951-52	1,556	3,606	2,317
1952-	1,608	4,498	2,797
1953-	1,638	4,649	2,838
1954-55	1,583	4,409	2,785
1955-56	1,598	4,370	2,735
1956-57	1,619	4,448	2,747
957-58	1,632	4,498	2,756
1958-59	1,692	4,602	2,720
1959-60	1,699	4,639	2,730
1960-61	1,700	4,638	2,728

Source.—Area and Production of Principal Crops in India, pre-war Average to 1961-62 (Summary Tables), Directorate of Economics and Statistics, Ministry of Food & Agriculture, Government of India.

These figures show an increase both in acreage and production from 1948-49 upto 1953-54. After that year, however, there is no marked trend towards increase either in acreage or in production. Moreover, as will be clear from the discussion in the following paragraphs, even the increase recorded between 1948-49 and 1953-54 is also due in part to changes in methods of estimation. Therefore, it would be correct to say that the last eight years have not seen any marked change either in area or production of coconut.

Production of coconuts is concentrated in the coastal areas of South India. The West Coast area in Kerala with extensions in the adjoining areas of Madras to the south and Mysore and Maharashtra to the north, is the principal producing region. The delta areas of the East Coast in Madras (Tanjavur district) and Andhra are the other major producing areas. Small quantities of coconut are grown in the coastal areas of Orissa and West Bengal. Inland production of coconut is mainly in Mysore and to a very small extent in the Brahmaputra valley in Assam.

The most important coconut growing State in the country is Kerala which accounts for 70% of the total area and production. Other important producing states are Mysore and Madras with approximately 10% of production each, and Andhra Pradesh with about 7% of the total production. These four states together account for 97% of the total production of coconut in the country. Distribution of coconut acreage and production by States is shown in the following table. Acreage and production in important producing districts is shown in Appendix III and the location of the principal producing areas is shown in Maps 2 to 15.

TABLE 3
State-wise Area, Production and Yield of coconut in 1960-61

State	Area (1000 acres)	Production (million nuts)	Yield (nuts per acre)
Andhra Pradesh	89	325	3,652
Assam	2	13	6,500
Gujarat	1	2	2,000
Kerala	1,175	3,248	2,764
Madras	133	437	3,286
Maharashtra	19	44	2,316
Mysore	242	463	1,913
Orissa	11	66	6,000
West Bengal	17	22	1,294
Andaman & Nicobar Islands	5	2	400
Laccadive & Minicoy	6	16	2,667
All India	1,700	4,638	2,728

Trends in area and production

A perusal of the State-wise area under coconut for the period 1952 to 1961, given in Appendix I, reveals that while there has been an increase in Kerala, Andhra Pradesh and Maharashtra, there is a decrease in Madras. In Orissa, West Bengal and Assam no change in area is noticed. Trends in production shown in Appendix II are similar to those under area.

The figures for area and production of coconut in India also suffer from a number of limitations. Firstly, the collection of data on area and production of coconuts is beset with several difficulties because coconuts are grown mixed with other tree crops and also as scattered trees over a wide area. Further the problems of estimation of yield of coconuts are different from those of field crops as the harvesting of coconuts continues almost throughout the year. Thus, the available estimates of area and production suffer from a number of defects and are not very accurate. The methods for collection of information regarding area and production differ in different states. In Andhra Pradesh, Maharashtra, Madras and Mysore estimates are

prepared annually on the basis of usual crop inspections by the Revenue staff. No record, however, is made of the number of coconut palms in each survey number. The figures of area under coconut are published in the season and crop reports of the respective States. In Kerala, prior to 1952-53, the official statistics of area were based on the crop registers maintained by the Land Revenue Department. They were of limited reliability. In order to overcome this difficulty, the State Statistical Bureau undertook sample surveys to estimate the area under different crops in the State including coconut. The results from these surveys began to be made use of for official purposes in the erstwhile Travancore-Cochin State from 1952-53. The marked increase in production from 1951-52 to 1952-53 in Table 2 appears to be due primarily to the change in the method of estimation in the former T. C. area which is a principal producer of coconut in India. This has been recently extended to the Malabar area which was formerly in Madras, but which forms part of Kerala since 1956.

No regular estimates of area under coconut are prepared for the States of Assam, Orissa and West Bengal. The figures of area under coconut for Assam and Orissa are purely conjectural. In West Bengal also the position was the same, until a plot to plot enumeration of agricultural crops began to be made.

Yield

The yield figures in table 3 above show the highest yields for Assam and Orissa.* But since the areas under coconut in both these States are negligible, the really significant figures are those for Kerala and the other important producing States, Madras, Mysore and Andhra. The figure for Kerala is close to the average for the country; those for Madras and Andhra are considerably higher, but that for Mysore is lower than the all-India figure.

Estimates of production of coconut were not being included in the official publications of the Government of India in the pre-World War II period. An estimate of the yield of coconuts per tree and per acre was first made during the All-India Marketing Survey conducted by the Directorate of Marketing and Inspection of the Government of India before World War II. This was done by ascertaining the number of coconut palms per acre, the proportion of bearing palms per acre and the average yield per palm in a number of gardens. The average yields per acre for various States so collected, form even now the basis for estimating the total production of coconut in some States. In a few States like Kerala and Mysore the per acre yields have recently been revised on the basis of fresh *ad hoc* enquiries conducted by the Statistical Departments of these States but scientific crop cutting experiments do not form the basis of official coconut production statistics in any of the States. These estimates of production and area reported by the State Governments are now being included in the publications of the Ministry of Food and Agriculture.

*The Sample Survey puts the yield in Assam at the very low figure of 1209 nuts per acre (See Table 4 below).

Survey for estimation of area and yield of coconuts

Considering the unsatisfactory position of statistics of area and yield of coconut, a scheme for conducting sample surveys for correct estimation of area and yield of coconuts has been undertaken in different States with the following objectives:

- (i) to estimate the total number of coconut palms classified according to age groups, bearing and non-bearing status, healthy and diseased;
- (ii) to estimate the area under coconuts;
- (iii) to estimate production of coconuts based on estimated number of bearing palms and average yield per bearing palm; and
- (iv) to collect information on cultural practices, incidence of pests and diseases etc.

The above surveys have been conducted in different coconut growing States except West Bengal and Orissa for a number of years and a suitable technique for estimation of area and production has been evolved. A proposal to issue all-India crop forecast for coconut on the lines of similar estimates issued for principal crops has already been formulated and circulated to the State Governments for their comments. The following information is proposed to be given in the forecast on the basis of the surveys in progress in different States:

- (i) Area under coconut.
- (ii) Number of coconut palms—bearing and non-bearing.
- (iii) Production in terms of number of nuts.

It is hoped that regular forecasts for coconut would be initiated from the agricultural year 1963-64 or 1964-65.

The results of the second round of the sample surveys that are now being conducted in the coconut growing States for the correct estimation of coconut area and yield give very different figures from the currently accepted figures of area or production, as will be seen from the following table with those given in Table 3.

TABLE 4

Area and Production of coconuts in 1960-61 according to the Statistical Surveys (Third round in Assam and second round in other States).

	Area (000 acres)	Produc- tion (000 nuts)	Yield (no. of nuts per acre)	Yield (no. of nuts per acre from Table 3)
Kerala	1,309	2,625,000	2,005	2,764
Madras	168	887,073	5,280	3,285
Mysore	254	484,622	1,947	1,913
Maharashtra	19	48,143	2,534	2,316
Andhra Pradesh	81	194,607	2,402	3,652
Assam	7	8,466	1,209	6,500

The deficiencies in the figures of area and especially of production of coconut will be clear from the above figures. Improvement of methods of collection of data, especially extension of sample surveys which would furnish a reliable basis for estimation of area and production is one of the primary needs of coconut cultivation in India.

Differences in yields in different States in India are but to be expected in view of the variety of conditions under which the crop is grown. But it is of interest to note that even in a country like Ceylon where coconut growing area is rather compact large yield differentials have been noted, the range of variation being from 1,000 nuts per acre in Pattalam, to 4,000 nuts in Marabil.* The variation in yield is not only from one area to another but also from tree to tree in the same garden. It is difficult to come across a garden or an estate where most of the trees are uniformly high yielders. Again, while considering yields, it is not sufficient to consider only the number of nuts, the weight of copra and even the weight of oil that can be obtained from it are factors of material importance. In India yield of coconut is expressed in terms of number of nuts per tree but in other important producing countries like Ceylon, Phillipines and Malaya, yield is generally expressed in terms of out-turn of copra.

Factors responsible for variation in yield

The factors associated with the variation in the coconut yield as classified by Dwyer (1938) are as follows:—**

1. Genetical and inherent characteristics of the trees or palms.
2. Climatic environment, such as rainfall, temperature, altitude and prevailing winds.
3. Cultural environment, e.g., manuring, over-cropping and cultivation.
4. Soil environment, e.g., chemical, physical and biological characteristics.
5. Other factors such as the ones produced by pests, diseases and changes and effects produced by other flora and fauna.

Besides these, capacity of a cultivator to follow improved methods of cultivation is determined to a great extent by the income of a cultivator, which in its turn, is governed by the size of his holding. The first round of a recent statistical survey to estimate coconut area and yield undertaken in Madras State revealed that about 65 per cent of coconut holdings were below half an acre in extent and a little over 25 per cent between 0.5 and less than 2 acres and about 3 per cent above 5 acres. In other States also the pattern of holdings tends to be more or less similar.

*The Coconut Palm—A Monograph P. 202.

** *ibid* p. 199.

Detailed information for all the areas on the above lines is not available and in its absence it may not be possible to make a detailed analysis of the factors responsible for variation in yield in different parts of the country. For making any sound programme of increasing coconut production in the country, the importance of such a study cannot be over-emphasised. It is, therefore, recommended that practices followed in different parts of the country should be formulated by the Indian Central Coconut Committee.

Yield of coconut in India compared with yields in other producing Countries

The comparative yields of coconut in India and other important producing countries given in the following table, show that yield in India is the highest among these countries:

TABLE 5

Average yield of Coconut in some countries of the World in 1958-59

<i>Country</i>	<i>Per acre per annum</i>
1. Philippines	2,436
2. India.	2,721
3. Indonesia.	2,133
4. Ceylon.	2,491
5. Malaya.	1,717
6. South sea Islands	1,250

CHAPTER III

MEASURES TO IMPROVE YIELDS

Seednut selection

A survey of an ordinary coconut garden would show that only 10 to 15 per cent of trees are heavy yielders, 50 to 60 per cent are medium yielders and the rest are poor yielding types. A fruitful line of approach would be the inclusion of a maximum number of high yielding eco-types in a garden. The girth of the stem and the number of functioning leaves can serve as useful indicators in locating the high yielding types in a garden where all the palms are of the same age and have received similar treatment.

Besides low yielders, there are trees which produce barren nuts i.e., nuts without kernel, with kernel partially developed or a decaying one. Table 6 would give an idea of the percentage of barren nuts produced by trees in the plantations of the Central Coconut Research Station, Kasaragod. The mean average of barrenness for all the blocks works out to about 3 per cent, but there are cases of particular trees producing as high as 42 per cent of barren nuts.

TABLE 6

Percentage of barren nuts produced by trees in the plantations of the Central Coconut Research Station, Kasaragod

Blocks	Total number of trees in the block	No. of trees the data of which were examined	Mean percentage of barrenness
1	2	3	4
I	184	164	2.44
II	211	192	3.40
III	85	73	5.14
IV	103	95	3.13
V	128	117	2.71
VI	149	139	3.15
VII	157	140	3.15
VIII	158	151	2.46
IX	191	99	2.71
X	113	99	2.71
TOTAL	1,479	1,323	29.91

The attention given to this problem in the past has not been adequate. An earlier experiment revealed that the tapping of trees definitely reduced the number of barren nuts in the post-tapping period. Further research on this line is required.

One of the long term measures of stepping up production is by planting quality seedlings of high yielding capacity. Plant breeders as well as experienced agriculturists unanimously agree that selection of good seed material is the basis for economic coconut plantation. Unless extreme care is taken in the selection of parent trees, seednuts and seedlings, the grower is likely to come to grief when the result manifests itself after many years and when he has already invested a large sum of money for starting and maintaining a garden. Any mistake committed at this stage is irretrievable; therefore it is essential that all possible care is given to the selection of seed nuts.

The various stages involved in production of quality planting material are selection of area, selection of parent trees, selection of seed nuts and selection of seedlings. (7)

Irrigation

In almost all the coconut growing areas, there are heavy and continuous rains for several days during the monsoons, resulting in water stagnation, floods and erosion, which affect the roots adversely. After the rains, the continuous period of drought also affects them. Thus decay during the rains and thirst for water during drought exist as unfavourable conditions. Experiments conducted at the Central Coconut Research Station, Kasaragod have shown that watering during the summer months helps to increase yield. Coconut wants moisture but no water stagnation. Drainage channels are useful in most of the gardens. The flow of rain water should be checked and controlled and the optimum flow regulated. Rain water can be conserved by having basins around the basis of the trees. If channels and soakpits are also provided, they will be useful to hold the surplus water and prevent stagnation near the base. This will depend on the condition of land, which varies from place to place.

In the coastal regions, where the water table is generally high, summer irrigation is very easy and important. Filterpoint tube wells can easily be installed here for this purpose. Even saline water can be used for irrigating coconut palms growing in sandy soils.

Tillage

The necessity for regular inter-cultivation of coconut gardens has been well demonstrated by experiments. Even in the absence of manuring, tillage has been helpful in increasing yields. Inter-Cultivation can be done either by ploughing, digging or by forming mounds. The last one is found to be better than the other two though it is costlier and is suitable only in light soils. The depth of tillage depends on local conditions, the principle to be adopted being that the sub-surface roots should not be injured.

(7) For details refer to Coconut Bulletin January-February 1962, Vol. 15, Nos. 10-11 pp. 418-421.

The soil should be kept free from weeds and should not be allowed to remain hard and impervious. Adoption of a regular schedule of field operations rather than sporadic attention is conducive to the efficient maintenance of coconut gardens. Tilling, weeding, summer irrigation, manuring, proper drainage and cleaning as well as spraying the crowns are necessary operations to be done regularly, annually and systematically. Since it takes three years to reap the fruits of agronomic treatments, the efforts should not be slackened.

Manurial treatment

After ensuring that most of the trees in the plantation are high yielders, the next step is to resort to proper manurial treatment of coconut plantations. Results of systematic manurial experiments at the Central Coconut Research Station, Kasaragod, Kerala are shown in table 7 below:—

TABLE 7

Increased yield obtained by regular inter-cultivation and manuring over no-cultivation and no-manuring at the Central Research Station, Kasargod, Kerala

Years	No. of nuts per acre of 60. trees
1933	2262
1934	3960
1935'	3360
1936	3426
1937	3906
1938	2862
1939	3390
1940	1620
1941	3078
1942	2472
1943	3588'
1944	2400
1945	3984
1946	1680
1947	3366
1948	2400
1949	1608
1950	1608
1951	1104
1952	744
1953	894
1954	1872
1955	2142
1956	2112

Years	No. of nuts per acre of 60 trees
1957	2226
1958	3216
1959	2472
1960	3774
1961	3282
1962	2640
TOTAL	77,448
Average per year	2581.6

Manurial trials conducted in different parts of India indicate that a properly cultivated and manured tree would yield about 65 nuts as compared to 40—45 nuts per tree without manuring. Experimental data also prove that higher yields of copra can also be obtained by the application of fertilisers.

Proper manuring is very necessary to step up yields. Experiments have shown that for most soil types a manure mixture consisting of 3 to 4 lbs. ammonium sulphate, 2 to 3 lbs. of bonemeal or superphosphate and 2 to 3 lbs. of muriate of potash would be sufficient. Instead of ammonium sulphate, Chilean nitrate can also be used. Wood ash 30 to 40 lbs. per tree per year can be substituted for muriate of potash. Fish manure, cattle manure etc. can also be used supplemented with nutrients that may not be present in adequate quantities.

Burial of dry coconut husks at about 1,000 per tree in trenches dug in between the rows of trees has been demonstrated to be very helpful. The beneficial effects of one operation are found to last for 5 to 6 years, even in the absence of manuring. This is however possible only in places where dry husks can be had readily and cheaply. Regular application of silt and sand to gardens with clayey soil and that of silt and clay to sandy soils has also been reported to give beneficial results.

Experience of enlightened farmers show that silt compost, cow-dung and green manure are useful basal manures and are helpful in reducing the dose of nitrogenous fertilisers. Phosphate and potash are also useful; but coconut is a lover of potash. Fish manure mixed with ash supplies constitutes a complete manure. Manuring during heavy rains should be avoided, the period of the light rains being utilised for manuring. The following prescriptions may be a useful guide for the growing of coconut:—

TABLE 10
Recommended dosages for manuring

Years after planting	Ammonium sulphate in Kg.	Bonemeal or superphosphate in Kg.	Muriate of potash in Kg.
2 and 3	0.25	0.25	0.25
3 and 4	0.50	0.25	0.50
5 and 6	1.00	0.50	0.75
7 years and onwards	1.50	1.00	1.00

Source.—Coconut Bulletin, Vol. 15, Nos. 10 & 11, January-February, 1962, p. 432.

One kilogram of ammonium sulphate and an equal weight of muriate of potash may be substituted by 3 to 4 Kg. of oil-cake and 15 to 25 Kg. of wood ash, respectively. The dose of oil cake is applicable to fish manure also.

In soils deficient in organic matter, green manuring, particularly by *Gliricidia* or sun-hemp which can be grown as hedge plants is considered to be very good for coconut plantations. It also helps in supplementing supplies of organic matter like cattle manure and compost which are already in short supply. The mode of application of green manure depends on the nature of the plantation. In a regularly planted and properly spaced garden, green manure can be turned over in trenches about 2 feet wide and one foot deep opened in the centre of every two rows of trees. The trenches should be opened length-wise and cross-wise in alternate years and their position changed from year to year. In gardens where the palms are irregularly planted or where under-planting has been carried out, the green manure will have to be applied in basins dug round the base of palms. "Organic manuring has also been shown to suppress many soilborne parasites. These considerations support the application of green manure to soil where crops are showing tendencies to get infested by pathogens." (9).

Control over pests and diseases

The coconut palm is susceptible to a number of pests and diseases. The annual loss caused by such pests in Kerala alone has been estimated to exceed Rs. 10 million. (10).

The root wilt disease is believed to be of a virus nature. The other common diseases of the palm in the Kerala area are of fungal type like 'bud rot' and 'leaf rot' which can be controlled by spraying the crown of the palm with Bordeaux mixture at least twice a year.

(9) Coconut Bulletin Col. 15, Nos. 10 & 11, January-February 1962, p. 433.

(10) The Coconut Palm—A Monogram, p. 203.

Leaching in coastal areas and also poor fertility in laterite areas and sandy soils are serious defects. Necessary care should therefore be taken to see that such conditions do not occur.

The most serious pest is the 'rhinoceros beetle' (*Oryctes rhinoceros*). Its attack is most serious when the plants are young. The beetle breeds in manure heaps, under trash and decaying vegetation of all kinds.

There are a number of methods effective in warding off the attack. They range from physical removal of the beetle to the control of the beetle at its breeding place and application of B.H.C. (5%) mixed with sand at the axis of the leaf.

The following measures are recommended for controlling the other important pests and diseases that affect coconut:—

Black headed caterpillar (Nephantis serinopa).—The affected leaves are cut and burnt if the infection is sporadic. If the infection is fairly extensive, the spraying of the crowns of palms with 0.2 per cent D.D.T. is effective. Liberation of 'Bethylid' and 'Eulophid' parasites which are being bred in the parasite breeding laboratories established in the important coconut growing regions in Kerala, Madras and Andhra States, is also very effective in control of this pest.

Injection of pyrocon—E (1,000 c.c. of 1 per cent solution) into the trunk or placing Paradichlorobenzene into the borehole made in the trunk and plugging it with cement, control the pest.

Cockchafer grubs

Spreading B.H.C. (5 per cent dust) at 56 lbs. per acre or 5% chlordone dust at 28 lbs. per acre twice a year and incorporating it either by ploughing or digging will control the pest.

'Stem bleeding' disease

The diseased tissues are chiselled out and the exposed portion is smeared with tar. If the drainage is defective, it should be improved.

'Bud rot'

The affected tissues are removed. The cut end is smeared with Bordeaux paste.

'Leaf rot'

The affected portions of leaves are cut and burnt. Spraying of the crowns of palms with per acre Bordeaux mixture should be done.

Extension of plantings

It will be necessary to increase the area under coconuts, by bringing additional areas under the crop in order to meet the future demand. In this it is necessary to ensure that the new areas are in regions which are agro-climatically most suited for the growth of the palm.

A survey conducted in Madras shows that an overall increase of about 50 per cent in acreage is possible in that State. Large areas fit for raising the coconut are available in the interior of South Kanara and Malabar Districts especially in the lower slopes and at the foot of the hills. Marked expansion is also possible in the sandy and saline areas of the coastal states. Seedlings can also be planted on canal banks. Large potentiality for extension of plantations in the Andamans should also be exploited.

In Kerala State the area that can be brought under cultivation consists of low-lying lands in which paddy cultivation is uneconomical, but cultivation of coconuts on bunds would be profitable. It is also possible to reclaim shallow backwater areas and cultivate coconut on bunds. In Mysore, cultivation is possible on canal banks and certain areas now lying fallow.

In Andhra Pradesh canal banks and suitable waste lands can be planted up. In West Bengal and Assam suitable waste lands can be brought under coconut.

Special drive for planting in homesteads should be launched in order that larger quantities of coconut may be released for use in various industries. This would necessitate large scale expansion of the nursery programme in the different States for meeting the additional requirement of planting materials.

CHAPTER IV

REVIEW OF DEVELOPMENT PROGRAMMES

Coconut remained more or less a neglected crop before the setting up of the Indian Central Coconut Committee in 1945 with its headquarters at Ernakulam in Kerala State. The Committee has set up two Central Coconut Research Stations. One at Kasargode in the Cannanore District of Kerala State was started in 1947 to tackle problems of fundamental research concerning coconut cultivation. The other at Kayangulam in the Quilon District of Kerala State was started in 1948 to investigate problems connected with pests and diseases of coconuts. Besides, regional coconut research stations for cultural and manurial experiments of local importance have been set up—three in Kerala and one each in Maharashtra, Andhra Pradesh, Assam, Mysore, Madras and Orissa. Steps have also been taken to start a station in West Bengal.

The main functions of the Committee are undertake, assist and encourage agricultural, industrial, technological and economic research on coconut; to supply technical advice to growers and to persons engaged in the coconut industry; to encourage the adoption of improved methods in coconut cultivation; to improve marketing of coconuts and coconut products in India and abroad and suggest suitable measures to prevent unfair competition; to promote and encourage cooperative efforts among the coconut growers and the coconut industries; to fix grade standards of copra and its products; and to collect statistics from growers, dealers, millers and other sources on all relevant matters bearing on coconut industry.

Second Five Year Plan

Coconut development programmes did not find a place in the First Five Year Plan. A sum of Rs. 30 lakhs was provided for the research on coconut in the Central sector of the Second Plan. However, in the first two years of the Plan the expenditure was only Rs. 2·9 lakhs, and increased to Rs. 7·69 lakhs in 1959-60. The total expenditure incurred during the plan period was Rs. 20·60 lakhs or about 2/3 of the plan provision.

The States of Kerala, Mysore, Madras, Andhra Pradesh, West Bengal, Assam and Maharashtra and Gujarat (former Bombay) had a total provision of Rs. 30·73 lakhs on the various programmes of coconut development and research. The additional number of coconuts targetted to be produced at the end of the Second Plan was 870 million nuts, an increase of about 22 per cent above the then average production of about 4,000 million nuts; but as a result of the late implementation of the development schemes the additional production has now been estimated at only 350 million nuts.

A review of the work done on the various programmes included in the Second Plan is given below:—

A. Research expansion and intensification of work at Central Coconut Research Stations, Kayangulam and Kasaragode

At the Central Coconut Research Station, Kayangulam besides intensifying research work on the existing lines, *viz.*, investigation on the root and leaf diseases of the coconut palm and control of pests and diseases, the following new items of work were undertaken:—

- (i) Studies on the microflora of coconut soils to assess the role of micro-organisms on the incidence of root and leaf disease.
- (ii) Investigations on the virological aspect of the root (wilt) disease of coconut.
- (iii) Studies on the nutrition of the coconut palm in health and disease.
- (iv) Collection of comparative analytical data on the soil and plant materials from healthy and diseased trees.
- (v) Studies on the insecticidal control of the rhinoceros beetle and the ecological studies of *Nephantis serinopa*. These studies are of a long term nature and, therefore, are being continued under the Third Five Year Plan for a period of three years.

At the Central Coconut Research Station, Kasargode besides expanding the scope of work already taken up in the botany, agronomy, cyto-anatomy and chemistry sections, the following items of work are being taken up:—

- (i) Detailed soil survey of the coconut growing regions in the country in order to classify the soils, study their characteristics and prepare a soil map for the entire area to serve as a guide for future research work and extension.
- (ii) Meteorological and crop weather studies.
- (iii) Survey of the coconut tracts in India to find out promising varieties for further propagation.
- (iv) Studies on the storage of copra and coconut oilcake.
- (v) Statistical work connected with the lay-out of experiments.

As in the case of the Central Coconut Research Station, Kayangulam, the experiments could not be completed within the Second Plan period. They are being continued in the Third Plan for a period of 3 years.

Setting up of regional coconut research stations

Under the Second Plan regional coconut research stations were set up in each of the States of Madras, Mysore and Orissa. They are being continued under the Third Plan.

Sample surveys for the correct estimation of area and yield of coconuts and enquiries into cost of cultivation of coconut

Four rounds of these surveys have been completed in Assam, three rounds in Kerala, Madras, Mysore, Maharashtra and Andhra Pradesh and one round in Orissa. Two rounds of the survey to ascertain the cost of cultivation of coconuts in Kerala were completed in October, 1962.

Revision of the Report on the Marketing of Coconut and Coconut Products in India

The revised report is expected to be ready shortly.

Parasite breeding stations for biological control of Naphanitis serinopa

Under the Second Plan, two stations have been set up in each of the States of Madras, Andhra Pradesh and Maharashtra and one in Kerala.

6. Investigation of diseases in Mysore and Andhra Pradesh:—

- (a) Scheme for control of anabe roga in Mysore: Anabe roga is a dreaded disease of coconut in Mysore. Its etiology has been worked out and control measures evolved, but the efficacy of the control measures lies in the complete eradication of the focii of infection. The objective of the scheme was to study the effect of new fungicides and fumigants to compare it with the treatment now followed, and to make a detailed survey of the incidence of the disease and the factors that are responsible for its virulence.

Experiments to study the effect of new fungicides and their comparative efficacy with sulphur treatment were laid out in consultation with the State Statistician. Growers were contacted and advice given about the measures to be adopted for control of the disease. Surveys for the incidence of the disease were carried out during the Second Plan period. They revealed that the disease affects old trees and is more prevalent in water-logged areas. The scheme is being continued under the Third Plan.

- (b) Scheme for the investigation of coconut disease in Andhra Pradesh: The object of this scheme was to conduct a detailed survey of the various diseases of coconut in the State and to evolve suitable control methods. The scheme is being continued under the Third Plan.

B. Technological Schemes

A special Sub-Committee, set up by the Indian Central Coconut Committee for organising coconut technological research, had decided that some of the important problems requiring investigation may be taken up at the established technological institutes in the country.

Schemes for the solvent extraction of oil from coconut oil cake and preparation of charcoal from coconut shell were sanctioned to be worked at the Regional Research Laboratory at Hyderabad while preparation of vinegar from coconut neera and processing of de oiled coconut cake so as to render it suitable for human consumption were sanctioned to be worked at the Central Food Technological Research Institute, Mysore.

C. Development

1. *Establishment of coconut nurseries.*—Under the Second Five Year Plan, additional nurseries for distribution of quality seedlings have been sanctioned in all the coconut growing States. By the end of the Second Plan period, there were 65 coconut nurseries with an annual production target of 7.49 lakhs of seedlings in the different States and centrally administered areas. The achievement of seedlings was, however, only two-thirds of the targets. The shortfalls in this regard have been reported mainly from Orissa, Madras and Andhra Pradesh.

In addition to the plan nurseries, seedlings were also produced and distributed in the departmental nurseries as a normal activity of the Committee outside the Plan provision. The consolidated figures for the production and distribution of seedlings from both the sources during the Second Plan period are given in Appendix VI. A perusal of the Appendix shows that out of a target of production of 32.94 lakh seedlings, the achievement was 25.26 lakhs during the Plan period.

2. *Spraying of coconut palms in Kerala State.*—The root (wilt) and leaf diseases of the coconut palm in Kerala State have assumed serious proportions. By controlling these diseases effectively, it will be possible to increase the yield of the palms considerably.

As has been mentioned already, the Committee has since 1949 been running several *ad hoc* schemes for spraying the crowns of the coconut palms with copper fungicides for controlling the leaf disease. The work was intensified under the Second Plan and the entire disease affected area of a lakh of acres covered by a comprehensive spraying scheme which started in November, 1956.

Although the State Government had planned to conduct 522.35 lakhs of spraying during the Plan period, it was possible to achieve only 310.50 lakhs of sprayings or 59.4 per cent of the target as shown below:—

Year	Target of sprayings in lakhs	Achievements in lakhs	% of Col. 3 to Col. 2
1	2	3	4
1956-57	40.00	26.21	65.8
1957-58	100.00	84.55	84.5
1958-59	136.75	96.10	70.3
1959-60	125.67	72.90	58.0
1960-61	120.00	52.33	43.6
	522.35	310.50	59.4

Bad weather, lack of sprayers and insecticides hampered the spraying operations to a large extent. It may also be noted that the percentage of achievement to the target has been steadily going down.

The other method of controlling disease and pests is through biological control. This is particularly necessary in the case of the pest *Nephantis serinopa* which attacks the leaves of the palm and devitalises it. Sporadic outbreaks of pests occur in various places in all the coconut growing areas. Control measures consist of releasing parasites to fight the pests. Stations to breed parasites, that would destroy the pest were started in Kerala, Madras and Andhra Pradesh during the period of the First Five Year Plan. The number of these stations was increased under the Second Five Year Plan to a total of 16. During the Third Plan, work in all these centres is being coordinated under a single scheme of biological control.

In addition to these control measures which are being taken in the principal coconut producing areas, investigations on the *Anabe roga* which is a dreaded disease of coconut in Mysore, and a survey of diseases of coconuts in Andhra Pradesh have been undertaken. The Mysore Scheme has worked out the etiology of the disease and further work on the efficiency of new fungicides is in progress.

3. *Organisation of demonstration plots.*—Two hundred and thirty-four (234) demonstration plots to bring home the advantages of manuring and inter-cultivation on scientific lines have been started in Kerala State, 150 in Madras, 50 in Andhra Pradesh, 24 in Orissa, 2 in Gujarat and 4 in Pondicherry. The demonstration plots have been popular and their number has been increased to 1,774 under the Third Plan.

4. *Coconut development schemes.*—Coconut Development Schemes functioned under the Second Plan in Madras, West Bengal, Orissa and Mysore. Work done under the schemes included propaganda for better cultivation of coconut, distribution of seedlings and manures etc. They are being continued under the Third Plan.

Madras

The scheme envisaged intensive propaganda on improved methods of coconut cultivation and assistance to the growers to adopt scientific methods of cultivation and also to control the pests and diseases. During the Second Plan period quality coconut seedlings to cover 3,309.50 acres of new area were distributed; 3,021 uneconomic palms were removed and quality seedlings planted in their place. The area covered by manurial practices, plant protection measures, irrigation practices, and cultural practices during the plan period are indicated below:—

	Achievements
1. Manurial Practices	49,500
2. Plant protection	83,155
3. Irrigation practices	51,718
4. Cultural practices	1,28,187
5. Number of seedlings supplied	3.46 lakhs
	(target 4.16 lakhs)

West Bengal

The scheme had for its programme of distribution of quality coconut seedlings, distribution of manure mixtures free of cost and propaganda among coconut growers for adoption of improved cultural practices, plant protection measures etc. During the Second Plan period, 24,000 seedlings were distributed to the growers for underplanting and new planting; 26.6 tons of manure mixture were distributed, and 100 demonstration plots were also maintained.

Mysore

The object of this scheme was to carry out propaganda among the growers on improved methods of cultivation and plant protection measures. During the Second Plan period, 134 demonstration plots were laid out, coconut gardens were inspected and advice given to growers for proper cultivation of coconut. The areas covered by the various measures are given below:—

	(In acres)	
	Target	Achievement
1. Area covered by fertilisers	76,800	43,194
2. Cultural practices	76,800	29,695
3. Plant protection measures	76,800	21,940
4. Irrigation practices]	19,800	8,493
5. Number of seedlings supplied	3.44 lakhs	2.47 lakhs

Supply of Fertilizers

The need for making available adequate quantities of fertilizers for manuring the coconut palms was repeatedly stressed by the Indian Central Coconut Committee. The Committee also suggested that—

- (i) Separate allotments of fertilizers be made to the coconut producing States in proportion to the area under coconut in each state; and
- (ii) that fertilizers be given as medium term loans to cultivators payable from the fourth year of granting of the loan. This longer period was suggested because unlike field crops in which the benefits of applying fertilizer are available in the same crop season, the cultivator of coconut gets the benefit of increasing the palms after a considerable period.

These suggestions did not prove acceptable to Government. The Central Government which make allocations of fertilisers to States taking into account their total requirements, felt that it was for the State Governments to earmark quantities for different crops if they considered this necessary. The suggestion to give fertilisers this necessary. The suggestion to give fertilisers on medium term loans was also not accepted as it was not considered feasible to alter the existing arrangements regarding distribution of fertilisers in view of the acute shortage of fertilisers in the country.

Estimates of the quantities of fertilizers used on the coconut crop during the Second Plan period are not available, but the I.C.C.C. consider the use very unsatisfactory.

Irrigation Facilities

A large part of the coconut growing area has assured heavy rainfall and does not require irrigation. However, there are tracts in parts of Mysore, Madras, Maharashtra where water deficiency is experienced especially in the prolonged dry period when the water table goes down. Facilities for providing irrigation exist in some of the areas notably in Mysore where nearly 28,000 acres are irrigated. The irrigated acreage is extremely small in comparison with the total area under the crop. Moreover, it has not shown any significant increase during the last few years.

Increasing area under coconut

The total area under coconut in the country is 17 lakh acres, which is the second largest in the World. An examination of the trends of acreage and production during the last ten years (Appendix I) shows however that the area has increased only slowly (from 16 lakh acres in 1952-53 to 17 lakh acres in 1960-61).

Third Five Year Plan

The Third Five Year Plan provides for the production of 5,275 million nuts, an increase of 775 million nuts or 17.2 per cent over the estimated production of 4,500 million nuts. The actual production in 1960-61 as reported is 4,638 million nuts.

All the coconut growing States have made a provision of Rs. 445 lakhs for the development and research on coconut. Kerala State alone accounts for about Rs. 345.49 lakhs or more than 70 per cent of the Plan provision made in the State Plans. Appendix IV gives the State-wise outlay and the progress of expenditure during the first two years of the Third Plan.

The various research and development schemes under implementation or proposed to be taken up during the Third Five Year Plan are given below:—

1. Scheme for strengthening the Central Coconut Research Station, Kayangulam. The scheme envisages investigation of the stem bleeding disease, studies on the antigenic properties of the coconut wilt virus and studies on its control measures, studies on the influence of water-logging on the incidence of wilt disease, investigations on red palm weevil and trials for controlling some of the diseases and pests by systematic application of fungicides and pesticides.
2. The object of the scheme at the Central Coconut Research Station, Kasaradod is to undertake long-range planned programme of selection, breeding and hybridisation and research on the irrigation and inter-cultural aspects and the economies of introducing suitable machinery for use on small holdings.

3. Scheme for strengthening of the office consists of appointment of additional staff.
4. A marketing unit to gather market intelligence, do marketing research, help the State Governments in setting up cooperative marketing societies etc., is also proposed to be set up.
5. The Regional Coconut Research Station proposed for West Bengal will be located in the Howrah District and will take up cultural and manurial trials of local importance.
6. The setting up of an elite seed farm in Mysore is an important item of work under the Third Plan. The coconut crop being cross pollinated in nature, the present method of collecting seednuts from selected mother palms is not considered a perfect method. The possibility is always there of the female flowers of the selected palms getting pollinated by pollen from inferior palms in the neighbourhood. It is therefore considered necessary to establish a nucleus plantation with seednuts obtained as a result in this controlled cross pollination. The seedlings raised in this manner are expected to grow into heavy bearing palms and seednuts collected from these can be used for future large scale propagation.

7. *Regional Coconut Research Station, Arsikere, Mysore.*—This scheme was started in June 1958 under the Second Five-Year Plan. The Government of India have sanctioned its continuance as a Category 'A' Scheme under the Third Five Year Plan. Work done under the scheme includes spacing-cum-manurial experiments, age of seedlings-cum-depth of planting experiments, experiments on manuring of seedlings, observation on cover crops and green manures, manurial trials in established gardens and distribution of seedlings from the nursery attached to the Station which has a target of 10,000 seedlings.

8. *Scheme for artificial culturing of coconut embryos in Kerala.*—The Scheme is to be undertaken by the Kerala University and has been sanctioned to be implemented in 1962-63. Steps have been taken to recruit the sanctioned staff.

9. *Scheme for correct estimation of area and yield of coconuts in the States of Kerala, Andhra Pradesh, Assam, Maharashtra, Mysore, Madras and West Bengal.*—In Assam, the fourth round of the survey was completed in September, 1962 and field work connected with the fifth round is in progress. The third round of the surveys in Kerala, Madras, Andhra Pradesh, Mysore and Maharashtra was completed in June, 1962 and the first round of the survey in Orissa has been completed. The survey in West Bengal started in September, 1962.

10. *Enquiry into the cost of cultivation of coconut in Kerala State.*—Field work in connection with the surveys has been completed and the data collected are being analysed.

11. *Layout of Demonstration plots.*—In Kerala, 800 demonstration plots are being started under the Third Plan. In Madras and Andhra Pradesh there are 196 and 50 demonstration plots respectively. In Mysore also 280 demonstration plots are being started. In Orissa 50 demonstration plots will be organised under a phased manner. West Bengal will have 20 demonstration plots. The target fixed for Laccadives is at least 10 demonstration plots for each Island. In Andamans, 70 demonstration plots have been laid out.

12. *Distribution of fertilisers.*—Application of fertilisers and manures is one of the surest ways of increasing the production of the coconut palm. Although the Committee had recommended the distribution of fertilisers and manures at subsidised cost under the Third Plan, the Government of India have decided that fertilisers would be made available to the State Governments outside the plan. Specific schemes for distribution of fertilisers have been sanctioned only for a few States. In Kerala State it is proposed to manure during the Third Five Year Plan 166 lakhs of trees according to a phased programme. Distribution of manures and fertilisers is also one of the items of work contemplated under the coconut development programmes in Orissa, West Bengal and the Laccadives. Information about proposed utilisation of fertilisers for coconut (State and year wise) during the Third Plan period is given in Appendix VII.

13. *Expansion of area.*—In Kerala State, a scheme for bringing under coconut about 1,123 acres of sandy coastal and reclaimed Kayal areas has been drawn up. The Mysore Government propose to advance loan at the rate of Rs. 200 per acre for bringing new areas under the crop. It is expected to bring 1,250 acres of fresh area under the crop. The Madras State have taken up a scheme for settling landless poor and repatriates from Ceylon in Ramanathapuram District and to allot to their families land for developing coconut cultivation. It is expected to bring about 9,000 acres of additional land under the crop.

In West Bengal it is proposed to bring 2,000 acres under coconut. In Andamans about 946 acres of forest land etc., had been cleared by the end of the Second Plan and brought under coconut cultivation. There are still vast possibilities of bringing fresh area under the crop in these islands. It is proposed to clear about 2,000 acres in the Andamans and 1,000 acres in the Nicobars of forest growth and bring the area under coconut.

14. *Control of pests and diseases.*—(a) *Parasite Breeding Stations.*—In Kerala, there are seven Stations for the control of *Nephantis* located at Trivandrum, Quilon, Kottayam, Vaytila, Kozhikode, Kasaragode and Trichur. In Madras, there are five stations located at Tanjore, Coimbatore, Gudiyatham, Udangudi and Nagercoil. There are two stations in Andhra Pradesh, one at Razole and the other at Ambajipet, two in Maharashtra State located at Alibag and Ratnagiri and one in Mysore State located at Mangalore.

(b) *Spraying scheme.*—During the Second Plan, a scheme for spraying twice a year 70 lakhs of coconut trees in Kerala affected by root (wilt) and leaf diseases was in force. Experience has, however shown that it is not enough to treat the disease affected trees

alone. Protective belts have to be formed in the regions lying continuous to the infected areas to prevent the spread of infection. It is now proposed to spray annually 150 lakhs of trees in the infested area and round about it. To give an incentive to the coconut growers to take up spraying work on their own, it is proposed to distribute 4,100 sprayers at half the cost among coconut growers in the diseased areas. The Madras Government also propose to distribute sprayers and insecticides at subsidised cost.

15. *Irrigation Facilities.*—In Kerala State it is proposed to construct 625 filter point tube wells and provide them with pumping installations. In addition, 111 electric motors and 514 oil engines and pumpsets will also be distributed during the Plan period. The cost of constructing the filter points and cost of installation of pumpsets, engines and motors will be treated as a loan repayable from the third year in five equal annual instalments. It is estimated that the coconut trees in about 1,875 acres will be benefited by the above scheme. The total cost of the scheme is estimated at Rs. 16 lakhs. The Mysore Government have also provided a sum of Rs. 2,25,000/- for grant of loans to cultivators for installation of pumpsets and provision of irrigation facilities.

16. *Distribution of quality seedlings.*—There are 112 Plan nurseries in the various States with a production target of 15.40 lakh seedlings per annum. The total production target for the Third Plan is 80 lakhs of seedlings, as detailed below:—

TABLE 9

Statement of Distribution of Seedling from Nurseries under Third Plan

Sl. No.	State	No. of Nurseries	Target of production	Seedlings distributed during '61-62
1	Kerala	47	6,00,000	2,71,439
2	Mysore	7	90,000	94,782
3	Madras	10	2,47,500	1,85,457
4	Andhra Pradesh	8	2,70,000	2,28,154
5	Orissa	5	1,50,000	71,101
6	Maharashtra	2	15,000	Distribution of seedlings not commenced.
7	Gujarat	1	30,000	31,018
8	West Bengal**	4	48,000	4,48,887
9	Assam	16		
10	Pondicherry	3	14,000	10,509
11	Tripura	1	6,000	4,000

**The total production target of these nurseries during the period is 3,34,000 in a phased manner i.e. 60,000 during 1961-62, 75,000 in 1962-63, 90,000 in 1963-64, 97,000 in 1964-65 and 1,12,000 in 1965-66

S. No.	State	No. of Nurseries	Target of production	Seedlings distributed during '61-62
12	Laccadives etc.	9	8,000	13,765
13	Andamans	2	24,000	7,711
14	Central Coconut Research Station Kasaragode	1	15,000	20,066
Total		116	15,17,500*	19,53,159

The year-wise distribution of the target is as follows:—

	No of Seedlings
1st year	15,77,500
2nd year	15,92,500
3rd year	16,07,500
4th year	16,14,500
5th year	16,37,500

However, it is estimated that the capacity will not be adequate to supply the needs for seedlings which are estimated at 34.3 lakhs per annum. An upward revision of the programme for establishment of nurseries is, therefore, urgently necessary.

The total financial outlay for the research schemes under the Third Plan is Rs. 31.63 lakhs of which the Committee will meet Rs. 24.94 lakhs from the Central Government grant made available for the purpose, while the remaining Rs. 6.69 lakhs will be met by the State Governments concerned.

An Appraisal

Programmes of development of coconut have not received the attention due to them considering the importance of the crop. These programmes began to make headway only during the latter part of the Second Five Year Plan. In the formulation of the Second Plan, the problem of nurseries and seedlings was inadequately dealt with. In the meantime, there was no marked improvement either in area or in production of the crop, as the figures for the year 1952-53 to 1960-61 show. The deficiency has been made up to some extent in the Third Year Plan under which a more adequate and diversified programme of improvement has been initiated. There is need for further intensification of these programmes of development specially with respect to supply of seedlings and fertilisers. In spite of the rather large areas under coconut, production in the country is not adequate for requirements. The demand is likely to go up steadily with rise in standard of living and consumption of oils in the country.

*Target for Assam State not included.

The possibilities of bringing additional lands under coconut cultivation are limited so that emphasis must remain in steps to increase yields per acre. There is enormous scope for this as indicated by the results at Research Stations according to which production could go up from the present average of 35 nuts to 55 nuts per tree. Regular replanting in order to eliminate the old and unproductive trees, manuring and use of chemical fertilisers and pest disease control are the principal steps needed for increasing production. As will be clear from the fore-going survey, the capacity of the nurseries for supply of quality seedlings has to be increased further so as to meet the needs of regeneration in the existing areas and planting in new areas. Fertiliser distribution and pest control programmes have also to be stepped up very considerably. Provision of irrigation facilities has barely made a start. These will have to be expanded wherever there is need for them.

In coconut, as in other tree crops, returns from investment come after a long period. However, as prices of coconut products are subject to fluctuations from year to year, the small cultivator who has only a few trees on his holding does not have adequate incentive to invest in improvement measures. State initiative in ensuring that measures for maintaining high yields are regularly taken by the small growers, is therefore even more necessary than in the case of field crops.

As a long term measure, extensive plantings of coconut are essential. This emphasises the need for a survey of potential areas where coconut cultivation can be extended. The programme for supply of requisite seedlings should also be stepped up simultaneously.

CHAPTER V

MARKETING AND INTERNATIONAL TRADE

Coconuts

Producers generally sell their tender coconuts in their gardens to hawkers, itinerant dealers, retailers, or merchants who in their turn, dispose of the nuts in towns, *shandies*, railway stations etc. The nuts are sometimes sorted according to size. The trade is mostly of a localised nature and the producer's share in the price paid by the consumer is estimated to be 56 to 75 per cent, depending upon the distances involved and the number of intermediaries taking part in the transactions.

In the case of mature nuts, big producers usually sell their nuts unhusked at their gardens to copra makers or merchants, while small producers take their nuts, husked or unhusked, to *shandies* or markets, and sell them direct or through commission agents. The nuts are generally offered for sale fresh as "water nuts" soon after harvesting, but in certain areas, some of the producers sell their nuts as "dry nuts", after several months of storage, during which time the water inside, gets absorbed by the kernel. Nuts for the whole year are sometimes sold by the producers in advance, on the basis of coconut oil prices prevailing from time to time. The assembling of coconuts on a co-operative basis, has developed in a few places, but still there is a great scope for developing the marketing of coconuts and copra, on co-operative lines.

The nuts collected by merchants are generally sorted into big, medium, and small sizes and offered for sale unhusked, fully husked, or partially husked, according to the requirements of different markets. As a rule, coconuts intended for local sale are fully husked, while those for despatch to distant markets, are only partially husked. The cost of husking may vary from Rs. 1.50 to Rs. 6.00 per thousand in different areas. When the husks are to be utilised for retting, the nuts are husked immediately after harvesting and the husked nuts used for preparing milling copra. In areas where there are no retting facilities, nuts are often stored for sometime, maximum of three months before making copra. The quality of copra produced from such stored nuts is better than that from fresh nuts. When the nuts are to be sold as dry nuts or used for preparing ball copra, the period of storage may extend from 9 to 12 months. The cost of storage is reckoned to be roughly about Rs. 1.50 to Rs. 6.00 per thousand nuts, per month. Although a considerable portion of the coconut crop is sold off the garden to copra makers and merchants, there are a number of assembling markets to which producers, merchants and contractors, take their coconuts and copra for sale. The sales are made by sellers direct, or through commission agents. In most of the markets, coconuts and copra are sold along with various other commodities, but in some places, certain

days of the week are exclusively set apart from trade in coconuts and copra. When the produce is taken to the markets, several charges have to be invariably paid in connection with the sales. The charges at different markets show considerable variation, and may comprise tolls and taxes, commission, brokerage, handling, selection and weightment charges, contributions to charities, allowances for quality etc. With the establishment of Regulated Markets at certain centres, some of the deductions e.g. selection charge, charity, discount for useless nuts etc., have been declared illegal and have been prohibited by law, in areas under their jurisdiction. In some markets, the sales take place by auction, while in others, buyers give their offers to the commission agents, openly or under cover. The most common unit of sale for wholesale transactions in coconuts is a thousand, but various other units are also in vogue, and certain number of extra nuts have invariably to be given in excess of the unit. The number of such extra nuts may vary from 20 to 250 per thousand.

The coconut producing areas retain the major portion of their coconut production for copra-making and edible purposes, and despatch the rest to various parts of the country. The cost of distribution largely depends on the extent of movement and the channels through which the produce passes, before reaching the destination.

Copra

Copra makers either sell their copra at their premises, to village merchants and agents of wholesale merchants, or millers, or take it for sale to important crushing centres in producing areas, where it is sold direct or through commission agents to wholesale merchants, or millers. These crushing centres serve both as assembling and distributing markets. The merchants and commission agents there distribute the copra purchased by them, to oil mills and merchants, at various consuming centres. Similarly, wholesale merchants and commission agents at consuming centres distribute the supplies received by them to retailers and grocers. The distribution of milling copra is confined to producing areas on the West Coast and the port of Bombay. Edible copra is, however, distributed from the Mysore State and the Godavari area of Andhra Pradesh, to other parts of India. The cost of distribution, as in the case of coconuts, depends upon the extent of movements, and the channels through which copra passes, before it reaches the consumer.

Several qualities and grades of copra are known in the trade. Copra made in different places is generally considered to represent distinct qualities, which are further classified into grades on the basis of size in the case of ball copra, and colour and size of the cups in the case of cup copra. The best grade of milling copra is known as "Vattument" or "Office Pass". In order to help producers and buyers to arrive at a standard procedure based on quality, standard Contract Terms, for transactions in milling copra, have been drawn up by the Agricultural Marketing Adviser to the Government of India.

Copra is packed in bags, and packages of varying weights in different markets. The most common unit of transaction in the wholesale copra trade is the *candy*, but it represents a varying number of

pounds or Kgs. in different places. For instance a *candy* of copra is of 500 lb. (226.79 Kgs.) in the Godavari area of Andhra Pradesh, 630 lb. (285.76 Kgs.) in Bombay and 700 lb. (317.51 Kgs.) at Calicut (Kerala). With the introduction of the metric system, however, some markets have adopted the quintal as the base of trading in weights.

Coconut oil

Coconut oil produced by *chekkus** in the coconut producing areas on the West Coast, is generally sold by the operators to local retailers, or direct to consumers. Coconut oil produced by the mills on the West Coast and in Bombay is sold by the mills, through their own selling organisations or through merchants, brokers and commission agents, both locally and in various other parts of India. There are no well organised trade associations to regulate the trade in coconut oil, except the Oil Merchants Association at Cochin, and the Alleppey Oil Millers and Merchants' Association at Alleppey. Forward trading in coconut oil, which is of recent growth in India, is also confined to these two associations. *Chekku* oil is sometimes preferred by consumers. There is, however, no system of marking mill oil and *chekku* oil separately, nor is there any method by which the two can be distinguished. Coconut oil is packed in drums of various capacities and in four gallon (18.2 litres) tins. The prices are quoted both for loose, as well as packed oil (inclusive of the cost of containers). The common unit of weight is, as in the case of copra, a *candy*, besides which, a number of measures are also used. Coconut oil is reported to be used for the adulteration of ghee and costlier vegetable oils. It is itself adulterated with cheaper vegetable oils or even with white mineral oil, synthetic coconut oil essence being added, to give the characteristic coconut oil smell. In order that the consumer may be able to obtain coconut oil of guaranteed purity and quality, grade specifications for coconut oil were notified in August 1955 under the Agricultural Produce (Grading and Marking) Act, 1937, and the Vegetable Oils Grading & Marking Rules 1935. The quantity of oil graded under Agmark is, however, small. It is desirable that more and more of it may be graded under Agmark.

The Planning Commission, both in the First and the Second Five-Year Plans, have laid considerable stress on the grading of various vegetable oils, particularly because they have a bearing on the health of the nation. Grading helps not only the consumer by assuring him pure and quality products, but also the producer who is enabled to get a price commensurate with quality. The Central Coconut Committee has recently expressed the view that coconut oil should be compulsorily graded for edible purposes because it is now being extensively adulterated. The recommendation should be accepted by Government.

Coconut cake

The bulk of the coconut cake produced by *chekkus* is distributed for local use by *chekku* owners themselves. The cake produced by mills is disposed of direct to exporters or wholesale merchants, who in turn sell it to exporters and to merchants and retailers in other centres.

*Wooden press operated by a bullock in the Villages.

The transport of coconuts, copra and coconut oil, within the producing areas and from producing areas to consuming centres in India takes place by road, railways, country boats and coastal steamers. The cost of road transport varies widely under different conditions. Country boats are mainly used for the transport of copra and coconut oil on the West Coast, and their charges are invariably lower than the corresponding steamer freights. Coastal steamers carry considerable quantities of copra and coconut oil from the ports in the coconut producing areas on the West Coast, such as Calicut, Cochin, Alleppey, etc., to Bombay, Madras and Calcutta.

Prices

The average annual wholesale prices of coconuts, copra, coconut oil and coconut cake at Cochin are given below:

TABLE 10

Annual average prices of coconuts, copra, coconut oil and coconut cake at Cochin

	1959-60	1960-61	1961-62	Percentage increase over prices in 1959-60		1962-63 upto Oct. 62
				1960-61	1961-62	
Coconuts (Rs. per 1000 nuts) .	198.18	210.61	201.60	10.6	1.7	220.89
Copra (Rs. per quintal) .	146.73	156.48	147.46	10.7	0.5	171.9
Coconut oil (Rs. per quintal) .	214.47	242.44	228.76	13.0	6.7	264.21
Coconut cake (Rs. per quintal) .	42.06	42.63	42.32	13.0	0.6	46.96

The prices of coconuts, copra and coconut oil move more or less parallel. The prices were between 10.5 to 13.0 per cent higher in 1960-61 than in the previous year, but had again declined except in case of coconut oil to about the 1959-60 levels in 1961-62.

The prices of coconuts in most of the producing areas generally move in close sympathy with one another but at other centres, the prices often do not show sympathetic movement. The prices also vary according to quality. Big nuts invariably fetch a higher price than small nuts; tender nuts usually fetch somewhat lower prices than mature nuts; coconuts which have been stored fetch higher prices than fresh nuts. Un-husked nuts fetch higher prices than husked nuts, in areas where there are retting facilities, while in inland tracts where the husk cannot be utilised for retting, prices of husked nuts are higher than those of unhusked nuts.

In the case of copra, ball copra generally fetches higher price than cup copra. Edible grades of cup copra fetch a higher price than milling grades. As regards coconut oil, a clear oil with low free fatty acid content, fetches a higher price than aurbid yellowish oil, with a high percentage of free fatty acids.

Coconuts generally fetch lower prices from May to September. The prices of milling copra as also coconut oil generally remain low on the West coast from April to August. The prices of edible copra, on the other hand, are fairly stable throughout the year in the consuming markets.

Utilisation

In the four main producing states of Kerala, Mysore, Andhra Pradesh and Madras, 30 to 60 per cent of the supplies are estimated to be used for edible purposes. In the coconut producing districts of West Bengal, Maharashtra, Orissa and Assam, most of the production is used for edible purposes.

Copra

The yield of copra from coconuts varies under different conditions. The average yield in different areas is estimated to range between 83 to 146 kgs. per thousand nuts. Copra, made in India falls under two main groups, viz. milling copra and edible copra. Milling copra is made in the form of either balls or cups. Ball copra is prepared from mature nuts which have been stored with the husk on, for 8 to 12 months during which period the kernel gets detached from the shell. The nut is then husked, the shell broken, and the copra taken out in the form of balls. Cup copra is prepared from fresh nuts or from nuts which have been stored for shorter periods. The nuts are husked, cut into pieces and lightly dried, so that the kernel gets separated. The cups are then further dried, the method and period of drying depending on the season and the quality of copra to be made. Edible qualities are generally made by sun drying only, while milling copra may be made either by sun drying or kiln-drying or by a combination of both the methods. The estimated average annual production of copra in India is 72,500 tonnes as can be observed from Appendix VIII. It may be observed from the same table, that 90 per cent of total production of copra is concentrated in the State of Kerala. The supply of milling copra is almost entirely (97 per cent of the total) from Kerala: the copra produced in the States of Mysore, and Andhra Pradesh is consumed mostly for edible purposes.

The quantity of copra produced in India, is insufficient for the country's requirements and about 1,00,000 tonnes of copra (mainly milling copra) are imported every year from Malaya, Ceylon and Singapore. Out of the total of about 3,70,000 tonnes thus available, about 300 thousand tonnes (1960-61) are utilised for crushing and the rest for edible purposes.

Coconut oil:

Copra is crushed both by *chekkus* and by power mills, equipped with rotaries or expellers. The yield of oil varies from 58 to 65 per cent under different conditions. The average yield may be taken to be 62 per cent of the weight of copra crushed. Appendix IX gives the quantities of copra crushed by power mills and *chekkus* and the production of coconut oil and cake during the years 1956-57 to 1960-61. It will be seen that the average quantity of copra crushed during the

period was 276, 346 tonnes and the average production of coconut oil and cake 170, 219 tonnes and 95, 455 tonnes respectively. The average imports of coconut oil during the period are 8,729 tonnes; there are no exports of coconut oil. Taking into account imports of copra used for production of oil and of coconut oil, 40·2 per cent of the requirements are met by imports. There is however a sizeable exports of coconut cake which averaged over 11,000 tonnes during this period. (See Appendix XI). The crushing units are located in the coconut producing area of the West Coast and in Bombay.

It may be observed from Appendix X, that about 43 per cent of the total available oil is consumed for edible purposes, about 28 per cent for soap making, 24 per cent for toilet preparations, and 5 per cent as an illuminant and lubricant. The quantity of coconut oil used in the manufacture of vanaspati is negligible.

Exports and imports of Coconuts and Products

1. The principal items in India's international trade in coconut and products (excluding coir) are:

- (i) imports of copra and coconut oil; and
- (ii) exports of coconut cake.

Besides these very small quantities of fresh coconuts also enter international trade. During 1961-62, the value of such imports and exports were Rs. 36,000 and Rs. 85,000 respectively.

2. India is a large importer of copra and coconut oil. The quantities and value of these imports from 1951-52 to 1961-62 are given in Appendix XI. It will be seen that the total value of copra and coconut oil imported had increased from Rs. 7·62 crores in 1951-52 to a maximum of Rs. 14·46 crores in 1957-58 and was Rs. 11·64 crores in 1960-61. The period has also seen a change in the composition of imports, through progressive increase in the imports of copra and decline in those of coconut oil.

The quantity of copra imported increased 11,700 tonnes in 1951-52 to over 125,000 tonnes in 1957-58 and was over 90,000 tonnes in 1961-62. The quantity of coconut oil imported has progressively gone down from over 30,000 tonnes in 1951-52 to only 3,600 tonnes in 1959-60. In the latter, the value of copra imports constituted 94 per cent of the total value of imports of copra and coconut oil.

The exports of coconut cake from India do not show any marked trend. These were rather high averaging nearly 11000 tonnes during the years 1956-57 to 1959-60; but had declined to about 9,000 tonnes in 1961-62. The value of coconut cake exports in 1961-62 was a little over Rs. 25 lakhs.

3. Thus the country is a net importer of copra and coconut oil to the extent of over 11 crores of rupees a year. These imports are estimated to meet about 49 per cent of the internal requirements (in terms of milling copra equivalent).

Copra

It will be observed from Appendix XI that the total imports of copra showed a gradual increase upto 1957-58, when they were 1,25,850 tonnes, after which they began to decline. The imports in 1959-60 were 86,595 tonnes. In 1960-61 however, imports increased by 14.6% over the previous year.

As a result of the rising trend of prices in India, the Government of India placed copra and coconut oil under the O.G.L., in August 1950, and this continued upto August 1952. Further, in November 1951, the Government of India reduced the standard rate of import duty on coconut oil from 43.75 per cent to 31.25 per cent, and the preferential rate from 31.25 per cent to 21.00 per cent. In January 1952, the standard and preferential import duties on copra, were reduced from 37.5 and 25 per cent, to 25 and 15 per cent respectively. Besides, the Ceylon Government introduced a sliding scale of export duties, based on weekly F. O. B. prices, which in a falling market, had the effect of reducing the landed cost in India of copra and coconut oil, from Ceylon. All these measures helped to step up imports into India. Though the Government of India had in August, 1952, announced the removal of copra and coconut oil from the O. G. L., they allowed liberal import quotas to established importers amounting to 100 per cent of the "best year's imports". In addition to these "actual users" of copra and coconut oil certain classes of "new comers" were also given licences for the import of these commodities. This policy continued to be followed without much change upto the end of June 1955. In June 1953, the Government of India made a further reduction in the standard and preferential import duties on copra, from 25 to 15 per cent and from 15 to 5 per cent respectively. By about this time, world supplies of copra and coconut oil had reached in the pre-World War II level, and prices in international markets had fallen much below the 1950-51 level. These lower import duties and falling world prices, paved the way for considerable expansion in the volume of imports of copra into India. The imports went on rising upto 1957-58, despite a cut in the quota for "Established Importers" of copra and coconut oil to only 75 per cent of the 'best year's' imports, from the half year ending December, 1955, and again to only 50 per cent in the first half of 1957.

The reasons for low imports during 1958-59 and 1959-60, were that the quota for the established importers of copra and coconut oil, was further reduced to only 20 per cent of the best year's imports, and the import of coconuts in the half year ending March 1958 was banned. "Actual user" licences were restricted to copra only, on an *ad-hoc* basis. The licensing policy for the half year beginning from April 1958, banned imports of copra and coconut oil by established importers, and allowed 'actual users' to import copra only on an *ad hoc* basis. For the next six months also, almost the same policy was in force. From April 1958, soap manufacturers who fell under the category of 'Actual Users' were allowed to utilize a portion of the face value of their licences, for the import of copra to import coconut oil.

Sources

Malaya has been the chief source of supply of copra to India accounting for about 52 per cent of the total imports of copra, Ceylon coming next with 31 per cent. Singapore, Seychelles Islands and Zanzibar are some other sources of supply.

Coconut oil

The quantities imported into India from 1951-52 are given in Appendix XI. The reasons for the fluctuations in imports from year to year are the same as discussed under the imports of copra.

Ceylon has been the main source of India's imports of coconut oil, other important sources of supply are Singapore and Malaya. The share of Malaya gradually increased until it touched 24 per cent in the five year period ending 1960-61.

Coconut cake

There are no imports of coconut cake into India.

CHAPTER VI

RECOMMENDATIONS

Recommendations	Agency to take action
A. Long-term measures:	
1. Survey of areas: Survey of areas to which coconut planting can be extended should be carried out in each State as early as possible. This survey should include, apart from compact areas, strips of land around the canals as also bunds of fields and homesteads, because large numbers of coconut trees are grown along such banks /field bunds etc. and increase in number of such trees can also make an appreciable contribution to increase in coconut production.	State Governments.
2(a) The target of production of seedlings during the Third Plan is about 80 lakhs. This will cover an area of 1 lakh acres only. As the requirement of seedling is very much in excess of this figure, the target of production of seedlings in the Third Plan should be raised to one acre. The requirement for achieving this target should be provided.	Indian Central Coconut Committee and State Governments.
(b) One of the important requisites for increasing the target of existing nurseries is the provision of irrigation facilities where these are lacking. The Central Coconut Committee has now agreed to provide full expenditure for giving additional irrigation facilities. The State Governments may be requested to make full use of these facilities and increase the target of production of their nurseries.	
(c) As it was noticed that most of the State Governments are achieving only two-third of their targets, it is necessary to go into the question of the bottlenecks in achieving the target of production of seedlings. For this purpose, the Coconut Committee should examine this question with a small Subcommittee and devise ways and means for remedying this shortfall.	
3. Availability of seednuts in required numbers would be a bottleneck in implementing the expanded nursery programme. Large scale procurement of seednuts in prospective areas should be undertaken by the Indian Central Coconut Committee on an all India basis.	Indian Central Coconut Committee.
4. The package programme should be adopted for coconut also in suitable areas in the coconut growing States.	Indian Central Coconut Committee and State Governments.
5.(a) Since the coconut palm can thrive even in saline soils, with facilities for irrigation and drainage, such areas should be taken up for reclamation and planting of coconut.	State Governments.

Recommendations	Agency to take action
5.(b) If permanent bunds are erected on all paddy fields, it will not only give sufficient space for planting one or two rows of coconut but also protect the paddy fields from inundation during the cropping season. What is, therefore, required are the provision of loan for cultivators on a long-term basis for erecting such bunds and offering facilities for planting coconut, areca-nut and bananas on them.	State Governments.
(c) As inclusion of land under coconut in the levy of land ceilings discourages progressive cultivators in using manures for improvement of land for production of coconut, it is advisable that in new areas like Gujarat, crop should be exempted from the ceilings just like other fruit crops.	State Governments.
6. Demonstration Farms to educate the farmers on the proper methods of reclamation of saline lands and their utilisation for coconut planting should be established in a large number of centres.	State Governments.
7. Trials designed to maximise production of coconut should be undertaken at the Regional Research Stations and in the holding of a number of progressive growers.	State Governments
. As the existing method of climbing tree for harvesting of nuts is highly labourious, simpler devices should be tried in areas where it is possible to implement this, like Assam etc. This will release labour for other agricultural operations.	State Governments.
9. As the requirement of seednuts for increasing the production of seedling is large and as the available sources in Kerala are tapped to the fullest extent for supply of meeting Kerala's demand as well as the demand of West Bengal and Assam, the possibility of locating more mother palms in other major coconut growing States like Mysore, Madras and Andhra Pradesh should be explored for supply of additional seednuts.	State Governments.
B. Short-term measures:	
10. Application of N. P. K. fertilisers gives good response in coconuts by way of increased production of nuts and better quantity and quality of copra where irrigation is available. But such response will be only from the fourth year of application of fertilisers. Hence every endeavour should be made to popularise the use of N.P.K. fertilisers by the following measures:—	State Governments.
(a) organising subsidised demonstrations in large numbers in all the important coconut growing areas;	

Recommendation	Agency to take action
(b) making available adequate quantities of N.P.K. manure mixtures in kind to the growers on medium term loan basis. The recovery of the value of the fertiliser loan should be done only from the fourth year of its issue.	
(c) <i>Ameliorative measures</i> : In addition to the application of artificial fertilisers, ameliorative measures for improving the soil conditions such as liming, addition of sand and silt etc. should be encouraged. The trace elements, wherever necessary, should also be applied.	
11. Provision of irrigation to the coconut palms in sandy areas with severe summer has been found to increase production markedly. Hence some of the minor irrigation programmes, viz. digging of wells, sinking of filter points, supply of electric motors and oil engines should be concentrated in areas where there is scope for irrigating coconut gardens during summer.	State Governments.
12. Systematic plant protection work on coconut has received meagre attention in the past. Considering the large extent of damage to the coconut palms by some of the pests and diseases, viz. the Rhinoceros beetle, Leaf-eating caterpillar, Red Palm sweevil, stem bleeding diseases, root wilt, bud rot and leaf rot etc., and <i>the annual loss</i> resulting therefrom, it is very necessary to intensify this aspect of work considerably. For this purpose adequate quantity of chemicals and equipment will have to be made available to the growers at concessional rates for spraying the diseased palms for the control of "bud-rot" and "leaf-rot" diseases. In areas like Kerala where occurrence of "root-wilt" is widespread and serious, since it is now belved that the root wilt which is due to virus attack, cannot be adequately controlled by spraying, the spraying campaign should be concentrated for the eradication of fungal diseases like "bud-rot" and "leaf-rot". With regard to virus aspect of the disease, as experiments have shown that suitable manuring and increasing the vitality of the affected palms will increase the yield by at least 25 per cent, manuring aspect should be encouraged in such areas. These measures should be got implemented through the cultivators themselves by giving them plant protection equipments, pesticides, etc. at subsidised rates for which sanction already exists, and it will be advisable to get the spraying operations executed through panchayats and cooperatives.	State Governments.
13. As green manure is a very important source of adding to the fertility of the soil and supplying nitrogen, extended use of <i>Gliricidia</i> , <i>Sunn-hemp</i> and particularly <i>Calogonium</i> should be popularised in coconut-growing areas.	State Governments.

Recommendations	Agency to take action
14. <i>Marketing coconuts and making copra on cooperative basis.</i>	State Governments.
<p>There is much scope for developing the marketing of coconuts on cooperative lines, especially in areas where nuts are stored for long periods for the preparation of dry coconuts and edible copra. Cultivators and village copra makers, generally cannot sell their copra to the best advantage, as the quality of copra sold by individuals cultivators and village copra makers at a time, is poor. Cooperative societies besides making copra from coconuts collected from their members, could also undertake marketing of copra, after drying it properly.</p>	
15. Coconut oil should be compulsorily graded for edible purposes because it is now being extensively adulterated.	Ministry of Food and Agriculture and State Governments.
16. <i>Increasing producer's share in consumer's price.</i>	State Governments.
<p>The producers are estimated to receive on an average only about 65 per cent of the price paid by the consumers in the case of tender coconuts, and 74 per cent in the case of mature coconuts, the balance being absorbed in transport costs, charges for handling, counting, weighing, commissions, brokerage, market charges, tolls and taxes, deductions for quality etc. The producer's share in the consumer's price can be increased by eliminating wasteful handling, and transport, and affecting sales through regulated markets where market practices and charges are controlled by a statutory body, the Market Committee.</p>	
<p>Where markets have not been regulated so far, steps need to be taken to regulate them, and coconuts and copra should be included amongst the commodities under regulation.</p>	
17. <i>Statistics regarding copra crushed and coconut oil produced.</i>	State Governments.
<p>The monthly returns of copra crushed and coconut oil produced by the oil mills which are to be sent to the Indian Central Coconut Committee, under the Indian Central Coconut Committee Act, 1944, each month are not being regularly submitted. In the interest of collecting this vital information, the question of making the submission of these returns compulsory may be considered.</p>	
18. <i>Trading on the basis of standard grades of copra and coconut oil.</i>	State Governments.
<p>The Agricultural Marketing Adviser to the Government of India has drawn up standard Contract Terms for milling copra and Agmark specifications for coconut oil. Little progress has, however, been made in their adoption by the trade. Their adoption will be advantageous not only to the producers and consumers but also to the trade. This will also help in improving the quality of copra and coconut oil.</p>	

Recommendations	Agency to take action
19. <i>Improving the statistics of coconut acreage and production.</i>	
<p>Accurate statistics about coconut acreage and production are not available at present. A scheme of sample survey to determine the area and production of coconuts in the important coconut growing States has recently been launched by the Indian Central Coconut Committee in collaboration with the State Governments and the position is likely to improve considerably as a result of this survey. It is, however, necessary that such surveys be conducted regularly, so as to ensure continued availability of reliable data on the crop.</p>	Indian Central Coconut Committee and State Governments.
<i>General :</i>	
20. A study of the demand and supply of coconuts for the next twenty years should be undertaken by the Indian Central Coconut Committee.	Indian Central Coconut Committee.
21. (i) Andamans and Nicobars, Gujarat and Orissa are important areas where coconut cultivation can be extended. Their potential for growing coconut palms should be assessed. In addition, intensification of growing coconuts in areas in Andhra Pradesh particularly under Nagarjunasagar project and in Madras in areas under canal and irrigation projects should be explored.	Ministry of Food and Agriculture
(ii) As there are no representations from Andamans and Laccadives on the Coconut Committee and as the areas of coconut cultivation in these regions are fairly large, these two territories should be given adequate representation on the Committee.	
22. At present some varieties of coconut palms have been imported from foreign coconut growing countries such as Philippines, Indonesia, Malaya and Ceylon and grown in the Coconut Research Station, Kasargode. It is desirable that adequate number of seed nuts of high bearing palms be imported from these countries and grown in the regional research station as well. The foreign exchange involved is very small and should be made available. It largely relates to countries in respect of which foreign exchange situation is comparatively easy.	Ministry of Food and Agriculture
23. Out of a total production of about 476 crores of coconut husk in the country, only 190 crores are used at the moment for coir industry. As a major portion of the production of husk is now used for minor purposes like fuel etc. it is highly necessary that more husk should be utilised for increasing our coir industry as well as for production of useful products such as rubberised fibre industry, cardboard industry, etc. and other non-conven-	Coir Board.

Recommendations	Agency to take action
tional uses of fibre should be vigorously pursued for earning more foreign exchange by additional export of coir products.	
24. As palm oil is a good substitute for a coconut oil in soap making, it was considered necessary to explore the possibility of cultivation of African oil palm in areas suitable for the purpose so that more coconut oil may be released for edible purposes.	Indian Central Coconut Committee and State Governments.

APPENDICES

APPENDIX 1

Area under cocount in India—Statewise.

(‘000 acres)

State	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	Remark
I	2	3	4	5	6	7	8	9	10	11
Andhra Pradesh . . .	82	84	84	88	88	86	89	89	89	
Assam . . .	2	2	2	2	2	2	2	2	2	Figures for
Gujarat & Maharashtra . . .	19	19	21	18	18	21	20	20	20	1958-59
Kerala . . .	1064	1086	1098	1107	1136	1145	1175	1175	1175	to 1960-
Madras . . .	169	175	125	127	126	126	132	133	133	61 are
Mysore . . .	233	233	215	218	211	214	235	241	242	Provisional
Orissa . . .	11	11	11	11	11	11	11	11	11	
West Bengal . . .	17	17	17	17	17	17	17	17	17	
Andaman & Nicobar Islands . . .	4	4	4	4	4	4	4	5	5	
Laccadive and Minicoy Islands . . .	7	7	6	6	6	6	7	6	6	
TOTAL . . .	1608	1638	1583	1598	1619	1632	1692	1699	1700	

APPENDIX II

Production of coconut in India—Statewise

(million nuts)

State	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61
1	2	3	4	5	6	7	8	9	10
Andhra Pradesh	306	313	311	233	307	315	325	325	325
Assam	13	13	13	13	13	13	13	13	13
Gujarat & Maharashtra	37	27	29	42	42	49	46	46	46
Kerala	2978	3042	3076	3099	3182	3199	3248	3248	3248
Madras	488	475	410	417	416	415	430	437	437
Mysore	612	608	495	499	417	440	486	487	463
Orissa	34	31	35	33	39	34	16(p)	46	66
West Bengal	22	22	22	22	22	22	22	22	22
Andaman & Nicobar Islands	3	3	3	2	2	2	3	2	2
Laccadive & Minicoy	15	15	15	10	9	9	13	13	16
TOTAL	4498	4649	4409	4370	4448	4498	4602	4639	4638

(p) It is due to heavy loss in Puri District on account of hail storm.

APPENDIX III

Area and Production of coconut in principal producing districts in 1959-60 (districts having 500 acres and above).

District	Area in acres	Produc- tion ('000 nuts)
<i>Kerala</i>		
1. Trivandrum	139,245	385,000
2. Quilon	149,153	412,000
3. Alleppey	183,429	508,000
4. Kottayam	145,829	403,000
5. Ernakulam	106,289	294,000
6. Trichur	86,385	239,000
7. Kozhikode	242,273	670,000
8. Palghat	45,003	124,000
9. Cannanore	119,485	330,000

Source : Director of Statistics, Kerala

<i>Madras</i>		
1. Chingleput	9,440	28,320
2. Kanyakumari	22,468	67,404
3. Tirunelveli	5,407	16,221
4. Ramanathapuram	6,991	20,973
5. Madurai	9,077	27,231
6. Coimbatore	11,828	35,484
7. Salem	9,882	29,646
8. Tiruchirappalli	7,493	22,479
9. Thanjavur	36,591	146,364
10. North Arcot	10,482	31,446

Source : Director of Statistics, Madras

<i>Mysore:</i>		
1. Bangalore	7,485	13,943
2. Tumkur	66,521	86,655
3. Mysore	12,379	21,894
4. Mandya	11,324	33,972
5. Hassan	51,773	99,484
6. Chickmagalur	19,973	53,093
7. Chitaldurg	24,605	58,049
8. North Kanara	11,811	40,906
9. South Kanara	29,832	81,514

Source : Director of Statistics, Mysore.

APPENDIX III—(Contd.)

District	Area in acres	Production (000 nuts)
<i>Maharashtra :</i>		
Ratnagiri	16,532	20,503
Source : Horticulturist, Agricultural Department, Maharashtra State		
<i>Andhra Pradesh</i>		
1. West Godavari	11,018	38,563
2. East Godavari	52,908	211,632
3. Srikakulam	13,548	36,580
Source : Director, Bureau of Economics and Statistics, Hyderabad		
<i>Orissa</i>		
Puri	7,500	31,050
Source : Director of Agriculture & Food Production, Orissa		
<i>West Bengal</i>		
1. Howrah	5,659	7,640
2. 24-Parganas	7,487	10,107

Source : Indian Central Coconut Committee.

APPENDIX IV

Coconut State Plans—Progress of Expenditure

(In Rs. lakhs)

State	Third Plan outlay	1961-62	1962-63
		Actuals	Revised
1. Andhra Pradesh	10.26	1.55	1.83
2. Assam	4.75	0.60	0.81
3. Gujarat	3.78	0.28	0.54
4. Kerala | . . . . .	345.49	15.58	35.89
5. Madras	35.00	4.66	6.99
6. Mysore	20.00	1.19	N.A.
7. Orissa	8.00	0.26	1.70
8. West Bengal	15.70	1.32	N.A.
9. Tripura	0.70	0.06	0.12
10. Andaman & Nicobar Islands	20.22	1.67	4.64
11. Laccadives	0.76	0.19	N.A.
12. Pondicherry	0.57	0.17	N.A.
TOTAL	465.23	27.53	

N.A.—Not available.

4. 3. — There is no separate Coconut Development Scheme for Maharashtra under the III Plan. Coconut Development is included in the "Integrated Fruit, Nut and Spices Development Scheme for Konkan Region" for which Rs. 146.50 lakhs has been provided under the Plan.

APPENDIX V

Production target and distribution of seedlings during second Plan period

Serial No.	State	Non-Plan Nurseries			Plan Nurseries			Remarks
		No. of nurseries at end of Plan	Production target	No. of seedlings distributed	No. of nurseries at end of Plan	Target	Achievement	
1	2	3	4	5	6	7	8	9
1.	Kerala	20	10,83,790	8,39,163	4	1,14,000	90,719	Distribution from 1959-60
2.	Mysore	1*	10,000	10,021	7	3,44,020	2,47,432	
3.	Andhra Pradesh	3	3,67,500	2,81,202	5	1,50,000	1,08,547	Distribution from 1960-61
4.	West Bengal	2	1,40,000	1,05,788	1	54,000	24,269	
5.	Orissa	3	1,27,000	93,677	2	60,000	25,256	Distribution from 1959-60
6.	Madras	..	..	..	10	4,16,100	3,46,745	
7.	Maharashtra	..	..	..	1	75,000	48,831	
8.	Gujarat	..	..	..	1	50,000	57,395	
9.	Assam	..	..	..	16	2,00,000	1,57,090	
10.	Pondicherry	..	..	..	2	28,000	23,974	Distribution from 1959-60
11.	Laccadives	..	..	..	9	27,000	25,000	Do.
12.	Andamans	..	..	..	7	48,000	41,115	Do.
TOTAL		29	17,28,200	13,29,851	65	15,66,120	11,96,373	
GRAND TOTAL		Target			Achievement			
		32,94,320			25,26,224			

*Brought under Plan from 1958-59.

APPENDIX VI

Statement showing number of Parasites released during the First and Second Plan Periods

(Thousands)

State	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61
I	2	3	4	5	6	7	8	9	10	11
1. Kerala	174	319	159	482	..	4,056	4,611	6,574
2. Madras	8	..	..	273	1,209	3,286
3. Andhra Pradesh	6,819	1,381	7,751	9,230	8,176	17,265	27,911	11,845

APPENDIX VII

Estimated consumption of Nitrogenous Fertilizers during the Third Plan period for Coconuts

State	(tons)				
	1961-62	1962-63	1963-64	1964-65	1965-66
Kerala	12,017	24,034	36,051	48,068	61,791
Mysore	2,471	4,942	7,413	9,884	12,705
Madras	1,414	2,828	4,242	5,656	7,271
Andhra Pradesh	912	1,824	2,736	3,648	4,690
Maharashtra	207	414	621	828	1,064
Gujarat	12	24	36	48	62
West Bengal	180	360	540	720	926
Orissa	117	234	351	468	602
Assam	23	46	69	92	118
Laccadives	80	160	240	320	411
Andamans	47	94	141	188	242
Pondicherry	23	46	69	92	188
TOTAL	17,503	35,006	52,509	70,012	90,000

Source : Third Plan proposals of the State Governments :

APPENDIX VIII

Production of Copra in Different States

State	Average No. of Nuts annually utilised for making copra (in thou- sands)	No. of Nuts required to produce one metric ton of copra	Estimated Production of Copra (Metric tons)		
			Total	Edible	Milling
Andhra Pradesh	26,333	8,820	2,982	2,682	300
Kerala	15,98,059	6,850	2,33,293	34,994	1,98,299
Madras	34,000	7,000	4,857	48	4,809
Mysore	2,16,179	7,000	30,883	29,519	1,364
Others	6,095	12,000	6,508	457	51
TOTAL	18,80,666	—	2,72,523	67,700	2,04,823

APPENDIX

Estimated quantities of copra crushed

State	Quantity of copra crushed /					
	1956-57	1957-58	1958-59	1959-60	1960-61	1956-57
Kerala . . .	70,815	99,651	1,08,744	1,17,628	1,26,240	44,209
Madras . . .	19,356	1,300	1,591	2,305	3,337	11,997
Bombay . . .	71,742	89,494	68,797	67,149	70,405	43,160
Andhra . . .	497	887	800	438	1,369	290
West Bengal . . .	704	2,269	1,283	2,263	6,893	391
Mysore . . .	2,917	3,695	3,567	4,729	5,164	1,800
Madhya Pradesh . . .	—	—	3	—	—	—
Crushed in power mills . . .	1,66,031	1,97,296	1,34,785	1,94,512	2,14,108	1,01,847
Average 5 years . . .	—	—	1,91,346	—	—	—
Crushed in Chekkus* . . .	85,000	85,000	85,000	85,000	85,000	53,000
Total . . .	2,51,031	2,82,296	2,69,785	2,79,512	2,99,108	1,54,847
Average 5 years . . .	—	—	2,76,346	—	—	—

*Rough estimates made during the course of survey on coconut and coconut

oil extracted and cake produced

(tonnes)

Quantity of oil extracted				Quantity of cake produced				
1957-58	1958-59	1959-60	1960-61	1956-57	1957-58	1958-59	1959-60	1960-61
62,283	68,058	7,37,784	80,464	24,544	34,819	37,090	41,135	44,694
817	982	1,419	12,092	6,299	443	544	788	1,189
52,986	39,332	39,820	41,717	22,684	32,548	24,182	23,404	24,870
503	477	271	835	183	333	308	163	508
1,333	788	1,392	4,213	235	848	455	790	2,631
2,283	2,211	2,939	3,246	986	127	1,222	1,630	1,802
—	1	—	—	—	—	1	—	—
1,20,205	1,11,849	1,19,625	1,32,567	54,931	69,118	64,621	67,910	75,694
	1,17,219					66,455	—	—
53,000	53,000	53,000	53,000	29,000	29,000	29,000	29,000	29,000
1,73,205	1,64,849	1,72,625	1,85,567	83,931	98,118	93,621	96,910	1,04,694
—	1,70,219	—	—	—	—	95,455	—	—
products.								

APPENDIX X

Estimated percentage utilisation of coconut oil for various purposes in different States

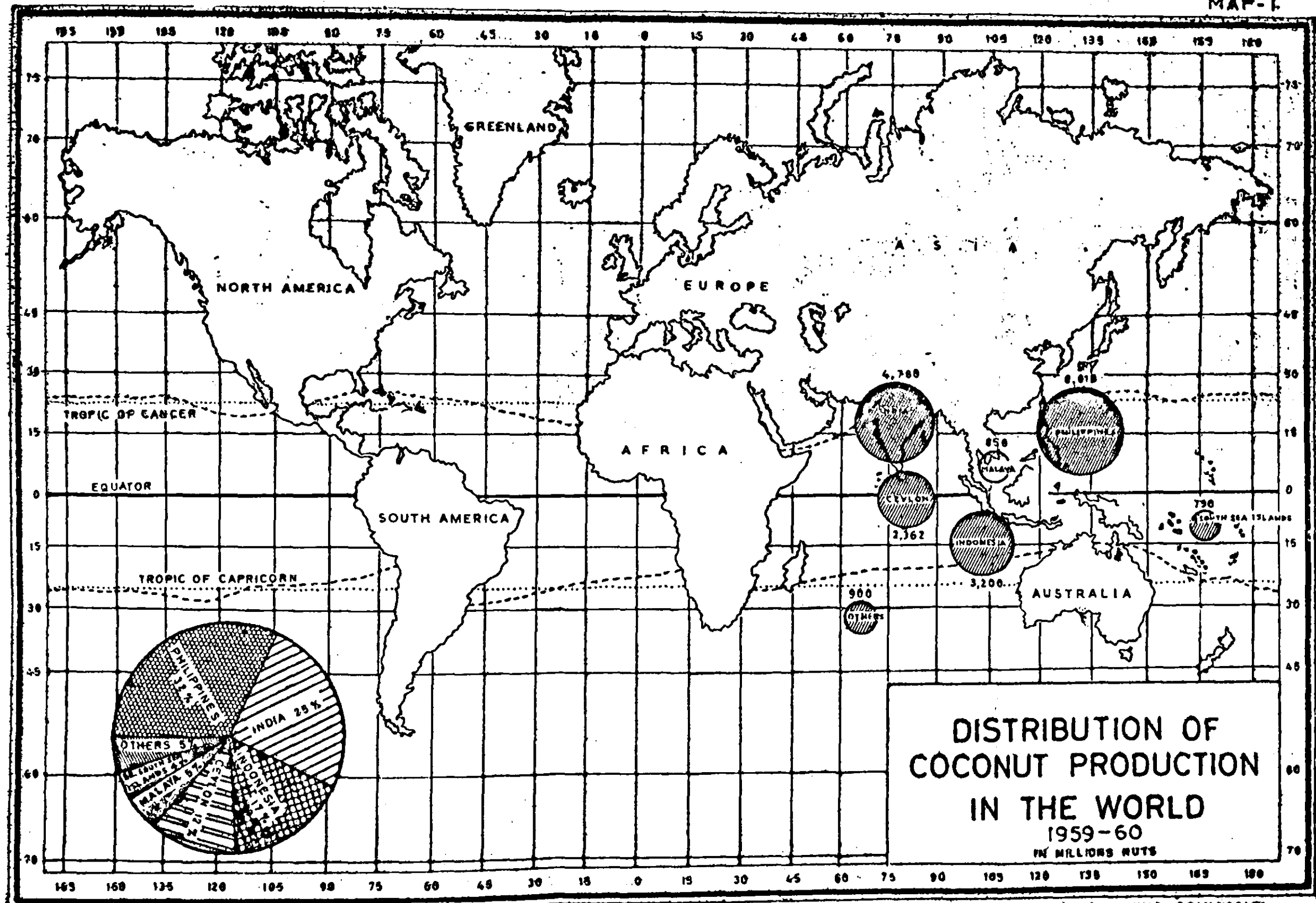
State	For Edible purposes	For Toilet & Toilet preparations	For Soap making	As illuminant and Lubricant	Total
Andhra Pradesh	10·0	28·0	60·0	2·0	100·0
Kerala	60·0	25·0	10·0	5·0	100·0
Madras	30·0	25·0	40·0	5·0	100·0
Maharashtra	15·0	20·0	60·0	5·0	100·0
Mysore	20·0	28·0	50·0	2·0	100·0
West Bengal	2·0	40·0 (For biscuit manufacture)	56·0	2·0	100·0
ALL INDIA	43·0	24·0	28·0	5·0	100·0

APPENDIX XI

Imports and Exports of principal coconut products

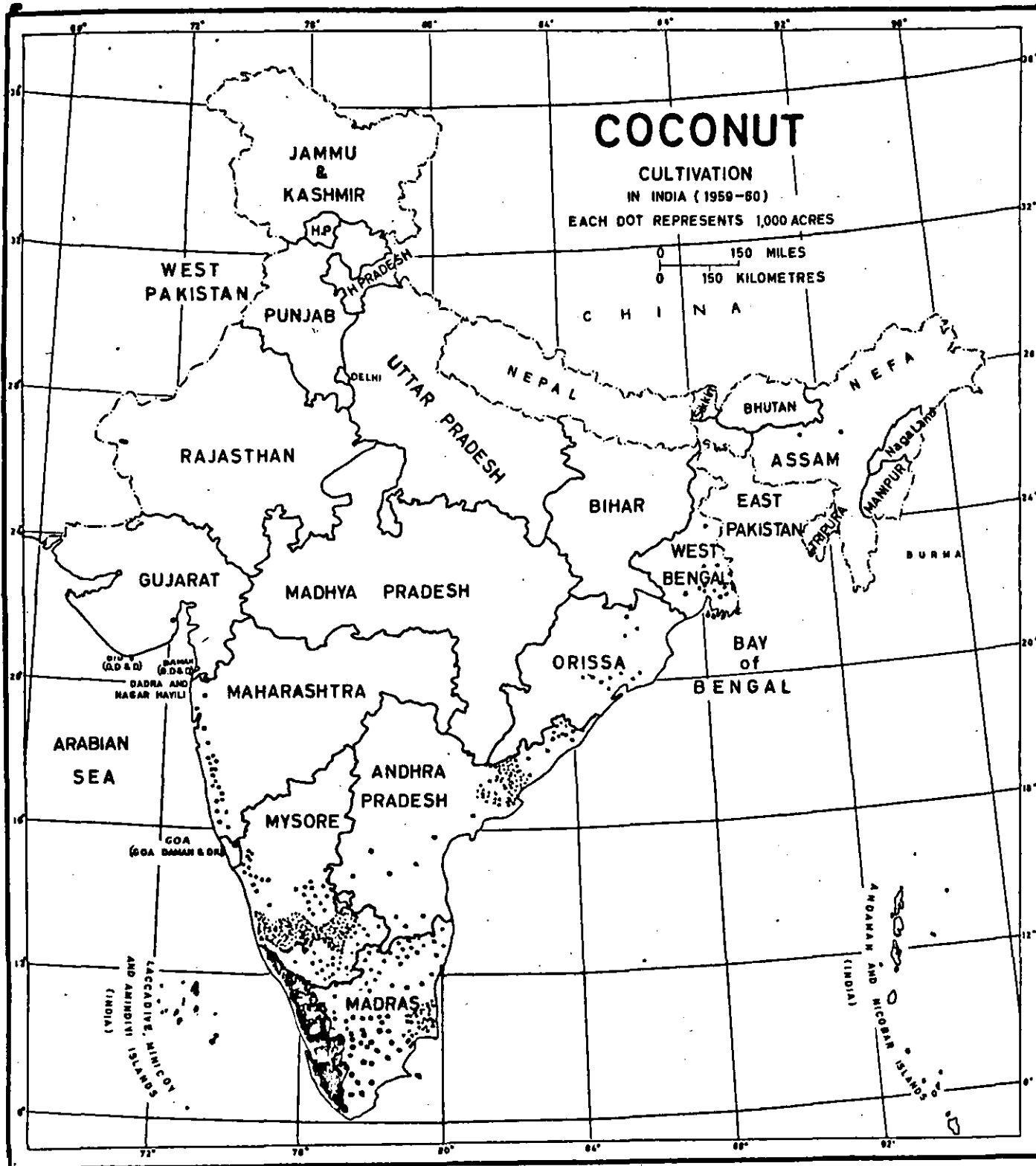
Year	Imports of Copra into India		Imports of Coconut oil into India		Exports of Coconut cake from India	
	Quantity (tonnes)	Value (Lakh Rs.)	Quantity (tonnes)	Value (Lakh Rs.)	Quantity (tonnes)	Value (Lakh Rs.)
1951-52	11,721	158.71	30,553	603.63	—	—
1952-53	19,542	203.64	20,941	308.20	—	—
1953-54	31,002	360.09	24,006	389.86	—	—
1954-55	66,685	704.49	23,288	358.38	Neg.	Neg.
1955-56	83,195	790.08	22,410	302.36	4,797	14.10
1956-57	99,976	943.33	21,191	289.85	8,693	28.09
1957-58	1,25,850	1,206.10	14,151	240.34	11,495	30.04
1958-59	98,368	1,063.61	4,672	110.60	11,310	35.92
1959-60	86,595	1,090.92	3,633	72.66	13,203	48.82
1960-61	99,258	1,163.89	—	—	13,622	57.17
1961-62	90,700	942.17	—	—	9,217	25.37

Neg.—Negligible



**DISTRIBUTION OF
COCONUT PRODUCTION
IN THE WORLD
1959-60**
IN MILLIONS NUTS

DATA



PRODUCTION OF COCONUTS

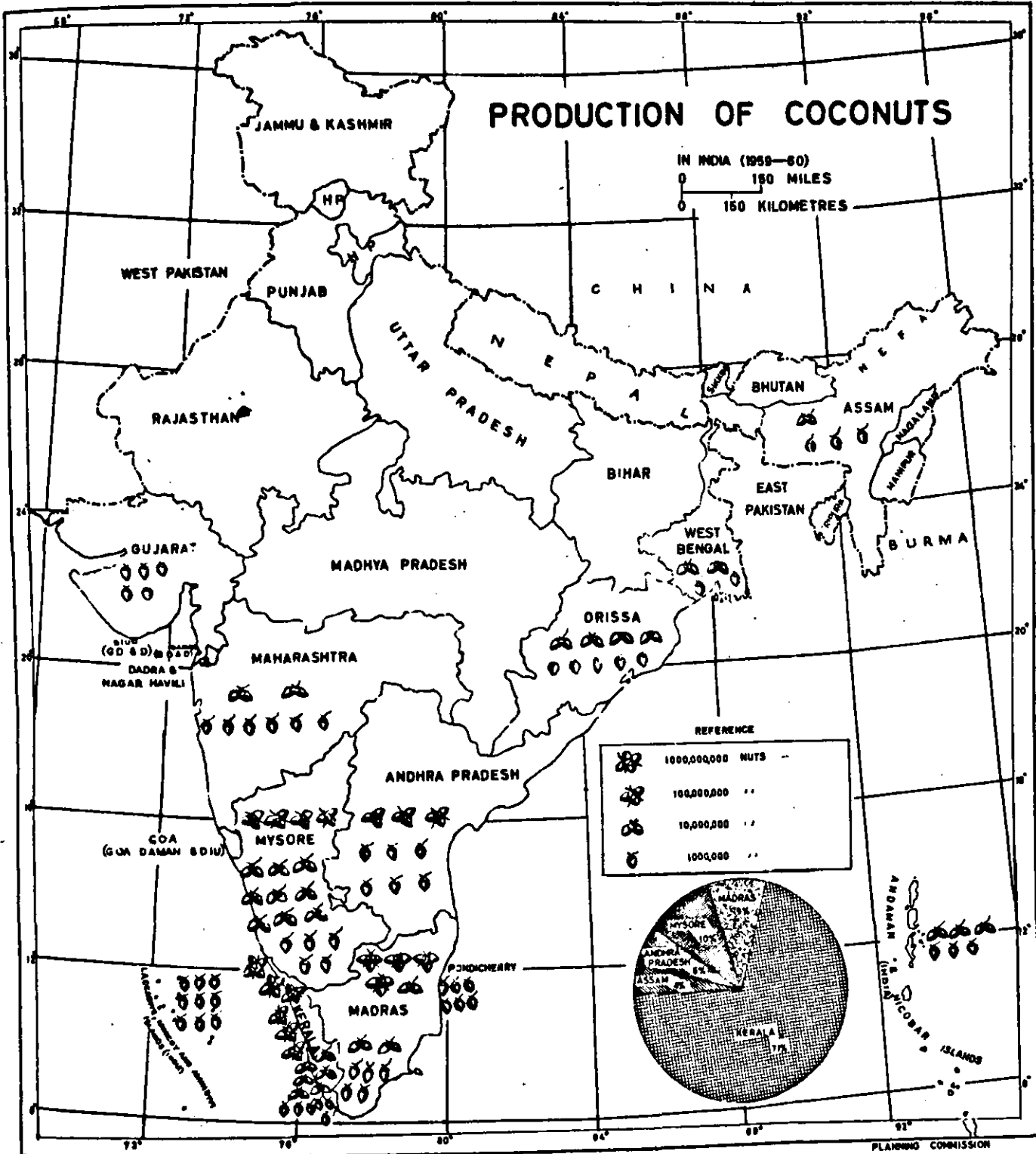
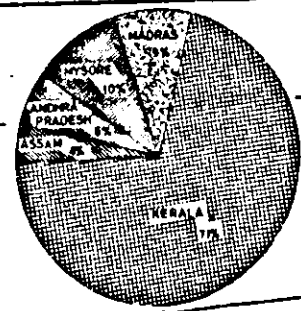
IN INDIA (1958-60)

0 150 MILES

0 150 KILOMETRES

REFERENCE

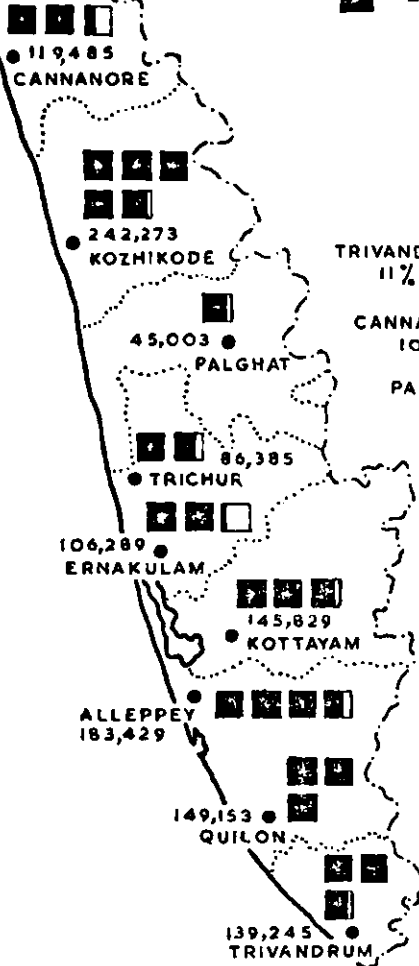
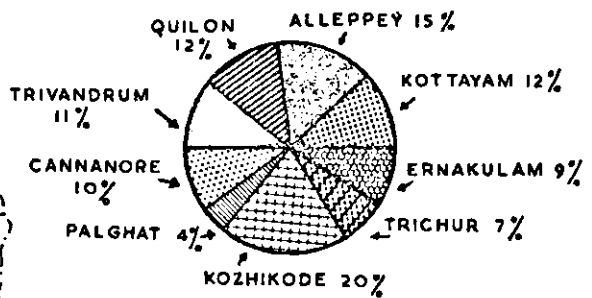
	1000,000,000 NUTS
	100,000,000 "
	10,000,000 "
	1000,000 "



AREA UNDER COCONUT
IN KERALA STATE
(1959-60)

■ = 50000 ACRES


PERCENTAGE



PRODUCTION OF COCONUTS IN KERALA STATE

1959-60

(FIGURES IN THOUSANDS)

 = 1,000,000

CANNANORE
330,000

KOZHIKODE
670,000

PALGHAT
124,000

TRICHUR
239,000

ERNAKULAM
294,000

ALLEPPEY
508,000

QUILON
412,000

TRIVANDRUM
385,000

TRIVANDRUM
11%

CANNANORE
10%

PALGHAT
4%

QUILON 12%

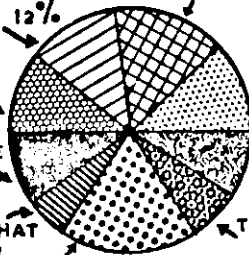
ALLEPPEY 15%

KOTTAYAM
12%

ERNAKULAM
9%

TRICHUR 7%

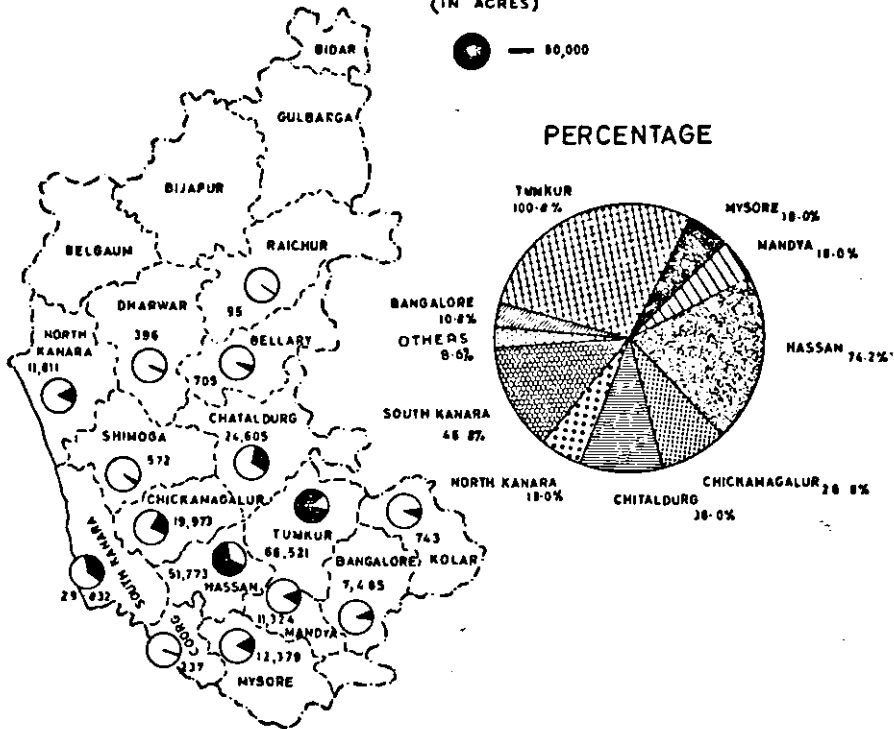
KOZHIKODE
20%



AREA UNDER COCONUT IN MYSORE STATE

(1959-60)

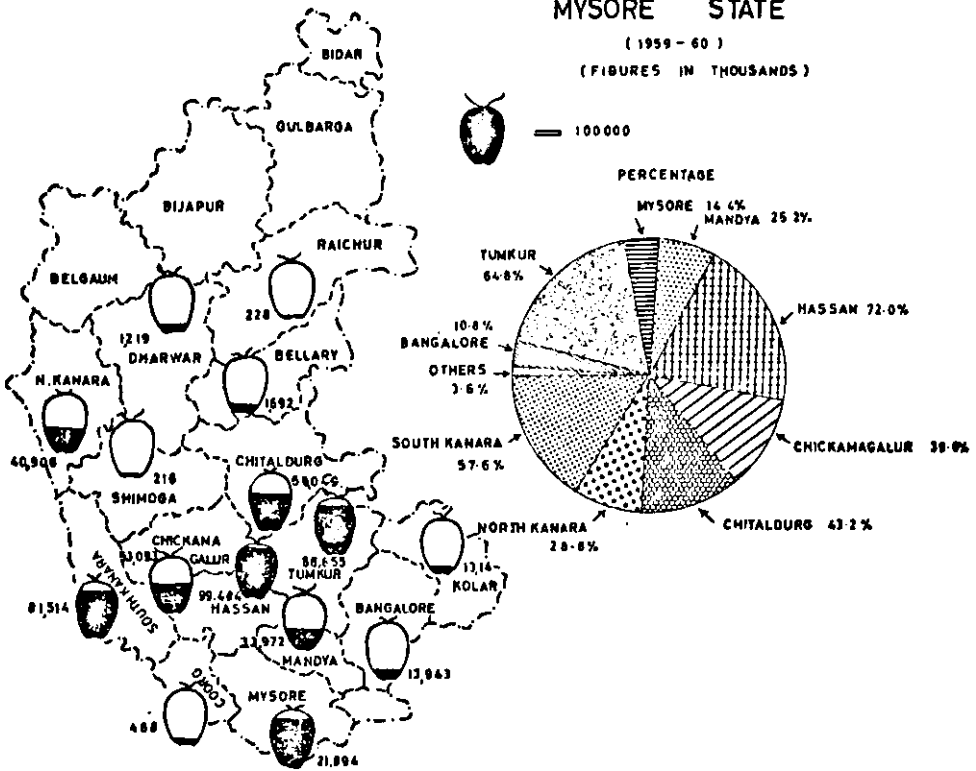
(IN ACRES)



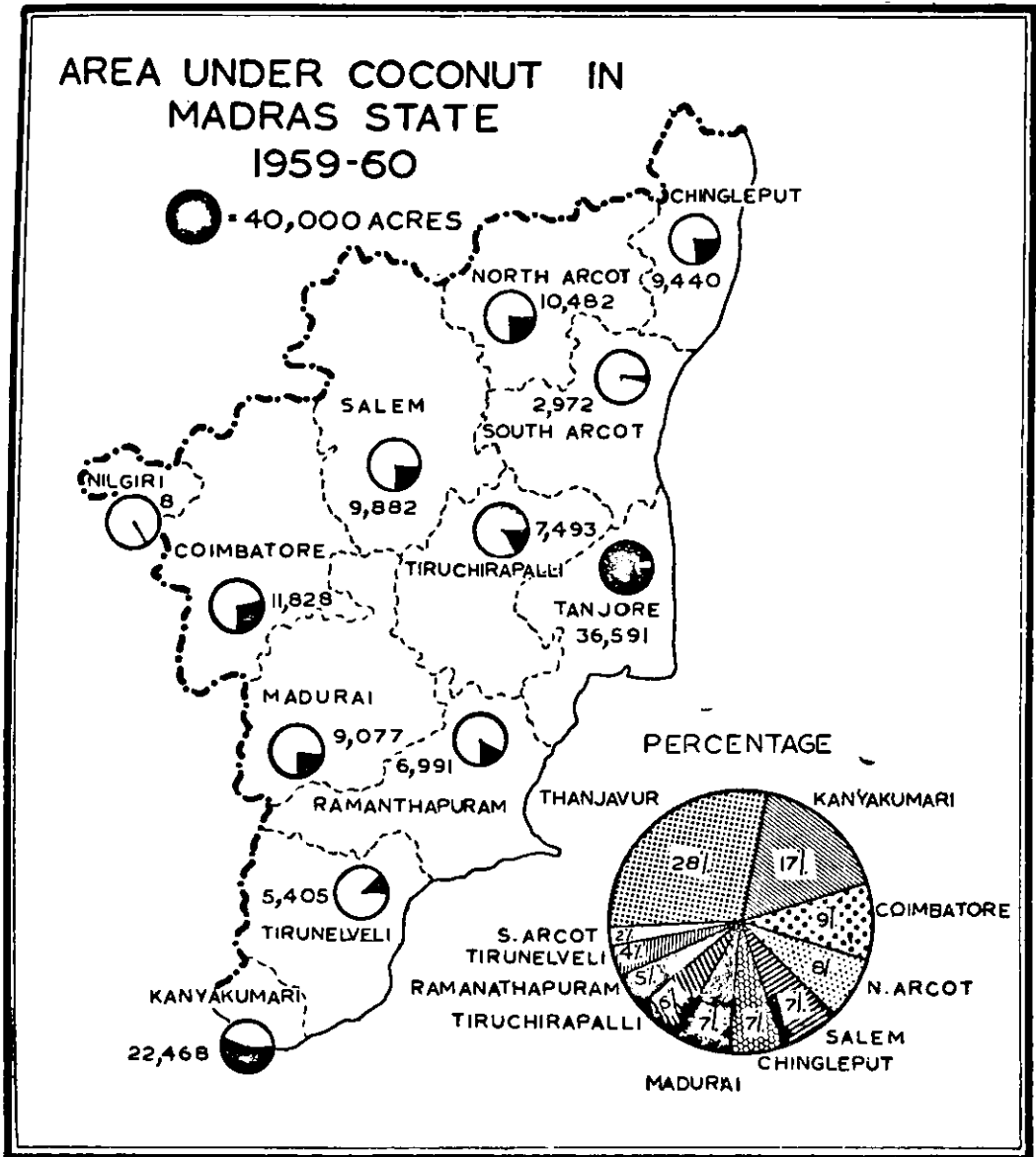
PRODUCTION OF COCONUTS IN MYSORE STATE

(1959 - 60)

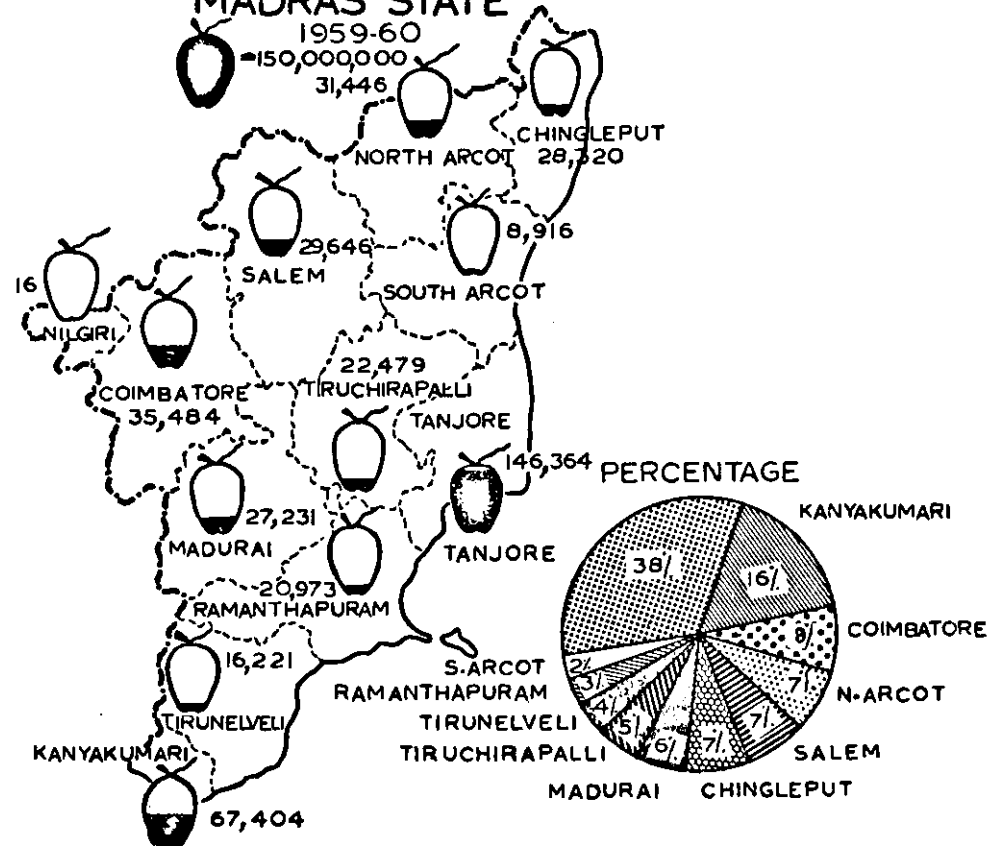
(FIGURES IN THOUSANDS)



AREA UNDER COCONUT IN MADRAS STATE 1959-60

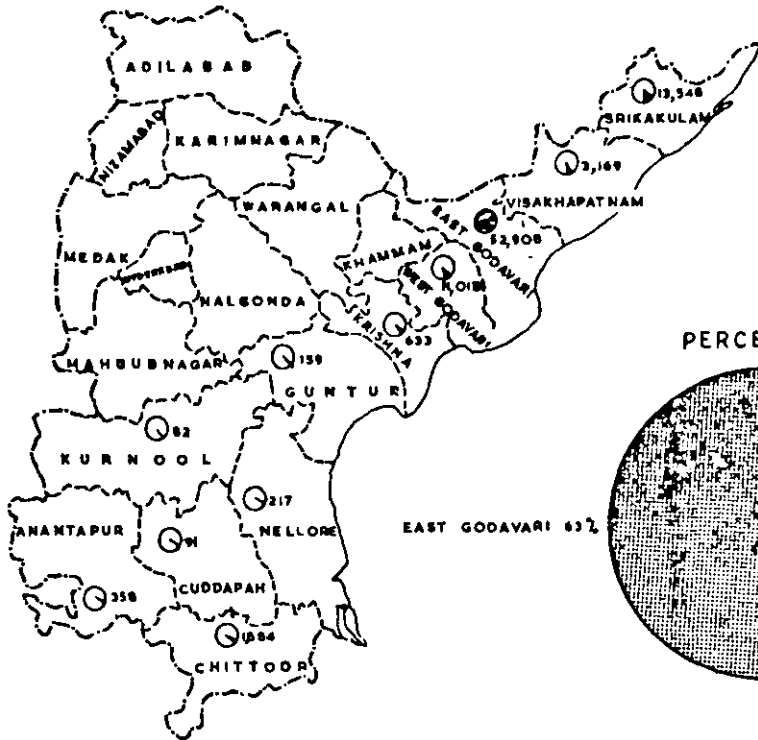


PRODUCTION OF COCONUTS IN MADRAS STATE

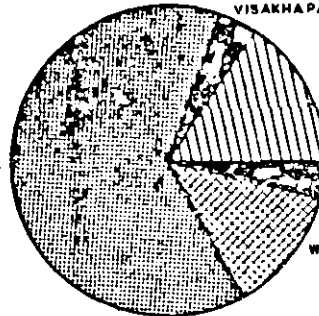


AREA UNDER COCONUT IN ANDHRA PRADESH (1959 - 60)

● = 40,000 ACRES



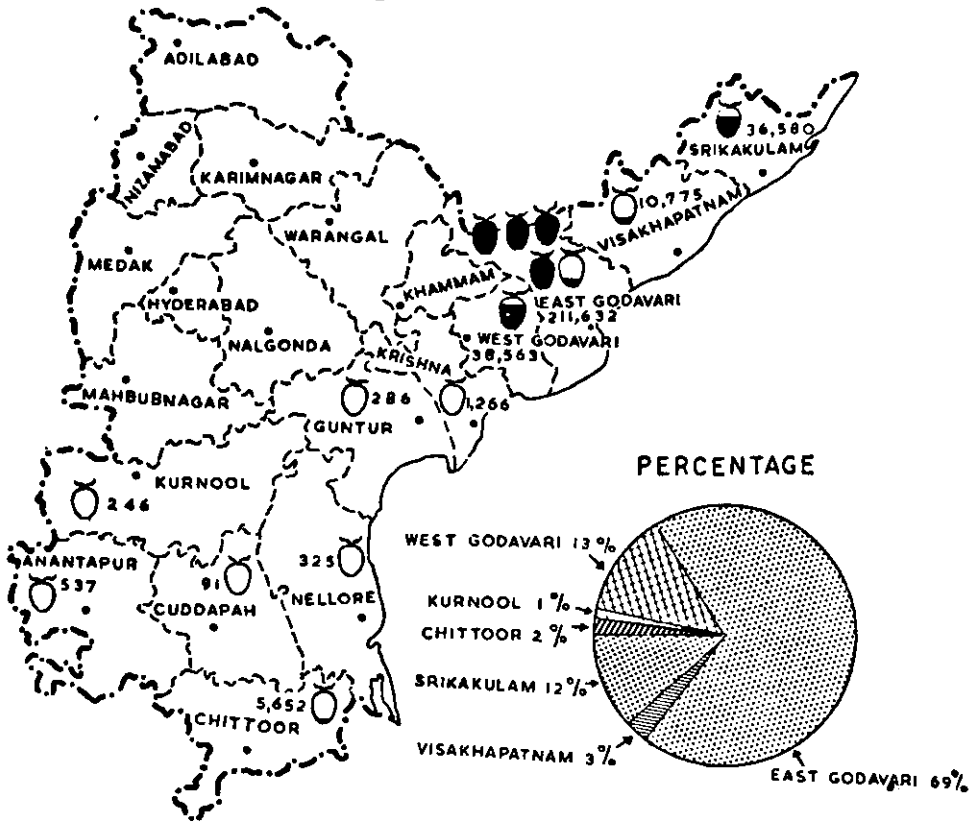
PERCENTAGE




PRODUCTION OF COCONUTS IN ANDHRA PRADESH 1959-60

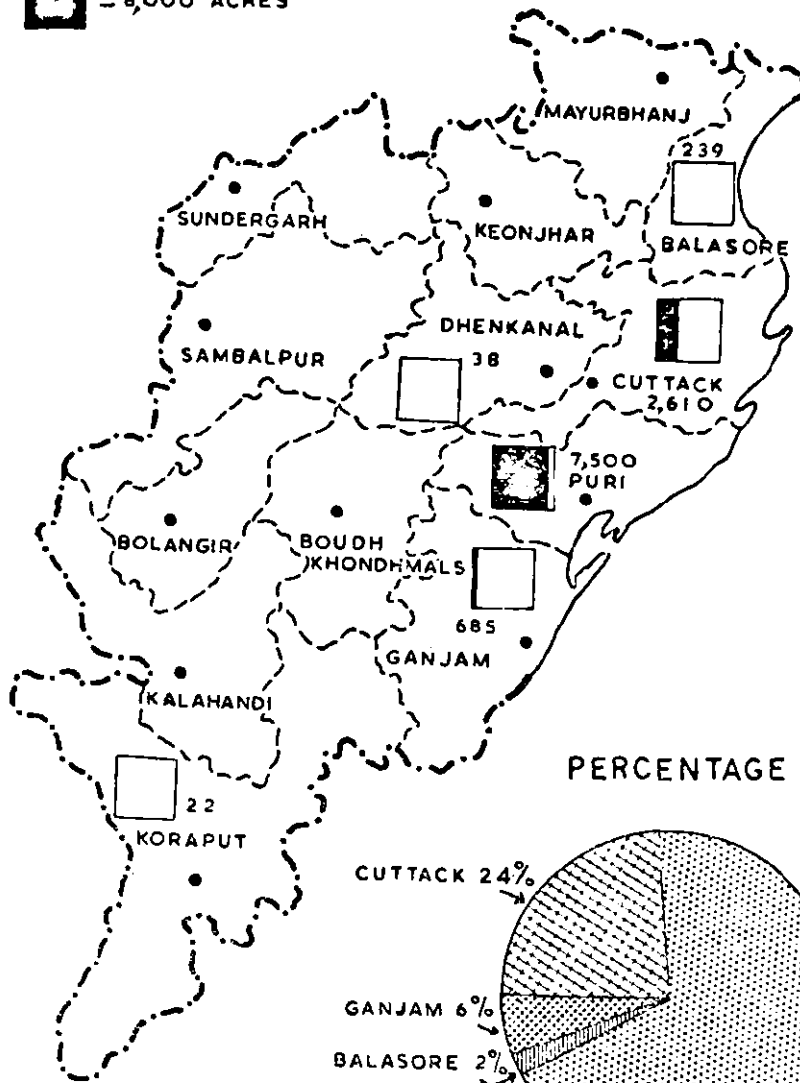
(FIGURES IN THOUSANDS)

● = 50 000

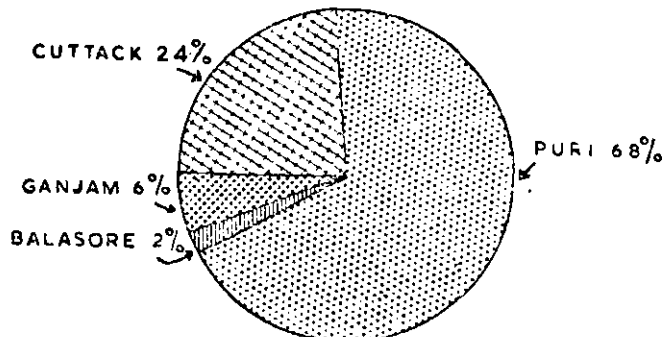


AREA UNDER COCONUT IN ORISSA STATE (1959-60)

 = 8,000 ACRES




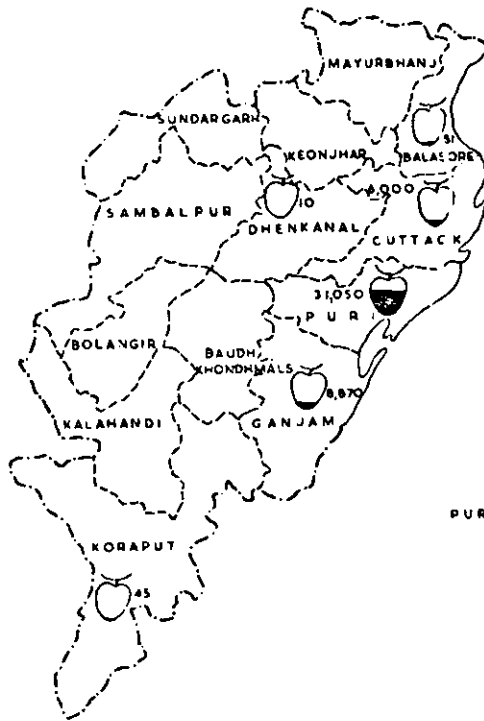
PERCENTAGE



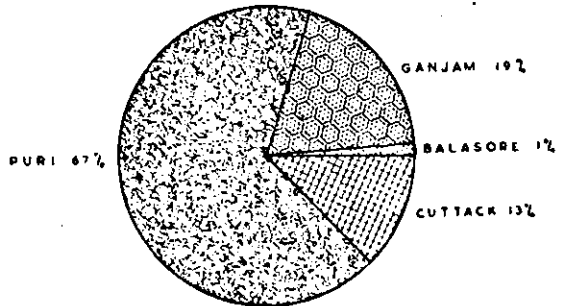
PRODUCTION OF COCONUTS IN ORISSA (1959 - 60)

(FIGURES IN THOUSANDS)

 = 50,000

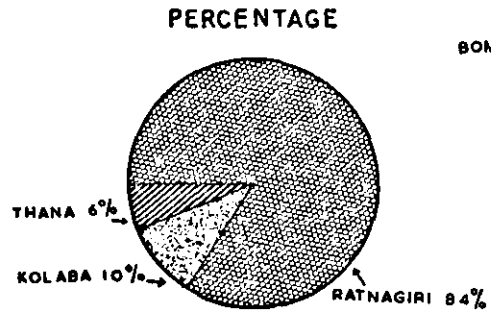


PERCENTAGE



AREA UNDER COCONUT IN MAHARASHTRA STATE 1959 - 60


■ = 20000 ACRES.

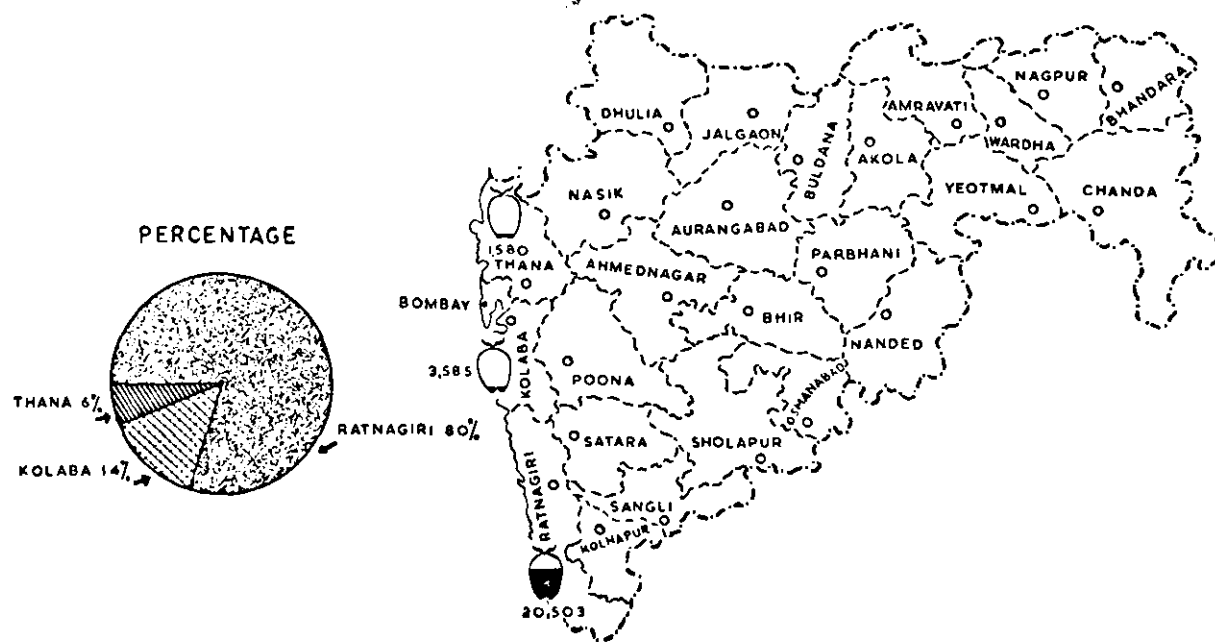


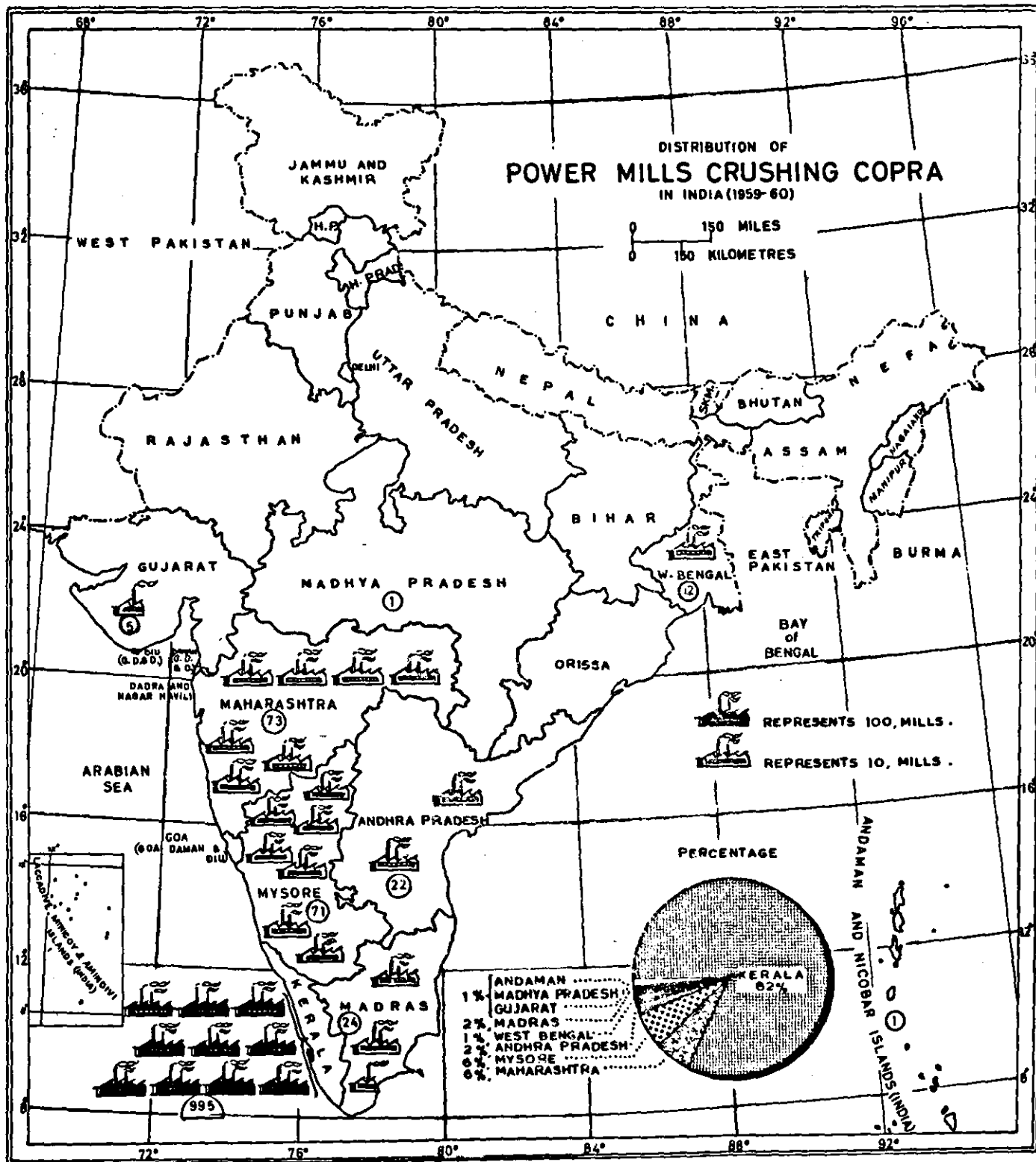
PRODUCTION OF COCONUTS IN MAHARASHTRA STATE

(1959-60)

(FIGURES IN THOUSANDS)

 = 30,000





Publications of the Committee on Natural Resources,
Planning Commission

- (1) Committee on Natural Resources, Organisation, and problems proposed for studies. (1962).
- (2) Natural Resources of India (A brief statement) by M. S. Randhawa. (1963).
- (3) A Coordinated Study of Organisations concerned with the Surveys of Natural Resources, e.g., The Survey of India, Geological Survey of India, Soil and Land Use Surveys, Forest Surveys, Cadastral Surveys and Town Planning Surveys. (1963).
- (4) Study on Wastelands, including Saline, Alkali and Waterlogged Lands and their Reclamation Measures. (1963).
- (5) Study on Cotton in India. (1963).
- (6) Study on Groundnut in India. (1963).
- (7) Study on Utilisation of Urban Wastes. (1963).