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THE INDIAN COCONUT JOURNAL

APRIL TO JUNE, 1949.

AS WE SEE IT

FIRST place in this issue of the Journal has been given to a paper entitled "Studies in the Cost of Cultivation of Coconuts in Cochin State" by Messrs. K. Gopalan and M. S. Venkataraman, Secretary and Statistical Assistant respectively of the Indian Central Coconut Committee. It is expected to be the first of a series of papers devoted to the study of the Cost of Cultivation of Coconuts in the various parts of the country. Very little work in this direction has been done so far and the absence of anything like reliable data in regard to the cost of cultivating coconuts has always proved a handicap whenever the question of the price of coconut - its adequacy or inadequacy at a given time - has been under consideration. But investigators in this field have to contend with certain limitations inherent to it. In the words of the authors themselves of the present paper, "Most of our coconut gardens consist of small plantations, the average holding being half an acre to one acre in extent. The cultivators do not maintain records of their cultivation expenses and, therefore, it has been extremely difficult to elicit accurate

information from them for calculating the cost of cultivation. Even those who supply the information do so from their memory. The information so obtained cannot be considered to be quite accurate. We had, therefore, to be satisfied with the data available." Moreover, the coconut being a perennial tree, living up to about eighty years, various economic changes take place during a tree's full life affecting the cost of cultivation from time to time. Factors that go to make up the cost of cultivation vary also from place to place.

The methods pursued in the present investigation and in the preparation of the present paper are not claimed to be incapable of modification. The authors will gladly welcome comments and helpful suggestions which, no doubt, they will keep in mind when taking up the question of the cost of cultivation of coconuts in other regions.

♦ ♦ ♦ ♦ ♦
ABOUT three years ago the Government of India appointed Rao Bahadur G. N. Rangaswami Ayyangar, I.A.S. (Retd.) as Special Officer for an agricultural survey of

the Andaman & Nicobar Islands. Mr. Iyyangar submitted two reports to the Government of India, both of which contain interesting information regarding the present condition of coconut cultivation on the islands and the possibility of improving and expanding that cultivation. We have published in this issue extracts from these reports, dealing with coconut cultivation, and hope that they will prove timely and useful, having regard to proposals which appear to be under consideration, to develop the islands' resources by settling on them families from the mainland.

* * * * *

WE have reproduced in this issue, from the "Indian Farming" an illuminating article on "Some Aspects of Grading and Standardisation of Agricultural Products in India" by Dr. T. G. Shirname, Agricultural Marketing Adviser to the Government of India. To the extent that it is a scathing commentary on business malpractices in this country, it also emphasizes the importance of grade standards for our agricultural products. As far as the coconut industry is concerned the need for prescribing grade standards for coconut products was realized by the Indian Central Coconut Committee as soon as it was set up. A scheme for the collection and analysis of representative samples of copra and coconut oil has already been put through and the data obtained are under the consideration of the Agricultural Marketing Adviser to the Government of India who will shortly, in consultation with the trade concerned, prepare grade standards and specifications for copra and coconut oil. Another coconut product in regard to

which the need for grading has been keenly felt is coir. Coir enters largely the international market and as Mr. K. C. Karunakaran has observed in his paper on "Coir", also published in this issue, "At present the absence of proper grading and standardization is standing in the way of coir being quoted in the well-organized commodity markets of importing countries and is bringing a low price return. The present method should be changed to a scientific one involving the use of well-understood grades defined by the estimation of moisture and foreign matter contents." Coir is, however, excluded from the purview of the Indian Central Coconut Committee for the time being; but the question of grading it will be taken up as soon as it is brought within the Committee's scope.

* * * * *

THE Preservation of the Coconut Poonac' by Messrs. N. Desikachar and B. L. Rao of Messrs. Tata Oil Mills Co., Ltd., another original paper contained in this issue, deals with a problem of practical importance to the development of livestock in this country. Coconut oil cake is a good cattle-feed, but it rapidly deteriorates and gets infested with insects in adverse weather conditions. The discovery, therefore, of some method by which coconut oil cake could be preserved in good condition for a reasonable length of time is bound to be of very great value. We are thankful to Messrs. Tata Oil Mills Co., Ltd., Tatapuram for passing on to us for publication the results of the experiments conducted in their Research Department in this connection.

STUDIES IN THE COST OF CULTIVATION OF COCONUTS IN COCHIN STATE

BY K. GOPALAN AND M. S. VENKATARAMAN

COCONUT is the mainstay of the people in Cochin State. It serves the purpose not only of an adjunct to diet, but is the most important money crop of the State, from the proceeds of which the people purchase their day-to-day requirements.

The total area under coconut in the Cochin State is estimated at 64,928 acres. Coconut grows well in the coastal and deltaic areas and also in the interior parts of the country favoured with good deep soil and soil moisture coupled with proper drainage facilities. The State contains some of the best coconut growing areas in India. The tract along the sea coast consists of loose white sandy soil with a good supply of underground water suitable for the cultivation of coconuts. The backwater areas of the State are blessed with rich alluvial soil with sufficient quantity of sand to provide fairly

good drainage facilities, well suited for coconut cultivation. Some of the best coconut plantations are met with in this area. Coconut is also cultivated in the State by reclaiming the shallow submerged areas by arranging clay and sand in alternate layers and raising the level above that of the water. In the inland regions away from the coast the soil is mostly laterite. The coconut palms in this area do not thrive as well as in the other two areas.

The yield of coconut varies considerably from place to place depending on several factors, of which the most important ones are the soil, rainfall, age of the tree and the methods of cultivation and manuring. Some of the coconut gardens have been found to give an annual yield of 5,000 nuts per acre, although the average yield per acre in the State is of the order of about 2,000 nuts. On the basis of that figure the total production in the State is estimated at about 116,306,000 nuts.

The area under and production of coconut in the various taluks of the State are given below:—

MR. K. GOPALAN, M.A., B. Com. (Manchester) is Secretary and MR. M. S. VENKATARAMAN, B. A. (Hons.), Statistical Assistant of the Indian Central Coconut Committee, Ernakulam.

STUDIES IN THE COST OF CULTIVATION OF COCONUTS IN COCHIN STATE

Name of Taluk	Area in acres	Production (in thousand nuts)
Cochin-Kanayanur	24,705	49,410
Mukundapuram	17,379	27,806
Trichur	11,847	18,955
Talappilly	3,081	4,930
Chittur	1,548	2,477
Cranganore	6,368	12,728
Total	<u>64,928</u>	<u>116,306</u>

It would be seen from the above statement that coconut is cultivated extensively in Cochin-Kanayanur, Mukundapuram, Trichur and Cranganore Taluks.

It is a well-known economic theory that the production of a commodity depends to a large extent on its net return to the grower. The price of the commodity should be such that the producer secures reasonable return for his capital and labour. If the commodity produced does not yield a remunerative price, its production is bound to suffer. Past experience has shown that the interest that the coconut grower takes in his trees depends upon the price of the coconuts. During the period 1929-39 when the price of coconuts declined sharply due to heavy and growing import of copra and coconut oil, the growers neglected their gardens and refused to raise new plantations. On the other hand, in recent years, when the prices of coconuts and coconut products have looked up considerably, growers have been found to

take more interest in their trees. They have been paying more attention to the cultivation of coconut by irrigating them whenever necessary and undertaking manuring and intercultivation like digging, ploughing, forming small mounds in August-September and spreading them out at the beginning of summer in December-January and preparing shallow basins round the trees at the beginning of the monsoon and filling them up at the close of the monsoon. The necessity, therefore, for ensuring a remunerative price for the coconut in the planned development of the coconut industry is apparent. And for satisfying ourselves that the growers have been obtaining remunerative prices, it is necessary that we should be able to determine the cost of production of coconuts. The cost of production would also enable us to see whether the price for coconuts is an economic one, fair both to the producer and the consumer.

The determination of the cost of cultivation of coconut is a thorny

problem beset with many a difficulty, but being fundamental to any system of planned development of the industry, we can hardly afford to shirk the responsibility of estimating it as accurately as possible.

LIMITATIONS OF THE STUDY OF THE PROBLEM.

The study of the problem has several limitations. Most of our coconut gardens consist of small plantations, the average holding being half an acre to one acre in extent. The cultivators do not maintain records of their cultivation expenses and, therefore, it has been extremely difficult to elicit accurate information from them for calculating the cost of cultivation. Even those who supply the information do so from their memory. The information so obtained cannot be considered to be quite accurate. We had, therefore, to be satisfied with the data available.

One of the limitations of the study of the problem is the fact that in the course of the full life of the tree various economic changes take place. The cost of labour, for example, does not remain stationary throughout the tree's life. During the last decade or two, it has actually been changing from year to year. Even the value of money has not been stationary, what with the recent change in the general standard of living of the people, inflation and the high

prices of commodities. The determination of some of the important items of expenditure which go into the cost of cultivation also presents considerable difficulties. The value of land, for example, varies from place to place, depending on several factors such as its location, soil condition, productivity, price of coconut and other crops, etc. We have also to recognise the fact that as coconut is cultivated essentially in small holdings, cultivators attend to farming operations themselves without the help of the hired labour. But some of the well-to-do owners of coconut gardens do not like to do manual labour themselves; they, therefore, engage labourers for doing the work in their gardens. We have also to reckon with the fact that while in some gardens coconut is grown as a pure crop, in others it is raised along with other trees such as mango, jack, plantain and arecanut, pepper vines, etc. Again, in some coconut gardens the land is also utilised for growing inter-crops such as sweet potatoes, tapioca, turmeric, ginger, ragi, green gram, etc. In the case of some lands irrigation may be necessary and irrigation expense may form an important item of expenditure, while in the case of others irrigation may not at all be necessary. In some gardens each seedling may be enclosed by a separate fence, while in others fences are put up for

entire gardens. There are also gardens which are enclosed with mud walls. The cost of cultivation in a Government experimental station, even though more accurate, cannot help us very much either, as it is not representative of the cost in an average coconut grower's garden, and the standard of cultivation in the former is far above that of the latter. While these varying factors may make the task of calculating the cost of cultivation a difficult one, it must be recognised that many of the items of expenditure are more or less common and uniform and that it should be possible to adopt, in broad outline at least, a uniform procedure in the method of calculation of the cost of production of coconut, making allowances for the varying factors.

DATA COLLECTED

It is apparent that it is not possible to conduct the investigations in respect of all the plantations. This would be a Herculean task, nor is it necessary. It has, therefore, been limited to typical coconut growing areas in the State and to representative growers in those areas. The villages selected are Chellanom, Narakkal, Azhikode, Chennamangalam, Kumbalanghi, Cheranallur, Cranganore, Anthicad, Manalur and Thaniam. Of these Chellanom, Narakkal and Azhikode have loose white sandy soil, Kumbalanghi, Cheranallur, Anthicad, Manalur,

Thaniam and Chennamangalam alluvial soil and Cranganore sandy, alluvial and laterite soils. The data collected have been tabulated and shown in the statements I, II and III appended. The different items of expenditure that go to make up the cost up to bearing stage and the maintenance charges of an acre of typical coconut garden have been shown separately.

COST OF BRINGING UP TO BEARING

The number of years required for a coconut tree to commence bearing varies from place to place, depending on several factors such as its hereditary quality, its variety, seed material used, soil condition, rainfall, manuring, agricultural practices etc. Along the sea coast, river margins and on the shores of the backwaters the trees commence bearing from the 6th to the 8th year after planting and yield well in ten to twelve years. In the case of trees planted on the bunds of paddy lands they commence yielding in five to six years and bear well in about ten years. In other areas, however, the trees commence bearing in 8 to 10 years after planting and yield well in 12 to 15 years. Although in backwater areas trees commence bearing comparatively early, they also exhaust themselves early and are supposed to yield well up to forty to fifty years. In other areas, the trees continue to give good yields up to

sixty or seventy years after planting. The common items of expenditure incurred during the period of bringing to bearing are:— 1) cost of land, 2) taxes 3) cost of seedlings, 4) cost of digging pits and planting, 5) cost of fencing, 6) cost of watering, 7) cost of cultivating the soil, 8) cost of manuring, 9) cost of cleaning canals and tanks and 10) cost of levelling and bunding.

1) *Cost of land.* As has already been indicated, it is difficult to estimate the value of land in different areas as it is affected by several factors. It may be used exclusively for planting coconut palms or a portion of the land may be used, for residential purposes. When coconut is more remunerative, more land may be brought under coconut cultivation, thereby raising the value of land and *vice versa*. Instances have been noticed when, because of the high prices of coconut land, paddy fields were converted into coconut lands. The cost of land may be high because of the high price of coconut or scarcity of suitable land for raising coconut gardens. Besides, on the West Coast there is little scope for opening up new gardens under coconut and converting small plantations

into large scale ones because of the natural limitations imposed by the existence of a network of backwaters, canals and rivers.

In the present study, where no reliable data were forthcoming in fixing the value of land, the rates paid for lands acquired by Government in the neighbouring areas have been taken into account.

2) *Land Tax.* Land tax is also a varying item of expenditure even in respect of the present study. For purposes of assessment of tax on coconut gardens lands are classified under three main divisions, viz., Pandaravagai Verumpattom, Pandaravagai Kanom and Puravagai. Pandaravagai Verumpattom lands are those held under full assessment rates. The lands under Pandaravagai Kanom and Puravagai systems are treated as lands held under favourable tenures and they are assessed at one-half and one-fourth of the full assessment rates respectively. An acre of land is considered as fully planted up for purposes of assessment when there are 60 trees or more in an acre. The rates per tree and per acre under the three classes of assessment are indicated below:—

Class of Land	Pandaravagai Verumpattom.						Pandaravagai Kanom.						Puravagai.					
	Per tree.			Per acre.			Per tree.			Per acre.			Per tree.			Per acre.		
	Rs.	As.	Ps.	Rs.	As.	Ps.	Rs.	As.	Ps.	Rs.	As.	Ps.	Rs.	As.	Ps.	Rs.	As.	Ps.
Class I.	-	3	6	13	2	-	-	2	4	8	12	-	-	-	11	3	7	-
Class II.	-	3	-	11	4	-	-	2	-	7	8	-	-	-	9	2	13	-
Class III.	-	2	-	7	8	-	-	1	4	5	-	-	-	-	6	1	14	-
Class IV.	-	1	-	3	12	-	-	-	8	2	8	-	-	-	3	-	15	-

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The above rates are applicable only to the trees in bearing stage. In the case of new lands brought under cultivation near the sea and backwater areas, however, the land assessment on trees which have not started bearing fruits is lower and

ranges from Rs. 2/- to Rs. 13/2/- depending on the age of the trees. In the case of coconut trees planted in lands classified as 'Parambas' only a nominal rate of tax as indicated below is levied.

(Rates of assessment per acre in Parambas without taxable trees in all Taluks except Chittur).

Class of land	Pandaravagai Verumpattom.			Pandaravagai Kanom.			Puravagai		
	Rs.	As.	Ps.	Rs.	As.	Ps.	Rs.	As.	Ps.
1	1	8	0	1	0	0	0	6	0
2	1	0	0	0	10	8	0	4	0
3	0	12	0	0	8	0	0	3	0
4	0	8	0	0	5	4	0	2	0
5	0	6	0	0	4	0	0	1	6
6	0	4	0	0	2	8	0	1	0
7	0	2	0	0	1	4	0	0	6

As the expenditure under this head (Land Tax) relates to trees which have not come to bearing stage, it may be estimated that the average land tax is Rs. 6/9/- per acre.

3) *Cost of seedlings.* As seedlings show their various growth characteristics only after they are nine months old as a general rule, seedlings which are one to one and a half years old are considered to be the best for planting under the ordinary conditions obtaining in Cochin. For planting on bunds of rice fields, however, seedlings which are generally two to three years old are preferred, but such cases are few and far between. The number of seedlings

planted in an acre varies from 60 to 100, the average for the main coconut growing areas in the State being of the order of 75. The cost of seedlings for an acre of coconut garden which came to bearing stage in 1940, 1945 and 1948 was estimated at Rs. 8-7-0, Rs. 13-5-0 and Rs. 17-13-0 respectively. In Chellanom, Narakkal and Azhikode where the coconut growers generally plant per acre about 80 seedlings which are two to three years old, the cost under this head is higher than in other areas. The expenditure per acre under this item in the case of plantations which commenced bearing in 1948 were 110 per cent more of those which started

bearing in 1940. This item of expenditure may be higher in the case of those gardens which may commence bearing after about five years and have used selected quality seedlings distributed from nurseries sponsored by the Indian Central Coconut Committee.

4) *Digging pits and planting.* Before the seedlings are planted the land has to be prepared properly. If the land is not already planted with coconut, it may be necessary to remove all unwanted shrubs and trees and lay it out with suitable bunds and drainage channels. In level lands ready for cultivation the first item of expenditure is in respect of the digging of pits for planting the seedlings. The pits may be dug two or three months prior to the time of planting and allowed to weather. The size of the pits depends on the nature of the soil. Three feet cubic pits may be generally suitable. It is usual to char the sides of the pit by burning dry leaves in the pit to prevent white ant attack. In the loose sandy areas, however, pits 1 to 1½ feet deep are usually made. In the marshy reclamation areas seedlings are planted on mounds made of river sand about 2 feet high and 3 feet diameter. The intervening spaces are filled up with earth in the subsequent years. At the time of planting, wood ash and river sand are used to fill part of the pit or to make up the mounds. The cost of

these items is also included under "digging and planting". The average cost for an acre of garden which commenced bearing in 1940 was Rs. 3/2/- and Rs. 5 to 6 in the case of those which started yielding nuts in 1945. In the case of those that started bearing in 1948, the average cost was Rs. 6/6/- per acre. In 1948 it varied from Rs. 2/14/- per acre in Anthicad to Rs. 12/- per acre in Chellanom and Azhikode.

5) *Fencing.* In the villages of Chellanom, Azhikode, Cranganore, Anthicad, Manalur and Thaniam, the seedlings are protected by individual enclosures till they grow beyond the reach of cattle, as seedlings browsed on by cattle off and on do not grow satisfactorily. It is also usual to fence round individual seedlings with thorns. In some places no fences are put up round individual plants, but they are protected by a suitable fence round the entire garden. Such instances are found in parts of Narakkal, Cheranallur, and Chennamangalam villages. Sometimes mud walls are constructed along the boundary of the plantation especially when a house is situated in it and catch crops are raised in it. The expenditure in this case is considerably higher, but no information, regarding the income from catch crops is readily available. The expenditure for fencing entire gardens has not, therefore, been taken into

account in the present study. The average cost of fencing round individual seedlings in an acre of garden which came up to bearing in 1940, 1945 and 1948 was found to be Rs. 4/9/-, Rs. 8/- and Rs. 10/11/- respectively.

6) *Watering*. Seedlings have to be watered regularly in the absence of rains till they get established. Watering may also be necessary during summer months. Seedlings are generally watered in the areas which are located away from rivers and backwater. The watering is done generally on alternate days in the first year and once or twice in the week during the next three summers after planting. Azhikode, Chennamangalam, Kumbalanghi, Chera-nallur, Cranganore, Anthicad, Manalur and Thaniam are the villages where watering is done. No watering is done after the first or second year of planting in those areas where the soil is moist. The average cost under this item for an acre of coconut garden which came up to bearing in 1940, 1945 and 1948 was estimated at Rs. 19/14/-, Rs. 29/2/- and Rs. 35/- respectively. The cost in the case of those gardens which commenced yielding fruits in 1948 varied from Rs. 15/- in Chennamangalam to Rs. 100/- per acre in Azhikode village. In Azhikode near the sea coast water is saltish. Water suitable for the seedlings, has, therefore, to be brought from some

distance. The cost of watering is, therefore, higher in Azhikode than in other places.

7) *Cultivation*. After planting, the seedlings have to be looked after properly. The pits have to be cleared of any weeds that may have grown round them and have to be filled up gradually as they advance in growth. The cultural practices in the newly planted gardens vary considerably. Sometimes catch crops are grown in the intervening spaces between seedlings for three to four years after planting. The cultivation of leguminous catch crops appears to leave behind a good residual effect in soil, thereby benefiting the coconut tree to a considerable extent. Investigations have shown that the cultivators in Thaniam, Manalur and Anthicad Villages generally grow catch crops such as colocassia, yam, green gram, turmeric, tapioca, etc. in their coconut plantations. They plough the gardens once or twice a year which helps to increase the yield of trees. The expenditure under this head for ploughing in an acre of garden which came up to bearing in 1948 varied from Rs. 93/- to Rs. 128/- in these villages. In places where catch crops are not grown, it is a common practice to dig up the earth and heap it into mounds after the first monsoon rains and spread them out again before the commencement of summer. This is done mostly in sandy and alluvial soils.

When the tree trunks are formed basins are dug round the trees before the monsoon rains to receive the manure and they are covered up after the first monsoon rains. The average expenditure for this type of intercultivation in the case of gardens which commenced yielding nuts in 1940, 1945 and 1948 was of the order of Rs. 55/10/-, Rs. 103/3/- and Rs. 151/8/- respectively. The cost of intercultivation in the case of a garden which came up to bearing in 1943 varied from Rs. 93/- in Anthicad to Rs. 192/- in Chennamangalam per acre.

8) *Manuring*. The coconut cultivators do not appear to realise adequately the need for manuring coconut trees. They seem to take coconuts for granted and forget that with the growth of the trees the soil gets depleted and that plant foods in the soil have to be made good from year to year. The manures commonly used in the inland areas are wood ash and cattle manure. Ash provides potassium to the soil while cattle manure provides the nitrogen and increases the organic matter in the soil and they, therefore, increase the yield. Prawn dust is also used when available. This supplies the phosphorous required in the form of phosphorous pentoxide. In riversides and backwater areas river silt and river sand are added to the coconut gardens. Because of these varying factors the cost of manuring

varies considerably from garden to garden. The cost under the head 'manuring' is noticed to be lowest in the case of those gardens which are subject to flooding as a result of which they get constant deposits of silt rich in plant food. Chennamangalam village is a typical place coming under this category. The cost of manuring for an acre of garden which come up to bearing in 1940, 1945 and 1948 varied from Rs. 49/- to Rs. 123/12/-, Rs. 67/- to Rs. 252/8/- and Rs. 105/- to Rs. 330/- respectively; the corresponding average cost being Rs. 84/- Rs. 158/12/- and Rs. 222/14/- . The expenditure under this item is maximum in Azhikode, Thanniam, Narakkal and Chellanam and minimum in Chennamangalam where many of the gardens are subject to flooding.

9) *Digging and cleaning tanks and canals*. The coconut gardens near backwaters in Cochin-Kanayanur and other taluks have canals connecting them with the backwaters. The ebb and flow of tidal waters through these canals help the circulation of sub-soil water around the coconut palms. To keep the canals in good working condition, they have to be silt-cleaned once a year, the silt collected being applied to the coconut palms as manure. Gardens which are not provided with such canals have generally one or two tanks for watering the trees and catch crops. These tanks are also cleaned once a

year and the silt applied as manure to the coconut palms. The cost of such operations varies considerably depending on the locality and the size of the canal or tank. The cost per acre under this head in the case of plantations which commenced to yield fruits in 1940, 1945 and 1948 varied from Rs. 10/- to Rs. 69/6/-; Rs. 40/- to Rs. 147/8/-; and Rs. 40/- to Rs. 180/- respectively, the corresponding averages being Rs. 26/6/-, Rs. 58/12/- and Rs. 74/-. No expenditure has been shown under this head in Anthicad, Manalur, Thaniam, and Chennamangalam Villages where the tanks are more commonly used for raising catch crops and for domestic purposes.

10) *Cost of levelling, bunding, etc.* If the planting of seedlings is done on sloping land, it will be necessary to terrace the land as a protection against erosion of soil during the rains. In the case of coconut gardens raised in marshy or low-lying areas near backwaters, the seedlings are generally planted on mounds made of river sand about 2 feet high and three feet diameter. The intervening spaces are filled up with earth in the subsequent years. The expenditure on this account is included under charges for levelling up the land and bunding. Rs. 145/- in Narakkal and Rs. 200/- in Chellanam were expended on this account for an acre of coconut garden which commenced bearing in 1948; the average for the

State being Rs. 51/12/- against Rs. 42/6/- in 1945 and Rs. 12/15/- in 1940.

The total cost of bringing an acre of coconut garden to bearing in 1940, 1945 and 1948 (including land value and taxes, but excluding interest) varied from Rs. 559/6/- in Chennamangalam to Rs. 751/12/- in Chellanam; from Rs. 864/6/- in Manalur to Rs. 1451/2/- in Azhicode and from Rs. 1150/4/- in Anthicad to Rs. 1769/3/- in Azhicode. The average cost for an acre of garden until it commenced bearing in 1940, 1945, 1948 was of the order of Rs. 642/5/-; Rs. 1174/4/- and Rs. 1380/6/- respectively.

COST OF MAINTENANCE PER ACRE

After the trees have come up to bearing stage the common items of expenditure required every year are the following:— (1) Cultivation of the soil, (2) manuring, (3) cleaning canals and tanks, (4) harvesting and collecting, and (5) taxes.

Part B of statements I to III indicates the different items of expenditure incurred during the years 1940, 1945 and 1948.

(1) *Cultivation.* The purpose of the cultivation of the soil is to preserve soil moisture. As in the earlier stages of the trees' growth, it is necessary to look after them after they have started yielding nuts. The land has to be ploughed two or three times as that helps to increase the

(Please turn to page 194.)

COCONUT CULTIVATION IN THE ANDAMANS AND THE NICOBARS

THE Andamans and the Nicobars are two groups of islands situated on the eastern flank of the entrance to the Bay of Bengal. The former are due east of Madras and the latter due east of Trincomalee in Ceylon. The islands are 780 miles from Calcutta, 740 from Madras, 360 from Rangoon and 950 from Singapore.

The Andamans, composed of a chain of 200 islands, have an area of 2058 square miles while the Nicobars consisting of 20 islands cover an area of 635 square miles.

In July, 1946 the Government of India appointed Rao Bahadur G. N. Rangaswami Ayyangar, F.N.I., I.A.S. (Retd.) as Special Officer for an agricultural survey of the Andaman and Nicobar Islands to investigate among other things the possibilities of improvement of crops and methods of cultivation and the expansion of the cultivation area. Later the officer was also asked to examine the lease terms of the coconut and other plantations and the possibility of coconut oil extraction and export of oil cake and fibre in place of the present direct export of nuts.

Mr. Ayyangar submitted two reports, one before he actually visited the islands and the other after a tour of them. We are publishing below

extracts from both reports in so far as they relate to the coconut industry in the Andamans and the Nicobars.

PRELIMINARY REPORT

The following are extracts from the preliminary report submitted by Mr. Ayyangar on the 26th August, 1946:—

I studied the four Administration Reports of the Andamans and Nicobars sent to me, viz., 1932-33, 1933-34, 1935-37, and 1938-39, and gather the following points regarding coconuts. The reports say that accuracy is not guaranteed. We may, however, take the figures as a rough indication of availability. I record the data separately under Andamans and Nicobars.

ANDAMANS

The Coconut Export Co-operative Association exported 2,33,919 coconuts at an average cost of Rs. 3-10-0 per 100 nuts in 1932-33, 5,66,540 nuts at Rs. 3-9-0 in 1935-36, and 5,57,037 nuts at Rs. 3-10-0 in 1936-37. The largest figure (1935-36) represents 181,440 lb. of copra (at 320 lb. of copra per 1000 nuts). The Co-operative Association wound up through lack of co-operation. The price of coconuts was dull. Coconuts were mainly shipped to Rangoon. The

Jail required coconut oil. The Government plantations supplied coconuts. Drying of copra in rainy months was a problem. The Jail had to store enough dry copra, even by purchase, to ensure oil production through the year.

NICOBARS

An export of 1,737,737 nuts and 46,676 bags of copra (the largest figures in five years) represent a total copra weight of 5,780,672 lb. (112 lb. being taken as the weight of a bag of copra). There is a general remark that the market was dull.

Both the Andamans and Nicobars have thus an exportable quantity of 181,440 plus 5,780,672=5,962,112 lb. of copra (2,662 tons). In terms of oil and cake, this works roughly to 1597 tons of oil and 1065 tons of cake. This excludes nuts and copra consumed locally and in the Jail.

SCOPE FOR A CRUSHING MILL

I worked out and arrived at the rough figure, as I wanted to get at the kernel of the coconut problem in the Andamans. This problem seems to have been set to the Indian Central Coconut Committee with what should have been defective data furnished to them in December, 1945. The reply of the Committee which the Secretary showed me was naturally disappointing. Had the production figure of nearly 6 million pounds of copra been given to the committee an encouraging reply

would have been received earlier. It looks as if it is quite possible to have a mill to convert the copra into oil and cake. The cake would come in very handy to tone up livestock production and such surplus oil as may be available after the needs of the local population have been met, could find a market in Calcutta where the needs of the soap industry require transport of oil from the Malabar ports. The 'Maharaja' is in touch with Calcutta oftener than with any other big place. Oil, sealed in tins, would be compact for transit. Coconuts as such are the object of cutting prices, if pooled within the islands. They may not suffer so much in price by converting them into oil and this would make it a better economic proposition.

Whether there should be one mill or two (one in Nicobars), whether crushing is to be through an expeller or a rotary type mill, whether this oil mill is to be an appendage to any existing mill, are problems which are soundly solved only by an industrial Engineer.

KILN-DRYING OF COPRA

The chief trouble in copra making is the drying. Sun-drying is the best, but with nearly 140 inches of rainfall and 180 rainy days the Andamans problem is as chronic as it is in the West Coast. In every one of the mills I found copra heaped up and mats covering them, waiting for the first spell of sunlight for the mats

to be down and the copra sunned. Artificial drying chambers have always been defective and when I discussed this point with the Secretary of the Coconut Committee I was informed that a small deputation of the Committee is visiting Ceylon to examine the technical aspects of the coconut industry, and one of the specific items referred to them is this important problem of artificial drying of coconut kernels in rainy weather. To me it seems to be a problem in engineering and it is my considered opinion that in the hands of an engineer the question is likelier to yield better results.

The Indian Central Coconut Committee is open for membership to all places in which a cess is leviable on all crops, whether produced in India or imported and compressed in a power mill, falling within the purview of the Factories Act. I wonder whether any cess is levied in the Andamans. If not, it is time we imposed this minor burden with a view to securing the major benefits of financial aids from the Committee for schemes intended to develop coconut plantations in these virgin areas.

In my interview with Mr. E. L. Pollard, General Manager, William Goodacre & Sons., Ltd., Alleppey (Mats and Matting), Chairman, Travancore Chamber of Commerce, I raised the basic question of an industry endeavouring to be self-supporting

from the nursery till the finished product is nailed into the packing cases, and he instanced the firm of Bryant and May, match manufacturers, Norfolk, who own their own forests which they work by rotation, to sustain a steady match industry.

NEED FOR NEW PLANTING

During my recent tour it was given to me to pass through miles of coconut area. The main thought that came to my mind was that the whole industry was living on old capital and prudence. It is a popular belief that like man the coconut lives for a century. Many trees were seen approaching their decline. Feeble endeavours in inter-planting young trees were in evidence but this caution was erratic and the new plants were in most cases anaemic. It looks to me that it is time we took a long range view of the whole of the coconut industry and made sure that each year new areas are planted up and plantations in their decline are propped up by new blood. From this perspective it is very desirable that industrial concerns depending upon coconut, turned agriculturists also so that there is a proper integration of industry and agriculture in the coconut line.

Arising out of this comes the next problem of the desirability of looking upon the coconut plantation with an industrial background as in Ceylon and not on the cottage basis picture in which it figures in Travancore

and Cochin. The Secretary of the Coconut Committee gave me to understand that the Committee advocated consolidation of holdings with a view to make the South Indian situation approximate to that of Ceylon and to help survive in competition. In my experience consolidation of holdings is one of those ideals that we find difficult of achievement even in lands lying bare for half the year. It will remain a pious wish in the case of coconuts. It is, therefore, more prudent to prevent the disease, instead of finding a cure. I am firmly of opinion that in any future scheme for the utilisation of land in the Andamans it should be made impossible for any holding to be less than ten acres. Suitable measures, legal or otherwise, should be devised in any land utilisation programme in which, short of state ownership, there should be no possibility of disintegration into uneconomic holdings. The word "Co-operation" is easily summoned in connection with the solution of big

problems, but the fate of the Coconut Export Co-operative Association, Andamans, is a sad pointer to the delusions that we are likely to hug.

SOARING PRICES

At the Tata Oil Mills I noticed no copra was used for crushing oil. The factory was extracting oil out of groundnut. I understood at the Tata Oil Mills that the British Government had entered into a five-year agreement with the Government of Ceylon for the purchase of all copra available for export and that to meet the needs of India, who was usually a very large consumer of Ceylon copra, they had released a certain quota for Indian use. I was given to understand that this quota hardly sufficed to meet the needs especially of the soap industry and that in consequence prices were soaring.

Prior to the commencement of the survey I interviewed the Provincial Marketing Officer, Madras, and he gave me the following price index:—

		Increased Per cent.
20-7-46	Rice	220-250
	Pulse	350
	Chillies	380-450
	Pepper	540-580
Cashewnut		
August, '39	(Rs. 4-4 per md.)	} 400
July, '46	(Rs. 17 per Imp Md. of 82-2/7 lb.)	
Coconut (1000)		
August, '39	Calicut (21-23)	} 700
July, '46	(155-160)	

COCONUT CULTIVATION IN THE ANDAMANS AND THE NICOBARS

Copra.

August, '39	Calicut 6-6-8	}	700
	Mangalore 7-4		
July, '46	Calicut 47-48		
	Mangalore 58-60		

Coconut Oil.

August, '39	Calicut 9.3 per md.	}	700
July, '46	72 per md.		

It will be noticed that the rise in the price of coconut products is phenomenally high. It is, therefore, no wonder that endeavours are being made to bring down this price. Soap makers would naturally find it impossible to supply Indian markets with soaps, perfumery, and other articles of toilet at competitive prices.

WORLD POSITION

I notice from the 1944 and 1945 volume of the Encyclopaedia Britannica that all official figures on coconuts for 1943 and 1944 were held confidential by the Government of the U. S. A. Production has been stimulated in Latin America and Honduras. Honduras seems to have developed a potential of 17 million nuts. The United States seems to have been importing 350 million pounds of coconut oil and 500 million pounds of copra annually. The world production in terms of copra handled seems to be 7333 million nuts per year. Of these, the Netherlands Indies contribute 25 per cent, the Philippines 22, British India 18, Ceylon 9, and Malaya 8 per cent.

Ceylon successfully sends its copra and oil to Bombay and Calcutta more favourably than the West Coast ports of Madras. This is mainly due to the better organisation of the Ceylon trade and the more favourable rates of freight. The Secretary of the Indian Central Coconut Committee showed me data from which I gathered that a comparison of the freights from Malabar ports to Calcutta and from Colombo to Calcutta, showed that for both copra and oil, Malabar was at a disadvantage of about Rs. 3 to 4.

ANDAMANS IN THE PICTURE

The United States that has come out so dominantly victorious in the war, is also dominating the economics of the world. She is a huge consumer of coconut oil. The Philippines supply her a lot. South America is a potential source of supply. The Netherland Indies are disturbed politically temporarily. Britain has taken a lot of Ceylon copra, and Ceylon influences the Indian price considerably. It is the opinion of the Madras Marketing Officer that if the coconut industry is to survive in

India, it needs protection not only against Ceylon but also against the F. M. S. and Straits Settlements (unpublished manuscript report). The recent adjournment motion in the Travancore Assembly is indicative of the existing nervousness. After a depression brought about by the war it is no wonder that the prices are soaring, and the cultivators, middlemen, and industrialists are all reaping the benefit of such prices. It is, therefore, risky to base any recommendations on the present abnormal situation and standards. But this fact is clear. India needs and would continue to need coconuts for a long time to come. If there is a fifty-year plan of coconut planting in the virgin soils of the Andamans, the Indian needs would to that little degree be met over a number of years as the plantations mature. Frequent steamer trips between the Andamans and Calcutta are a necessity and for some time to come steps must be taken so to adjust transit charges to stimulate the trade. It was a piece of significant information when I read that in the case of the United States excise taxes are rebated back to the Philippines by the U. S. A. thus giving the Philippines an advantage.

COCONUT CARBON

This carbon got from burning coconut shells was a valuable product said to have been used in gas masks during the war. It seems to be no

longer of importance. I noticed that coconut shells were coming in boat loads for purely fuel purposes. They kindle easily and maintain fires during the months of heavy downpour. I would, therefore, not count on coconut carbon as a monetary by-product in the Andamans.

COIR, YARN AND ROPES

In the 1938-39 report of the Andamans it is stated "introduction of better methods of retting improved the quality of the fibre, yarn and rope, and led to increased earnings". Research experience and subsequent enquiry showed that good quality coir fibre can be made from 10-11 months old husks and that 9 months of retting is the optimum. These are under backwater conditions. What they will be under the insular conditions of the Andamans only personal knowledge can teach. At Alleppey I had a good insight into coir factory conditions. The coir trade is very lucrative and is highly organised. Beyond suggesting that in due course a few handlooms may endeavour to make mats out of coir ropes for local use, I feel that it will take some good time before the new plantations establish themselves, more husks become available, and more yarn made, and anything like an elaborate industry involving exports could be thought of. The Islands, needs should and could be met.

FINAL REPORT

In his final report submitted early in 1947 after he had intensively toured the islands Mr. Ayyangar has the following observations to make:—

THE ANDAMANS

THE PORT BLAIR SETTLEMENT

There are about 2,500 acres under coconuts; most of these are under grants or licenses. Some of these have been planted by owners on Government land. The biggest owner is Mr. Subban Ali with about 1,000 acres. Next comes Mr. Farzand Ali — 500 acres, Mr. Werning — 200, and the Rangachang Syndicate — 190 acres. Others are 100 acres and less.

JAPANESE DESTRUCTION

It is roughly estimated that over 25,000 trees were cut by the Japanese. Wholesale cutting was done to clear sites for aerodromes. Some were cut to eliminate obstruction to observation posts. Cut trees were used as barricades, hurdles, and as roofing to dug-outs. In some instances tree tops were cut for the sake of the edible tender shoots, possibly in the last stages of desparation for food. A few have been bombed to death, and some killed through the action of salt water escaping through damaged sluice gates.

CONDITIONS IN PORT BLAIR AREA

The general coconut position and its relationship to the Andamans has

already been discussed in extenso (please see extracts from the preliminary report printed above). After inspecting almost all coconut plantations in the Port Blair area I make the following observations:— (a) Coconuts float in water. They are landed on a beach, buried in sand, watered by the waves and sprout. Those that are fit to survive grow up. Nature-grown coconuts sometimes struggle with other forest trees in the littoral area. Many of them manage to bear nuts. This is nature's way. (b) In interior cultivated areas coconuts grow in a belt on either side of rivers or around ponds. (c) Coconuts are not intended by nature or by their own constitution to grow on hill tops. (d) When forests were cleared round the Port Blair area and the method of utilising the cleared area was considered, well-intentioned planters naturally thought of the coconut palm. It is graceful and fruitful. (e) The soils in Port Blair are very friable and easily lend themselves to erosion. In the young stages of a plantation there was the accumulated soil fertility preserved by the forest and made available to coconuts. Young plantations must have grown up vigorously and established themselves. Year after year has gone, pattering rain has poured and much soil wash has occurred. I calculate that the wash varies from 1 foot to 3 feet according to the life of the land and

the nature of the soil. The domed bases of many coconuts bear evidence to this. One of the worst eroded areas can be seen at Jungli Ghat. All reactions to the soil wash can be seen in the trees. Some of them have tapered abruptly. (f) Not all hill top coconuts are bad. Some that have been lodged in places with a good depth of soil are doing well. Others planted on thin soil, practically over rock are languishing. An example of the latter can be seen at Navy Bay. (g) Hill top planting should have been done after terracing. To start terracing now will worsen the situation. (h) Many of the plantations have set me the paradox — is the soil holding the coconut, or the coconut holding the soil? (j) The consequence of all this is that the general yield from the plantations of the Port Blair area is relatively poor. The best plantation is at Rangachang by the sea-shore. Parts of it are on low sloping uplands. The next best plantations are those at North Bay and on Viper.

SUGGESTIONS FOR IMPROVEMENT

What to do? The Government is interested and worried over these plantations, as the land belongs to it and as its criminal labour was used in planting it. The following suggestions strike me as the best way of handling the plantation: (a) to open transverse furrows and manure the plantation with Ammonium Sulphate, (b) to burn dry coconut leaves etc.

and scatter the ashes throughout the plantation, (c) periodically to cut down weed brush and scatter it to give a brush-mulch, (d) to cut down dead trees to prevent beetle breeding in the decaying tops, (e) to plant gaps and replace cut trees, (f) prevent the grazing of young plants in the old plantation, (g) bar up big and small gullies with tree trunks laced up with wood brush barrages. As very often these operations cannot be performed by a holder whose resources are poor or weak, it is desirable to examine the financial resources and stability of would-be lessees, so that there is a reasonable hope of doing what is expected to be done. It is, therefore, desirable that there should be a greater scrutiny of this aspect of future lessees. In future leases it is desirable to insert the following clauses: (a) the lessee shall cultivate the land and maintain it in good and proper order, (b) the lessee shall be responsible for the systematic manuring of the plantation according to the advice of the Agricultural Officer.

It is necessary that the Agricultural Officer should periodically inspect and satisfy himself about the enforcement of these conditions. It is also necessary to insist on a proper record of estate maintenance expenses and a systematic record of periodical yields and incorporate these conditions in future lease terms, so that the increase or decrease

in total yield may be gathered directly and not at the time of sale.

RANGOON PRICES

It is stated in the review of the Settlement Report that land revenue will be charged on a sliding scale varying from Rs. 3 to Rs. 20 per acre according to the prices prevailing in Rangoon as proposed in appendix XII to Siddiqi's Settlement Report subject to the following conditions:- (i) that the new rates will hold good for the remainder of the present tenures; (ii) that they will be liable to revision if in consequence of the separation of Burma from India - (a) the Government of Burma levy an import duty on Indian coconuts, or (b) the Andamans Administration is unable to send the chartered steamer to Rangoon at the usual intervals of about two months. I could not get a copy of Siddiqi's Settlement Report either at Port Blair or at New Delhi. I, therefore, miss the appendices in it which are very important for evaluating the coconut position with reference to Rangoon.

Burma separated from India on April 1, 1937. What the position was after the separation of Burma I am unable to trace. There is only one information I have, and that is that a consignment of coconuts was sold in Rangoon some time before this survey began at Rs. 40 per 100 nuts and a sum of Rs. 39,000 was realised. Whatever the position,

the separation of Burma gives us an opportunity thoroughly to overhaul the question of coconut plantation, leases and grants. If there is no cause of action now, most of the leases and grants, I understand, will be expiring between 1952 and 1956. Then at least we should take steps to impose new lease conditions and ensure that there is the certainty of all planters joining together to keep the coconut mill to be started as a going concern.

FRESH PLANTING OF COCONUTS

This is proposed under two heads - homestead basis and plantation. On the homestead basis the 5,600 acres of rice land would, at 5 acres per family, represent 1120 families. Each paddy holding of 5 acres is to have at least 2 acres of garden land. In these two acres it should be insisted that a minimum of half an acre should be planted up with coconuts. Being open on all sides, 30 trees could easily be planted in this half an acre. We expect the settlement to be full in 3 years and by that time over 33,600 seedlings would have been planted out in 560 acres. On an estate standard, plantings should await the realisation of my plan to consolidate existing plantations under a local syndicate or the coming in of a big commercial agency interested in coconut oil to open a huge plantation. If and when any one of these two materialises, these fresh coconut plantations in the Port

Blair area may be started. I expect that 1,000 acres of good land would be available for such planting. Areas that come to my mind are - round Rangachang - 200 acres, south of Burma Nala - 100 acres, north of Kaudiyaghat - 100 acres, near Wandur - 200 acres, on the high land north - east of the big marshy area of Stewart Gunj creek - 100 acres and contiguous to existing scattered plantations - 300 acres.

COCONUT OIL MILL

The possibility and desirability of opening a coconut oil mill has already been indicated in my preliminary report. How is the crushing mill to come into being? The following questions arise: (a) Who is to start the factory? Certainly not the Government. (b) In view of the prevailing high prices in Rangoon will there be an inclination to crush them here? But the present high prices may not continue. Sooner or later the local growers will realise that the opening of a crushing mill is worth seriously thinking about. Oil can be sent to Calcutta in less shipping space. Its sale can be deferred to get better prices. Like nuts, oil does not perish. (c) If an outside agency is allowed to start the mill there will be the cry of exploitation, but surely the local people should not adopt a dog-in-the-manger policy. They should effectively step in. They must co-operate and start a mill. (d) It is obvious that the oil mill should

be started on the strength of the least quantity that will make it worth while. If Port Blair cannot meet the demand just as much as is wanted to make up the deficit, can be got down from the Nicobars. The rest of the Nicobar coconuts can be sold where the local trade agent likes. The Nicobar local trade agent should be invited by the Local Syndicate to be a member in this undertaking. (e) Till there is a genuine desire to start an oil crushing mill, the present practice will have to continue. The lessees could, however, be circularised as to the desirability of this move and the nature of their response gauged. (f) If, slowly, little plantations are bought over and merged into a big unit, these questions will not arise. The trouble is in the large number of medium and small size plantations whose lessees cannot be forced to pool coconut for the mill. (g) In view of the bigger coconut interests in Port Blair centering round three gentlemen and a Syndicate, it should be easy to confer and fix up this undertaking.

COCONUT CAKE

The island has no oil cake. Cake will be available only if oil is extracted. In the 1929-39 Administration Report it is noticed that over 15,000 lb. of cake were consumed locally. There will be no substantial improvement in the livestock industry without more cake, bran and husk.

COCONUT CULTIVATION IN THE ANDAMANS AND THE NICOBARS

If and when cake is produced on the islands, nothing can be exported. All will be used up in the islands and if the Nicobars send nuts, some of the cake may go to the Nicobars to feed the pigs of the Nicobarese.

COIR

Most of the nuts in the islands fall by themselves and are collected. A few, however, are picked. From a coir point of view the best time to pick (from experience in the West Coast of South India which is the home of the coir industry) is before it is dead dry. Plucking it then is good for coir making without in any way affecting coconut or copra value. Next to the right time of

plucking, the right method of retting is important. In my visit to the Navy Bay, it was a sad sight to see hillocks of coconut husk waiting to be dumped into the Japanese trenches just to fill them. On a request made to the Chief Forest Officer, I understand that the requirements of the Forest Department by way of coir rope costs the department about a lakh of rupees. I am sure another few thousand rupees worth of roping would easily be required by the Marine and other departments. That being so, it is an avoidable waste of material and capital to treat coconut husks like this. I give the approximate annual requirements of the Forest Department.

	Approximate cost.	Total value of purchase.
Rope coir oiled for towing.		
3" cir. 3 ply 500 coils of 120 fathoms each.	Rs. 40 per cwt.	} Rs. 89,000
3½" ,, Do. 200 coils of 120 fathoms each.	Do.	
4" ,, Do. 30 coils of 120 fathoms each.	Do.	
5" cir. 3 ply 20 coils of 120 fathoms each.	Do.	
Rope coir oiled for drive.		
3½" cir 4 ply 20 coils of 120 fathoms each.	Rs. 55 per cwt.	} Rs. 10,700
5" Do. 20 coils of 120 fathoms each.		

Indents are placed on the Director-General of Industries and Supplies, New Delhi, who invites tenders and arranges supplies. I suggest that a

syndicate of local coconut planters may be formed to examine the situation and utilise their resources in capturing this market. All the coir

that can be made, can possibly be used in the islands. Apart from its use in the manufacture of floor coverings and rope, on account of resistance to rot and also to white ants to a large extent, coir fibre has immense prospects amongst the various fibres of the world. The present war has shown that coir can be utilised for various purposes, one of which is the making of roads or producing a good wearing surface. The use of coir in the preparation of protective lagging materials for underground pipes such as gas, oil and water pipes and cables, subjected ordinarily to the corroding influences of bacteria, electrolytic action etc., and the chemical corrosion from the clay and soil itself in which they are buried has successfully passed the experimental stage. Before the coir factory is started it is desirable to send one or two young men to Alleppey to get a thorough training in the industry.

SMALL FARMS VS. LARGE ESTATES

In any scheme of land utilization and development there is room for both these types of farming. When the problem is to find food for a growing population, or labour for industrial developments, great application of labour in small farms has to be encouraged.

When large areas have to be brought under cultivation, on a plantation scale, especially to provide

raw material to an industry e. g., coconuts for oil, it is best to have as large a unit as possible. There is thus no room for a middle class condition in which the owner will be very secure and comfortable in a possession which is not big enough in material backing and endeavour to rise to the level of an industrial enterprise.

I am of opinion that in the Port Blair settlement area there is no room for any large scale enterprise. We want a number of peasant proprietors in holdings that they can work on. We want to draw labour from them for the ever-growing needs of Port Blair.

As for a large coconut plantation, there is plenty of room for such plantations in the vast littoral areas of Middle Andamans and along the banks of its big rivers and in some of the islands. The coconut is adapted to thrive on the sandy shores of a sea coast and on the banks of rivers. Ingliss island is a typical example. There are hundreds of coconuts germinating and struggling with the trees of the littoral forest in this area.

I consider it desirable that a big firm interested in coconut oil and soap manufacture like the Tatas, Lever Bros., Swastik or Godrej, should send a delegation to inspect areas suitable to coconut cultivation (to begin with they will be pleased

to note the suitability of the littoral forests on either side of the Betapur creek and on either side of the Betapur, Ranghat and Bomlunta rivers) and enter into negotiations with the Government and the Forest Department for planting up all suitable areas of subsidiary interest to forestry and from which coconuts will produce better wealth.

The modern trend is to employ labour, house them, pay them well, take care of their health, and give them a small share of the estate's profit (say up to 4 per cent of their basic labour wage, if and when the total gains of the company exceeds a minimum, which minimum should represent the interest on capital and enterprise. As the labourer does not participate in losses and as his liabilities are one-sided, it is best to inaugurate a huge Coconut Plantation Company or Syndicate (of interests pressed for coconut oil) to take up this question of starting a plantation in these islands so that they can have a sure source of raw material for their industry. I have discussed this question quoting the analogy of a match factory in my preliminary report. I am sure that if the Forest Department and the coconut oil and soap interests sit in conference and then have a joint inspection of the islands, vast areas, will by mutual agreement, be made available, especially in the Middle Andamans and in some of the big islands.

Communication is a difficult matter, but a large firm will doubtless have its own motor boats. It is also possible that in agreement with the new lessees for the exploitation of the forest areas of the Northern Andamans, and the northern areas of middle Andamans a common tramway and a common jetty can be shared and full facilities for a vigorous planting scheme inaugurated. Adjacent moist areas, too moist for coconuts and forests, can be converted into paddy land and the plantation labour helped to be self-supporting as regards rice. These plantation villages will also be under the purview and supervision of the Forest Village Officer.

THE NICOBARS

Coconuts grow in plenty and well in the coral beds and coral clays rich in vegetation and in humus. Coconut cultivation has attained here the perfection which any crop that is a food crop is bound to attain in any community. There are waves of plantations varying in age. As the old ones decline the young ones take their place. When a plantation is about 50 years old, the need for beginning a younger plantation is realised. I have seen plantations in all stages of growth from 5 to 20 years. The oldest plants were about a hundred years old. The sad sight that I noticed in many of the plantations in the West Coast of South India in

which the present generation was living on the foresight of elders was not met with here. The Nicobarese do not drink plain water. Their drink is the water of the tender coconut. The tender kernel may or may not be eaten and when not eaten is not wasted, but consumed by dogs and pigs. In addition to at least two tender coconuts, two mature nuts may, on an average, be said to be consumed by every adult each day. This is added to various preparations and made into a variety of dishes. Coconuts are scraped on the thorny surface of a scandent palm common in the islands. In sandy areas the yield is 50 to 60 nuts per tree and in good areas 100. There is a belief that like a leap year, a lean year of yield occurs once in four.

There are special trees with small nuts suitable for huqqas. These are exported from the island. In the 1927-28 Report it is recorded that nearly one and a half lakhs of these nuts were exported.

Coconut oil is extracted in two ways, by boiling and by pressing in an improvised press. Coconut is scraped and the scrapings lightly fried. The fried mass is put inside a folded sieve-like fibrous appendage of the coconut leaf-sheath base and pressed by a horizontal rod inserted into the hollow of a tree and levered on a wooden oil receptacle with a groove leading out (through a

projection) to a receptacle for oil. At the other end of the rod women and children sit and act as a press, and watch the slow trickling of the oil. The coconut refuse is fed to pigs. Coconut oil, apart from its use in the food and for lighting, is smeared over the body as a protection against both heat and cold. It is suggested that enquiries may be instituted through the Indian Central Coconut Committee, Ernakulam, Cochin state, for the simplest, least costly and most elementary type of improved hand press (to be manipulated by light human labour) get down the design for one of these presses and see if one could be made and introduced. If popular, more can be made locally.

TODDY

Toddy is a drink which both men and women use commonly. It is much used on festive occasions. It cheers, but does not inebriate. This island should be exempt from the operation of prohibition as understood in the mother country. Any attempt at stopping toddy tapping will lead to considerable illicit tapping and to the production of more injurious liquor. The recent vigorous action of the Assistant Commissioner in confiscating stills in use during the Japanese occupation for the distillation of liquor is highly appreciated by the more knowing of the population. For tapping toddy special

trees tested and found suitable for a good yield of toddy are selected. These are permanently dedicated to tapping. Permanent notches are cut into the trunk to ensure safety in the constant climbing. These permanent notches are a symbol of the determination of the people permanently to stick to toddy. Toddy is collected in a number of coconut shells. A big bamboo tube is hung up at the top of the trees and in this toddy is collected and brought down. Both men and women climb coconut trees.

COCONUT SHELLS

Shells of big coconuts are the usual water receptacles. Their tops are cut up leaving a handle. Two are tied up and swung on a pole. There are about 10 such pairs, 5 in front and 5 in the rear. These poles are usually carried by young boys and girls. Water carrying seems mostly their work

YOUNG LEAVES

The leaves of young coconut plants whose leaflets remain cohering are cut and used as a protection for the head when there is a drizzle.

DEAD TREES

There are a number of dead trunks of coconut trees standing in the island. Their disintegrating tops are a fertile breeding ground for the rhinoceros beetle whose grubs will be found in plenty on them. Pigs are reported to eat rhinoceros

grubs. In areas in which there are young coconut plantations, pigs are sent away to another part of the island. This biological balance is upset and there is now severe rhinoceros beetle attack. It has now become all the more necessary to cut down dead trees. Some dead trees are used as an edging to road sides to prevent metal sliding down into the steep or miry sides of the road.

A FREAK

In the village of Chuckchuca there is a coconut having three branches - trident fashion. All the three crowns bear fruit.

CURRENCY AND ROYALTY

Coconuts are the currency of the islands.

Export to India: The exchange rate is 16 pairs of nuts per rupee. Royalty - coconuts Rs. 6-4-0 per 1000 copra - Rs. 4/- per 3 bags of 100 lbs. each, betel nuts - Rs 4/- per bag of 175 lb.

Export to Burma: The exchange rate is 5 pairs per rupee. Royalty - Rs. 18-12-0 for 1000, copra Rs. 12/- per bag of 100 lbs. each, betel nut Rs. 4 per bag of 175 lb. It will be noticed that given facilities there is a greater inducement to sell produce in the Burma market. What conditions will prevail when Burma settles down and how best the produce of the islands can then be traded on are points, it is difficult to decide now.

WHAT THE VILLAGERS DESIRE TO BARTER THEIR COCONUTS FOR

Rice, tea, sugar, tobacco, cigar and cigarattes, match box, soaps, spoons, forks, beads and cheap ornaments, clothing, steel for bows and arrows, tools and implements like dah (light chopper) axe, knife, hammer etc.

TRADE

Upto the year 1938-39 the largest export seems to have been 17 $\frac{1}{4}$ lakhs of nuts and 43,000 bags of copra (130 nuts per bag). The Nancowry centre contributed a larger number of nuts and Car Nicobar a larger amount of copra. In addition to this about 240 bags of arecanuts have been exported. We have recently reoccupied after the enemy has left and the present trade situation is still uncertain.

Mr. Scott, a former Assistant Commissioner, has suggested that in view of the repulsiveness to trader settlers, the question may be considered whether, as about 40 years ago, sailing vessels may not come in, anchor, bargain with the islanders and give and take what they need and clear out.

One trader of repute is functioning on the islands. I understand that a second one will be allowed to do so shortly. This is a desirable move in that it might result in a healthy competition between traders to the benefit of the inhabitants.

In view of the separation of Burma from India and the acute need of the motherland for coconuts and copra, and the responsibility of India for immediate rehabilitation and for the ultimate economic and moral well-being of the inhabitants of the Andamans and Nicobars it is a matter for consideration:-

(1) Whether the copra of the Nicobars could not go to augment the minimum unit of supply necessary for the successful running of the coconut oil mill in Port Blair and this must be started sooner or later, and

(2) Whether some effective arrangements cannot be made by which all the surplus coconuts of the Nicobars (after meeting the needs of the Port Blair oil mill) should not be made available to sustain, in part, the coconut oil and soap industry of the motherland. If rice is obtained cheaper from Burma and coconuts get a better price there, the export of nuts to Rangoon and Moulmein may be restricted to that much.

The temporary phase in which abnormal prices prevail in the Rangoon market should not cloud permanent issues. A mere larger royalty is a shortsighted objective and should not take the place of more abiding issues. Money is not copra. I cannot but help referring to these aspects that require examination at higher levels, both in the political and economic fields.

SOME ASPECTS OF GRADING & STANDARDISATION OF AGRICULTURAL PRODUCTS IN INDIA

By T. G. SHIRNAME

WE are all aware that the price a farmer gets for his produce is determined by the rates prevailing in terminal markets like Bombay or Calcutta. Even in the case of agricultural products, like fruits and vegetables, which normally do not move over long distances, the price a farmer receives is determined by the rates prevailing in the principal consuming centres like Delhi or Kanpur. For any one agricultural produce, the price in a terminal market or a consuming centre depends on the variety and quality of that produce. It is, therefore, very important that the rates so determined in the terminal or consuming market for a particular type or quality should be related to the type or quality of the farmers' produce with a view to see whether the farmer does or does not get a price on parity with the rates prevailing in the terminal or key markets. Every aspect of improvement

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in the agricultural marketing systems in any part of the world, therefore, depends very largely on the manner in which arrangements could be made to put the farmer in a stronger bargaining position from the point of view of his getting for the type and quality of his produce a rate on parity with prices prevailing for the same type and quality in the key markets.

INEVITABLE VARIATIONS IN AGRICULTURAL PRODUCTS

But for this purpose, we must have standards for types and qualities of the agricultural produce. In any manufacturing industry, it is easy to put on the market, a product of standard quality which would not vary from month to month or from year to year. The manufacturer can do this because he can control and standardise all aspects of the manufacturing processes. In agriculture, on the other hand, such a control is not possible in so far as environmental conditions like soil, climate and rainfall are concerned. The type and quality of seed, the cultural practices and the methods of harvesting and preparing the produce

for the market, which also determine quality, could, however, be controlled by the farmers.

PRESENT PRACTICES

Yet even these controllable factors are not given the attention they deserve by the farmers mainly because of the present market practices in which dirt and dishonesty play a prominent part. The existing market practices are such as would discourage the farmers from putting on the market their produce properly cleaned and dried. It is commonplace in all the primary markets to find a considerable proportion of refraction and moisture in the products offered for sale. After the introduction of rationing, this seems to have increased and it is everyday experience of the consumer of rationed foodstuffs to find in his ration things which should not be there. This is, however, not a new development but is a legacy of the market practices which have evolved in this country during the past 100 years or so.

These market practices actually encourage the addition of dirt, stones and other foreign matters to agricultural produce even in terminal markets like Calcutta or Bombay. The methods of business are such as do not offer any or adequate premium for quality. This may be because the terms of contract on which the members of same trade associations conduct business, permit, as

a necessary clause, a certain percentage of refraction without making allowance for premium for such of the sellers who would deliver their produce in a more clean condition. Or it may be due to the indifference of the buyers to discriminate a good quality produce from a bad or indifferent lot. The business practices in port towns have been such as have actually resulted in earth, dirt, etc. being carried to and fro between the port town and the producing centres. Evidence is on record to indicate that earth or small stones from areas of production are actually packed and transported to port towns to be mixed with clean produce merely because the terms of business permit a certain percentage of refraction and to show that admixture took place in the producing area itself. *Vice versa* the excess of dirt or refraction separated in markets is transported back to the villages to be mixed with clean produce before being despatched to the markets. There have been instances on record of prominent business houses maintaining a specialized branch for breaking clods of earth into sizes, somewhat similar to the agricultural product like groundnut or linseed, so that those small particles of earth could be more easily mixed with the agricultural produce.

WASTEFUL TRANSPORT OF DIRT

Such practices obviously discourage not only the producer but also a

genuine trader who would like to do business in a straightforward manner. The amount of dirt, stones, etc. entering into the internal and foreign trade of the country is enormous. Taking the heavy staples like oilseeds and principal foodgrains like rice, wheat and millets, the total quantity of dirt involved in inter-provincial trading alone would be over 1,20,000 tons. The number of wagons and trainloads required for transporting this rubbish could be easily imagined. The quantity would be much larger if the trade within the provinces is taken into account. The movement of such a huge quantity of refraction and foreign matter involves an enormous waste of the cost of packing and transport and the occupation of valuable transport space. This excludes the excessive moisture contents found in most agricultural products. The practice of wetting the produce before sale is not uncommon, and if the transport and other wastes on this account are to be considered, the total loss would be at least twice, if not more. There is also another aspect, namely, that the wetting of agricultural produce definitely results in further deterioration of the quality of the produce which would be otherwise sound without the excess moisture.

These practices of dirt and dishonesty also enter the country's

foreign trade and it is well known that the reputation of Indian agricultural produce in the international markets is not high. Yet, the Indian products continue to be sold in the foreign markets, mainly because they could be had at rates cheaper than those obtaining for similar products offered for sale by other countries. Apart from this question of the nation's reputation in the international markets, the country spends huge sums of money every year on transporting refraction and other foreign matter along with sound produce. Taking the instances of only two commodities, like groundnuts and linseed, exported to foreign countries, it can easily be reckoned that prior to the outbreak of War in 1939, we were exporting something like 27,000 tons of earth, dirt, stones, etc. every year admixed with sound groundnuts and linseed. Statisticians can easily calculate the amount of shipping space and the number of steamers required for transporting this rubbish. The total sea freight paid over the transport of this rubbish of 27,000 tons to foreign countries at pre-1939 rates was of the order of Rs. 5,00,000. In addition, there was the cost of packing and the movement involved from the producing areas to the port towns like Bombay, Calcutta or Madras. This figure of loss on sea freight does not take into account the moisture contents of these oilseeds which can be reckoned easily

at double the contents of the foreign matter. The huge loss on account of the refraction and excessive moisture contained in agricultural products traded within the country and exported abroad could, therefore, be easily imagined. The presence of excess moisture causes further deterioration by way of increased development of free fatty acids which spoil the quality of oilseeds and of the resultant oils.

ENORMOUS LOSS

The enormous loss to the country on account of such malpractices is therefore obvious and it should be possible to avoid a considerable portion, if not the whole, of this loss by adopting better and modern methods of marketing. The malpractices are the main cause for lack of confidence between the primary producer on the one hand and the trader on the other. They also result in want of confidence amongst the tradespeople themselves and not infrequently one tradesman tries to cheat the other. In so far as our foreign trade is concerned, such malpractices can be hardly considered conducive to maintaining and improving the country's reputation in the international markets.

This has been the principal handicap to the Indian Government Trade Commissioners in promoting India's trade in foreign countries and everyone of them has been pressing for

effective action for regulating the quality of India's exports in accordance with standard grades.

TRADE ON CONSIGNMENT BASIS

In the absence of such standards, a very large portion of India's foreign trade is conducted on consignment basis. In the absence of regulation on the quality of our exports, the foreign buyers prefer to inspect the produce before agreeing to buy. For this purpose, many of them have opened offices or agencies in India. Others prefer to buy after inspecting goods consigned to their countries for sale. The commission houses and brokers in foreign countries are, therefore, the agents who secure customers for our commodities consigned to foreign countries. During recent years, however, sale on the basis of sample has developed, but a very large number of such sales is followed by disputes and arbitration. The arbitration is arranged in countries where our produce is despatched and, as such, the Indian shipper has no effective voice in such arbitration. Normally, therefore, he has to accept the arbitration award.

In so far as our foreign trade is concerned, there is also another danger if matters are not improved by regulating the quality of our exports. Foreign manufacturers requiring Indian raw materials for their manufacturing processes, are greatly upset when they cannot get from

India raw materials of the requisite quality from year to year. All such manufacturers must put on the market their manufactured goods in a standard form which must not vary from year to year. For the manufacture of such standard articles, they must be assured of a regular flow of raw materials of the requisite quality from year to year. Owing to indifferent qualities of shipments from India, they either try to buy from other countries or prefer the use of substitutes. In regard to the latter, i. e., substitutes, the cases of lac and jute are well known. For the present we are deficit in jute but in so far as lac is concerned, we still hold a monopoly in the world. But we are slowly losing in the international lac market due, to a considerable extent, to the absence of standards in the quality of our shipments. Similar is the case in regard to carpet wool which we export very largely to the U. S. A. It is reckoned that out of 41.5 million pounds of carpet wool exported from the Dominion of India, not less than 10 million pounds consist of foreign matter. The carpet manufacturers in the U. S. A., therefore, are always on the look out for alternative sources of supply and have expressed that they would greatly appreciate anything that India could do to see that the shipments from India take place either in accordance with standards of grades or the sample on

which the sale between the Indian shipper and the foreign buyers was contracted.

AGMARK GRADING

The importance of grade standards for our agricultural products is, therefore, obvious. It is important to the farmers, to the traders, to our manufacturers, to the exporters and to our foreign buyers. It is also important from the point of view of cutting down our losses by way of packing costs, transport costs and space costs due to shipment of unwanted materials to foreign countries and also the merchandising costs incurred on shipments sent on consignment to brokers and commission houses in foreign countries. An attempt towards the grading of agricultural produce on a statutory basis, for the country as a whole, was first made after the passing of the Agricultural Produce (Grading and Marking) Act, 1937. Under the provisions of this Act, standard (designated as Agmark) grade specifications could be prescribed for any produce of agriculture, animal husbandry and forestry. Though grading under the Agmark has been in existence for about 10 years, the quantity of produce graded is yet small, being worth a little over Rs. 10 crores. The slow progress is due to the fact that the Act is not absolutely binding on the producer. The tradespeople agree to the principle of grading, yet they have not yet

taken kindly to it mainly on the ground that they already do their own grading and, therefore, it is not necessary for them to adopt any all-India specifications of the Agmark type. It is possible that they apprehend that recognition and adoption of the national or Agmark grades by all tradespeople and manufacturers from within the country and by our foreign buyers might make it easier for newcomers to join the export trade, thus increasing competition. The commission houses and brokers in foreign countries have also not so far encouraged Agmark grading, presumably because they apprehend that the wholesale adoption of such grades by Indian shippers would ultimately stop exports on consignment and that foreign manufacturers requiring Indian raw materials would buy their requirements direct from Indian shippers, thus short-circuiting and saving their costs incurred over commission houses and brokers. A large number of Indian shippers quote such foreign commission agents and brokers as an authority in support of their unwillingness to trade on the basis of Agmark or national standards. Purchase agencies of Indian and foreign manufacturers also have not shown enthusiasm for Agmark grading for reasons which seem obvious and which need not be further explained. On the other hand, genuine manufacturers have expressed that they would appreciate if they could be

assured of their raw materials from year to year, graded exactly in accordance with standards and without any variations in grading either from one supplier to another or from season to season with the same supplier.

Even the voluntary efforts in grading on the basis of Agmark standards have become quite popular. Agmark is now accepted as the standard of purity and quality in the case of many commodities like ghee, table butter, vegetable oils, etc. The Agmark products are fetching a premium. But this has also resulted in the misuse of Agmark and several cases have recently come to light wherein the Agmark label has been either imitated or counterfeited or the contents under the Agmark seal were found either tampered with and adulterated or absolutely off the Agmark specifications. Cases are also on record where financing agencies like banks were cheated by way of taking advances on stored containers sealed with the Agmark label but containing cement, stones and other foreign materials. This clearly indicates that the national standards could also be misused and serve as another item of malpractice for committing deceit and fraud.

ENFORCEMENT OF AGMARK STANDARDS

Having regard to the existing trade practices, at least some of

which could be hardly considered satisfactory and creditable, the problem of enforcement of the national or Agmark standards has become an important and urgent issue. The ideal way of enforcing such standards would be for the trade itself to enforce them. But considering the organization and working of even the more prominent trade associations in the country, it is doubtful if the trade could be depended upon for the effective enforcement of such standards. From what has been discussed earlier in this paper, it is obvious that the enforcement of standards is important in all markets primary, secondary and terminal. A well-organized trade association can at best enforce its decisions when the transaction takes place between two of its members. It is, therefore, difficult to foresee how the trade would be in a position to enforce standards for the country as a whole. Even in agriculturally advanced countries, like the U. S. A. and Australia, the enforcement of the standards of quality is done by the State itself, directly and indirectly. In Australia, the quality of all exports of agricultural produce is controlled by the Commonwealth Government through its various Commodity Marketing Boards. In the U. S. A. the Federal Department of Agriculture inspects quality through its elaborate Inspection Service and the licensed Inspectors.

REGULATING THE QUALITY OF INDIA'S EXPORTS

This leads me to give a brief account of the efforts made in India for regulating the quality of our exports. After the outbreak of War in 1939, the Government in the U. K. repeatedly complained about the bad quality of exports from India, particularly in regard to tobacco and sann hemp. It was reported that the quality of shipments was so bad that a considerable sum of money was required to be spent in removing and destroying the unwanted rubbish shipped from India. In consequence, steps were taken by the Central Government to prohibit the export of tobacco and sann hemp from India excepting in accordance with Agmark standards. An elaborate Inspectorate staff now checks the quality of sann hemp and tobacco exported from India. The results have been very satisfactory, particularly in regard to tobacco. The results for sann hemp have not yet been so spectacular, entirely because of the opposition of the trade to the Government intervention. The trade is, however, slowly adjusting itself and there are reasons to believe that in regard to sann hemp also the results would be as satisfactory as for tobacco. Prior to the introduction of compulsion in 1945 on the grading of tobacco before export, by far the largest part of exports sent by Indian shippers used to be on the basis of consignment.

Some sales used to take place on the basis of samples also. Since the introduction of compulsory grading in 1945, our exports have progressively changed over to the basis of F. O. B. Indian ports like Madras or Coconada. We are now getting firm quotations on the basis of Agmark grades with 100 per cent credit opened in India. This proves that our foreign buyers have accepted and are convinced about our Agmark grading. The banks in India are accepting our Agmark grading certificates for assessing the value of tobacco pledged with them for the purpose of determining the extent of financial advances. This facility is also being extended by the banks to other Agmark products like ghee and vegetable oils graded for consumption within the country. As the quotations on the basis of Agmark grades received from foreign countries are now quite open, the farmers have begun to take an active interest in those price quotations and to realize that if they grade and process their tobacco in accordance with Agmark specifications, they would get the same price as quoted, say by London, minus the expenses which they by now already know. They have been, therefore, put in a stronger bargaining position at the time of selling their produce to the local merchants or shippers. This is the objective of all marketing improvements and could be achieved by the

adoption of standards of grades. The grading of tobacco has helped in making the tobacco-growers realize the importance of organizing themselves into a co-operative society and several hundreds of such growers together owning some 10,000 acres of tobacco have now come forward to form themselves into a co-operative society with the object of pooling their produce, processing and packing it and then selling the packed goods either to buyers in India or to foreign countries in accordance with the price advantage. The introduction of standards of grades has also resulted in increased competition amongst the tradespeople themselves. This competition has assisted in maintaining strictly the Agmark quality standards and giving to the farmer a more competitive price.

UTILITY OF STANDARD GRADES FOR PRICE BROADCASTS

The adoption of such standards of grades for agricultural products in countries like the U.S.A., Canada, Australia and new Zealand has greatly helped in evolving a system of price broadcasts with the object of letting the farmer know as to how much he should expect to get in his market for the type and quality of his produce. The United States Department of Agriculture has a tremendous organisation for collecting and disseminating prices and has for this purpose taken on lease from

Western Union a separate wire over a distance of some 10,000 miles for transmitting information on prices and market trends. For all the important markets in the 48 States, parity tables exist which enable the farmers and the local trade to calculate without any difficulty the local prices on parity with rates prevailing in key markets like New York, Chicago or New Orleans. Other countries have also organized a similar price broadcast service. The farmer in those countries daily listens to the radio and the two items which he never misses on the radio are the weather and price broadcasts. There are many farmers, even in these advanced countries, who cannot read

and write. Yet, they can always listen and the items which they like most to listen to are those on weather and the prices. In the scheme of village broadcasts in this country, the farmers' economic and social welfare must inevitably play the most important part. His economic position would largely depend on his getting the correct price. For this he must know every day as to how much price he should expect to get in his market for the type and quality of his produce. This would be feasible only after we agree to adopt universal standards of grades or quality for our agricultural products.

— *Indian Farming*, January, 1949.

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COIR*

BY K. C. KARUNAKARAN

COIR is the fibre obtained from coconut husks. The fibre can be spun into yarn which in turn can be used for the manufacture of mats and matting, rugs, carpets and other floor coverings, cordage and twines, and coarse cloth. Coarse and long fibres are used for making brushes and brooms, and the short and curly ones as stuffing in upholstery. Apart from these uses coir fibre has immense prospects on account of its resistance to white ants and to rot. Properly treated coir resists decay, is not disintegrated by bacteria nor hardened by water, and can be easily impregnated with bituminous and resinous compositions. During the World War II, coir was used in making roads with good wearing surface.

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*Contribution to the Dictionary of Economic Products and Industrial Resources of India. Suggestions regarding this article are welcomed by the Chief Editor, 20, Pusa Road, Karolbagh, New Delhi.

It can also be used in the preparation of protective lagging materials for underground pipes and cables against corroding influences of bacteria, and electrolytic and chemical action.

CONFINED TO KERALA

The coir industry is located mainly in Kerala on the West Coast — in Travancore where it is most developed, in Cochin and along the Malabar Coast of Madras, where it is supposed to be the biggest industry. Among the reasons which are responsible for the development of the industry in this area may be mentioned the extensive coconut plantations and vast stretches of backwater, the brackish water of which is considered to be most suitable for retting of the coir fibre. Coir is also manufactured, in smaller quantities in Mysore, Orissa, Bengal and in Ratnagiri and Kanara Districts of Bombay. During 1938-39, about 1.5 million acres were under coconut plantation which produced 3,000 million coconuts (Dept. of I. & S., Report of the Panel on 'Coir', Rope, Cordage and other Fibre Industries, 5). India is the largest producer of coir and coir manufactures, and excepting Ceylon, nowhere else in the world are appreciable quantities made.

The coir industry in Travancore is said to have provided employment

to some 30,000 families in the various preliminary operations involved in its manufacture, such as extraction of fibre, spinning of yarn, etc. About 2,00,000 people, two-thirds of them being women, are estimated to be employed in these subsidiary processes. About another 30,000 workers are engaged in the mats and matting industry in Travancore State, of which about 10,000 workers are employed in Alleppey alone. In Cochin about 40,000 workers are employed in all the processes of which 1,500 persons are engaged in the manufacture of mats and mattings (Mukhtar, A., Report on Labour Conditions in Coir and Mats and Matting Industry, 1945, 1). In Ceylon, the coir spinning and weaving industry is estimated to be employing over 50,000 workers (The Ceylon Trade Journal, 1948, 13, 342).

The Coir industry produces three different types of products:— Coir fibre, coir yarn, and the various coir manufactures made from the fibre or the yarn.

COIR FIBRE

The preparation of coir fibre consists primarily of husking the coconut, retting the husk and beating the retted husk to separate the fibre from the pith. Husks are collected from the different areas and sold to people who do the retting. Retting involves some capital investment. After retting, the fibre

is extracted from the husks in cottages. Mostly women workers purchase the retted husks and spin the fibre into yarn for marketing.

The husking is done soon after plucking of the coconut. An iron spike or a hard wooden spike with a sharpened upper end, fixed on ground at an angle of about 30° to the vertical, is used for this purpose. The stem end of the fruit is jabbed on the pointed end in such a way that the point penetrates between the husk and the nut and with a sharp twist, the husk is separated in 3 parts (S. Sarma — Coir Industry in Travancore, Bulletin 31 of the Dept. of Industries, Travancore, 1932, 5).

RETTING METHODS

The green husks are first retted in order to make them suitable for the extraction of fibre from cork and piths contained in the husk along with fibre. Retting is done by burying them in pits adjoining backwaters. This is considered to be essential for proper fermentation of the husk. The tidal action of the backwater helps to remove the fermentation by-products. This periodical change in the water is one of the most important conditions for good retting. The pits are generally lined with coconut leaves in order to protect the husks from dirt as it adversely affects the quality of the fibre, and the bottom is lined with sand. The pits are covered with coconut leaves and mud. Sometimes, as

near Anjengo, the husks are placed on coir nets and kept floating for a few days, and then sunk by covering them with clay and coconut leaves, or buried in pits connected with the backwater by means of canals.

Retting is allowed to continue for a period of 6 - 10 months. If properly done the fibre is of a light golden colour, clean and free from dirt and other impurities. The total yield of fibre from 1265 million husks at 180 lbs. per 1000 coconuts is roughly 102,000 tons. In the whole of Travancore the best fibres are produced near Anjengo and Paravur. Retting involves some form of capital investment as it requires the retter to purchase husks at current market rates and to wait for 6 - 10 months for the retting to be completed.

In localities having no nearby backwater, the retting is done by either burying the husks in sandy soils or keeping them in small pools of water. The husks so treated for a short period only yield a type of coarse fibre with a large admixture of pith and of brown colour. This is a low grade fibre (Dept. of I. & S., *loc. cit.*, 6).

EXTRACTION OF FIBRE

After retting, the husks are removed from the pits, washed and then beaten with short wooden mallets or clubs made usually of tamarind heartwood for extracting the fibre.

During the beating, pith and other matters fly to the sides leaving the fibres behind. The coarser fibres are removed by hand, leaving the finer fibre which is utilised for spinning. Too long exposure of the husks to the sun will darken the colour of the fibres and will make fibre extraction difficult. The whole process is a laborious one. An adult woman can beat 45 husks in a day.

Generally, green husks are used for retting and subsequent extraction of fibre, but sometimes coir is made also from dry husks. After the separation of the kernels the dry husks are immersed in water for about 12 hours and then beat for the extraction of the fibre. Green husks are also sometimes treated without soaking. The fibre obtained in this way is inferior and is known in the trade as unsoaked variety.

After extraction, the fibre is cleaned and dried in the shade and allowed with poles in order to make it suitable for utilization. For this, the fibres are spread on the ground in the shade and beat and tossed up with poles. This operation helps the mixing of long and short fibres thoroughly, removes the adhering pith and makes the fibres smooth and soft. The fibre is then combed in a specially designed 'comber', which consists of a number of flat-teethed iron blades mounted on a wooden shaft set spirally and which

is revolved inside a drum-like structure by means of a handle. This operation, besides cleaning the fibre, straightens, smoothens and softens it and lays them parallel to one another.

On an average 3500-4000 husks are required to prepare one candy (candy = 672 lb.) of yarn in Travancore (Dept. I. & S. *ibid.*, 7).

FIBRE VARIETIES

Coir fibre may be of three different types; mat fibre, curled fibre and bristle fibre (Agri. Market. Rep. 137). The bulk of the fibre produced belongs to the first type; it is suitable for spinning into yarn, for manufacturing mats and matting, ropes and twines, etc. The yield of curled fibre which is prepared from unretted husk, is very low; it is short and inferior and used in mattresses, upholstery, cushions, etc. Bristle fibre which is coarse and thick is suitable for brushes and brooms; it is not prepared in India and the country's requirements of this type are obtained from Ceylon.

Most of the fibre produced on the Malabar Coast is spun into yarn, which is mostly used for export and for making mats and mattings, ropes and twines, bags, and nets. The fibre is also used for the manufacture of superior mats. For export purposes the clean fibre is hydraulically pressed into bales of 200-224 lb.

COIR YARN

Spinning of coir yarn is essentially a cottage industry, although there are several factories engaged in this work. It is produced in Travancore, Cochin and Malabar. In the cottages the workers, who are mostly women, boys and girls, spin the yarn from retted husks which they purchase, and sell them in the local market. It is spun either by hand or by means of two wheels, the latter being more prevalent. Hand spinning is generally done in Malabar. The wheel method of spinning is common in Travancore, although in a few places like Alapat, Vaikom and near-about places hand-spinning is done. Generally all the yarns are two-ply.

HAND-SPINNING AND WHEEL-SPINNING

In hand-spinning the fibre is rotated between the palms of the hands with a clockwise twist into short lengths; when a sufficient quantity has been made they are again twisted together in the opposite direction to give a strand yarn. The spun yarn is held in position by the toes while other slivers are prepared and added as required. About 4-5 lb. of yarn can be made by one worker in a single day of 8 hours. The fibre for hand-spinning does not require to be combed.

Wheel-spinning is controlled by capitalists who get the work done

by means of workers. Two wheels are used. One containing 2 spindles is fixed to the ground and the other with one spindle can be moved forward and backward. A group of 3 workers is required for the spinning—a boy or girl to turn the stationary wheel and 2 adult persons to make the 2 strands which go to make up the yarn. Each spinner taking a bunch of fibre starts from the fixed wheel and walking back delivers the fibre to form the requisite thickness of the strand whilst the stationary wheel is rotated to give the necessary twist to the strand (Sarma, *loc. cit.* 9). When a length of 50-60 ft. has been made the working of the fixed wheel is stopped, the two free ends of the strands are hooked to the single spindle of the movable wheel which is now gently rotated to give the two-strand yarn a twist in the opposite direction. As the yarn is made this wheel moves towards the fixed wheel. A triangular block of wood, grooved on the sides, is held between the strands, which regulates the counter twist, prevents knots and kinks and binds the strands very close. About 100 strands of 50 ft. each and weighing approximately 25 lb. can be produced by a group of 3 workers in one day.

Hand-spun yarn is soft and has uniformity of twist and thickness whereas wheel-spun yarn is of hard

twist and does not possess the evenness of the former type of yarn.

VARIETIES OF YARN

The quality of the yarn is judged by its length, colour, appearance, twist, scorage and strength. The coir trade broadly classifies the yarn into a number of types according to their place of manufacture. The names now are also applied to similar yarns produced elsewhere. The well-known varieties of coir yarn, produced in Travancore, Cochin and Malabar, and known to the trade are (Planel Rep., 7):—

TRAVANCORE: Anjengo superior (hard twist), Anjengo ordinary or Mangadan (hard twist), Ashtamudi (hard twist) Alapat (soft twist), Aratory (hard twist), Vycome (hard and soft twist), and Beach (soft twist).

COCHIN: Fine weaving yarn (soft twist), and Rope yarn (soft twist).

MALABAR: Beypore, Quilandy, Calicut (Fine unsoaked) and Div (from Laccadives and Maldives).

Excepting Alapat, Vycome, Beach, Beypore and Quilandy yarns all the others are hard-twisted.

The most important types of wheel-spun yarns are Anjengo, Aratory and Ashtamudi while among the hand-spun yarns, Alapat, Vycome and Beach are probably the best known. Travancore State produces the best types of yarn.

The Beach yarn which is produced from husks not properly retted, is of low grade, containing a large quantity of pith and is of a reddish brown colour. The tensile strength is also low. Cochin yarn is somewhat coarser and of inferior quality and is meant mainly for export, some superior types are also now made. The Cochin yarns are known as the rope yarn, Vycome yarn, Parur yarn and M. K. yarn (Mukhtar, A., *ibid*, 42). Their percentage production is 40-50, 20-30, 20 and 10 respectively. The first two are hand-spun. All these four grades are mainly used for making ropes, although a small quantity of Vycome yarn is also utilized in making mats and mattings. Malabar yarn is mostly hand-twisted but the proportion of wheel-spun yarn is gradually increasing.

In addition to the above-mentioned grades, other varieties which are common in Calicut and Ponnani markets are Kadalundi, Ponnani, Chowghat, Ariyalur, Kallai and Parapanangadi grades; these are all hand-spun weaving yarns. In Ceylon, coir yarn is sold in 2 grades, Kogalla and Colombo, with sub-divisions according to texture and thickness.

Superior grades are further classified according to fineness and evenness of twist, e. g. Anjengo Superior, Anjengo ordinary. These in turn may be sub-divided according to

their colour into 2 or 3 grades and distinguished by 1, 2, 3 or A, B, C. Cheaper types are sub-divided into several grades denoted by numbers, 1, 2, 3, 4, etc., according to their colour, evenness of twist and amount of pith (Agri. Marketing Rep. 140).

GRADING & PACKING

The yarn is sold to dealers who sort it according to colour, appearance and thickness, and sell it to big dealers in cylindrical bundles of 1 local maund or multiples thereof for different types of yarn. Eventually these reach the main assembling and distributing centres like Alleppey and Cochin, which are the principal production centres of mats, matting, and carpets. The exporters and manufacturers of coir goods get their supplies from these centres through commission agents, and do their own grading. Some of the exporting firms and coir goods manufacturers have their own agencies who collect yarns from the various centres, grade and reel them into hanks. For overseas export purposes the yarn is regraded and reeled into hanks of 450 yds. each weighing 2½ lbs. by the shipper and is invariably hydraulically pressed into bales of 3 cwt. each, whereas for inland markets the yarn is made into hand-made bundles. Inferior grades for export are made into dholls of 5 or 7 lbs. for acceptance as broken stowage.

USES OF COIR YARN

Coir yarn of superior quality is mainly used in the manufacture of mats and mattings. Beautiful rugs and carpets are also made from coir yarn. Inferior varieties such as yarns made from Cochin fibres are mainly used for making ropes although Vycome yarn of Cochin is partly used for the preparation of mats and mattings. Coir bags are also made from Travancore yarn and these are used in the Southern India and Ceylon tea-gardens for drying tea leaves, and also for lifting coal from mines in Bengal, Assam and Central India (Patel, J. S., Coconut, 1938, 324). During the Great War I, Travancore yarn was also utilized in the manufacture of coir beltings due to the abnormally high prices of leather beltings. Coir screenings were also supplied during the war to France for camouflouge purpose.

COIR MATS AND MATTINGS

The mat and matting industry is mainly concentrated in the Travancore State. It was introduced there in 1859-60 by the late Mr. James Darragh of Messrs. Darragh, Smail & Co., Ltd., Alleppey. He opened a small factory on the beach in Alleppey, where these were first manufactured on boards and looms with the assistance of a few trained weavers from Bengal (Report of the Board of Conciliation of Trade Disputes in the Mats and Matting Industry, Travandrum — 1939). In the beginning,

mats and mattings made at Alleppey were mainly exported to New York. The business gradually expanded to U. K. and later to Australia, New Zealand, South Africa and other places. Coir mats and matting industries now occupy the most important place among the industries of Travancore. The main reasons for their development in Travancore are availability of superior grades of yarn and imposition of duty on exports of yarn.

The industry in Travancore was mainly located in Alleppey until the close of World War I. Since then the industry has been expanding, and now almost all the villages of the Malabar coconut producing coastal area manufacture mats and mattings in cottages and small factories though the bigger factories are mainly confined to Alleppey town. In 1938, there were in Travancore altogether 249 factories in the villages and 41 in Alleppey town. (Rep. on the Board of Conciliation of Trade Disputes etc., p. 83). The total number of matting looms and mat looms were 4335 and 7350 respectively, Alleppey's share being 2374 and 2180. In December 1944 the total number of factories, large and small, increased to 360, including 46 in Alleppey town. (Dept. of I. & S., *ibid.*, 2). The smaller factories have certain advantages, *viz.* low labour and initial costs and so are able to compete with Alleppey products.

Very little mats and mattings are made in Cochin although some three decades ago she had a flourishing industry in this line. The raw material used was the superior Anjengo yarn obtained from Travancore. Subsequently Travancore imposed an export duty on this yarn with a view mainly to develop this industry in the State, and this destroyed the Cochin industry. There are at present only three small factories there. Mats and mattings are also manufactured to a very small extent in Malabar district and in Bengal jails.

WEAVING OF MATTINGS

Mats and mattings are woven on wooden handlooms similar to those used for other textiles. Power looms are not used as, due to coarseness of the fibre, very little yarn could be used in shuttles at a time which means that shuttles would require too frequent replacements. In matting machine-spun yarn is used for warp but weft used is hand-spun. For superior grades of mattings, the warp used is made of superior yarn. In Travancore for matting manufacture, Anjengo, Vycome and Aratory yarns are employed. The name of the matting is also often known by the name of the yarn and also the quality judged by the number of warps for a standard width of 36 inches.

In the hand weaving process the yarn is first wound on bobbins and

these are transferred to a creel and the warping is done between sticks or by means of a peg board. In so doing the yarn from the bobbins is passed on to the warping drum, and the requisite width of the warp is then prepared by warping the sections on a weaver's beam which is then fixed to the loom.

There are many types of matting, but the common types are the two-shaft and the four-shaft mattings. In the former the warp yarns are held in two frames which alternatively go up and down and a weft is passed between the sheds every time they move. The matting will be plain or striped according as the warp is of one colour or of different colours. Four frames for warp yarns are used for four-shaft matting in which simple repeat designs such as diamonds are produced. Very rarely jacquered cards and Dobby machines are fitted to the looms for the production of complicated designs but their use is found difficult in the wooden country looms.

Mats, mattings, rugs and carpets are made in a large variety of exquisite patterns and designs, and offer useful, damp-proof and pleasing floor coverings. The standard size of mattings is 36 inches in width and 50 yards long, but they are also made in widths of 9" or multiples up to 72" wide. Ordinarily plain and fancy mattings are rolled into 50

yards. The coloured designs on mattings are done through the use of coloured yarns whereas those in mats are done by means of stencils. Sometimes the yarn for better varieties of mats and mattings is treated with a dilute solution of sulphuric acid for improving its colour and brightness. It is thoroughly washed and dried in the shade. For despatch the rolls are wrapped in hessian cloth.

Various other products such as rugs, carpets, beltings, bags, nets, tent components etc., are also made.

WEAVING OF MATS

Brush door mats for use in the doorways are generally made from spun inferior yarn, usually Beach, but for better grades, Vycome yarn is used. Hard fibre imported from Ceylon is also used in door mats. Mats are made plain, inlaid or with designs. They are woven on a simple loom on which the warp is tightly drawn and rows of tufts for the pile are inserted simultaneously with the weaving of the weft. To quicken the process of putting tufts a slotted iron rod sufficiently long to cover the width of the warp and of the necessary diameter is used. The strand for the tuft is wound round it simultaneously passing it underneath alternate warps. Each round of the topping is with each strand of the warp wound round the rod. After the winding

is over a thin knife-edge is inserted into the slot of the rod which is held with the slot facing directly upwards and drawn along the whole length of the rod cutting the tuft strand whereby a complete row of tufts is formed. The weft is then knocked in, which forms along with the warp a firm base for the tufts. Any desired pitch of mat can be made ranging between 600 and 1200 tufts per square foot depending on the fineness or coarseness of the warp threads and tuft yarn, number of warp threads per foot of the loom roller and on the closeness of the 'beating up'. The mats are then cut correct to the lengths, and braided. They are next dried, sheared and finally trimmed, and sometimes bleached.

For inlaid mats the required design is traced on papers ruled with small squares of required size, each representing a tuft knot. Wherever the design cuts a row of tufts the winding of the tuft yarn is stopped and then a yarn of the required colour is inserted. The process which requires skill and taste, is a very slow one.

In the better kinds of plain and fancy mats, unspun coir is used for piles instead of spun yarn. Two warp beams one above the other are used. The warp on the lower beam is drawn taut on the loom and is manipulated by two heald frames

taking alternate threads. The upper beam has two weighted ropes coiled round it and is thus prevented from being given off too freely. Small sheaths of fibre are knotted around strings of the lower shed of the taut warp by hand and a weft is knocked in and the positions of the heald frames are changed. Then the lower shed of the taut warp and the loose warp of the upper beam are woven together with the weft forming a backing for the mat. Designs are woven by using sheaths of fibre of various colours. After weaving the mats are stiched and braided, sheared by machine and finally trimmed with a pair of scissors to give the pattern a good relief. Fibre mats are made in very fine and attractive designs. Mats of poor colour are bleached before packing. These products are costlier than brush door mats owing to the slow process of weaving.

Another type of mats, known as 'creel mats', are warp-piled fabrics. A loose and a tight warp is employed as in the case of fibre mats. The loose warp is carried over a slotted rod to form loops while being woven into a texture with the taut warp with the use of a weft. The loops are then cut into tufts by passing a knife through the slot facing upwards and running the entire length of the rod.

Jute floor coverings are now competing with coir products but the

latter are much superior due to their hard-wearing and damp-proof qualities. In pre-war days grass floor coverings at cheap rates used to be imported by U. S. A. from China and Japan. These were preferred there to coir products mainly due to cheapness, but under the present condition the competition is remote.

Production of manufactured and unmanufactured coir during the pre-war years was estimated as follows:—

Madras 25,038 tons, Travancore 80,000 tons, Cochin 17,000 tons, Mysore (not available) Bombay 63 tons, Bengal 225 tons (Panel Rep., *Ibid.*, 8).

The figures, are based on exports as it is difficult to obtain actual figures, it being a cottage industry. During World War II the production considerably went down owing to the closing down of the normal markets, shortage of labour and uneconomic returns. The Panel recommended a post-war target of 2,29,125 tons of manufactured and unmanufactured coir, made up as follows:—

Travancore 1,00,000 tons, Madras 1,00,000 tons, Cochin 19,000 tons, Bombay 7,500 tons, Mysore 2,400 tons and Bengal 225 tons (Panel, Rep. 10).

During the war owing to the stoppage of supplies of fibres like Manila and Sisal from the Philippines and the Dutch East Indies and the difficulties of exporting sisal from East Africa coir fibre

had to be used for various key purposes and in spite of markedly superior qualities of the former regarding handling and tensile strength,

coir played an important part in the war. The following table gives the supply of coir goods by Travancore and Cochin for war purposes.

Year	Rope		Fibre and Yarn.		Mats and Mattings.		Tentage components (Salithas large, bags of various types for packing tent poles).	
	1000 ft.	1000 Rs.	1000 tons.	1000 Rs.	1000 sq. yds.	1000 Rs.	1000 Nos.	1000 Rs.
1942	4254	29	nil	nil	nil	nil	232	1180
1943	12450	135	1.9	361	2915	2812	400	537
1944	5400	236	1.2	310	1850	1590	1800	4437
1945	2400	150	5.0	1400	1300	2000	1000	2300

These large supplies were not accompanied by any special claim on behalf of coir over Sisal or Manila. Hence soon after the war the coir industry received a set-back.

The whole of the Malabar Coast being the principal coir and coir products area, almost the entire amount of export is shipped through Alleppey, Cochin, Calicut and other

Malabar ports. Exports through other ports are negligible. Hence in the following statistics only shipments through the Malabar coast ports are given.

The following table gives the exports of coir fibre, coir yarn, coir mats and mattings from the Malabar coast:—

Exports of Coir Fibre in cwts.

	Alleppey	Cochin	Calicut	Other Malabar coast ports	Total.
Quinquennium ending					
1935-36	2,496	1,793	1,182	—	5,471
1940-41	4,833	4,182	2,449	—	10,319
1945-46	701	15,500	n. a.	—	16,201
In 1946-47	—	17,454	n. a.	—	17,454
1947-48	—	11,258	n. a.	—	11,258

Exports of Coir Yarn in cwts.

	<i>Alleppey</i>	<i>Cochin</i>	<i>Calicut</i>	<i>Other Malabar coast ports</i>	<i>Total.</i>
Quinquennium ending					
1935-36	266,122	567,726	179,563	24,691	1,038,011
1940-41	198,742	532,764	165,925	20,857	918,288
1945-46	10,354	420,056	n. a.	n. a.	430,410
In 1946-47	39,437	848,258	„	„	887,695
„ 1947-48	163,582	835,772	„	„	999,354

Exports of Coir Mats & Mattings in cwts.

	<i>Alleppey</i>	<i>Cochin</i>	<i>Calicut</i>	<i>Other Malabar coast ports</i>	<i>Total.</i>
Quinquennium ending					
1935-36	337,533	68,411	120	—	406,070
1940-41	223,447	142,267	10,363	—	446,107
1945-46	23,484	220,223	n. a.	—	243,712
In 1946-47	25,204	491,011	n. a.	—	516,215
„ 1947-48	84,486	165,988	n. a.	—	250,474

Very little coir fibre is exported. The principal importer is U. K. Out of the total shipment of 5,664 cwts. of fibre in 1937-38, she took 2,666 cwts. i. e., 47.1 per cent.

The exports of coir yarn had been fairly steady. During the period from 1928-29 to 1937-38 the figure was maintained at about 1 million cwts. On account of high import duty on coir manufactures most of the European countries generally import coir yarn. About 80 per cent of the imported yarn is used by these countries for mats and mattings and the balance for other purposes. Practically

all the European countries, the Middle East, U. S. A., Africa, Australia, and New Zealand were importing substantial quantities. Out of a total export of 9,58,493 cwts. from the Malabar ports, Germany received 1,87,650 cwts. (19.9 per cent) which is the highest. The other places with their shares in order of importance are U. K. — 1,34,820 cwts. (14.1 per cent), Holland 1,06,618 (11.1 per cent), Burma 63,902 (6.6 per cent), Belgium 56,515 (5.9 per cent), Italy 53,602 (5.6 per cent), France 44,196 (4.6 per cent) and America 31,223 (3.3 per cent). A total of 1,57,798

cwts. or 16.5 per cent was received in parts of India through Malabar Coast ports. During World War II the export declined tremendously owing to the loss of European markets, but now there is a likelihood that import of yarn will be resumed by these countries.

The first market for coir manufactures was U. S. A. Subsequently exports to U. K., Australia, European countries, New Zealand and British India also developed; but towards the end of the 19th century the industry suffered a set-back owing to stoppage of imports by other countries and most of the Travancore manufactures were marketed in North India. In 1898-99 shipment to U. S. A. and U. K. again resumed and after World War I there had been a steady increase. For example, exports of mattings from Travancore increased by about 86 per cent from 1.115 million yds. (1919-20) to 9.578 million yds. (1936-37), and that of mats by 233 per cent from 110,527 cwts. (1921-22) to 258,106 cwts. (1936-37). The main reasons for this significant development were low price of mattings as compared to other floor coverings, and improvement in colours and designs, and in the technique of manufacture.

Alleppey is the biggest export centre. In the 5 years prior to World War I she exported on an average per year 405,780 yds. of matting and

14,775 cwts. of mats. Excepting for a decrease during World War I, exports increased continuously and in 1935-36 the corresponding figures were 6,758,771 yds. and 145,193 cwts. From 1936-37 figures for mats and mattings were combined, that year recording the highest figure of 4,11,683 cwts. of mats and mattings. During World War II the port of Alleppey was almost closed for steamers and from 1942 onwards most of the shipments were through the Cochin port.

Prior to World War II, the principal markets were in order of importance, the U. K., Australia, U. S. A., Holland, New Zealand and almost all European countries, except U. S. S. R., Italy, Greece and a few others. In 1937-38 out of the total exports of 4,26,492 cwts., U. K. took 3,04,749 cwts. (71.4 per cent). Other importers were Australia, 33,122 cwts. (7.7 per cent), U. S. A. 26,003 cwts. (6.6 per cent), Holland 8,357 cwts. (1.9 per cent), New Zealand 7,988 cwts. (1.8 per cent), Africa 10,151 cwts. (2.0 per cent) and Sweden 5,258 cwts. (1.2 per cent).

During the war U. K. reduced her offtake considerably. Most of the European markets were closed. At present the U. S. A. and Canada are purchasing large quantities, but this may be a temporary phase.

PROSPECTS & FUTURE

Only about 60 per cent of the husks available in Travancore and Cochin

are at present utilized (Panel Rep. 20). Much of the husks from the interior cannot be utilized owing to the non-availability of proper retting facilities and lack of easy transport to the backwater areas. A suitable mechanical and chemical method for retting and fibre separation can solve the transport problem. A number of processes have been patented, the principal ones being known as (a) the Nanji process, (b) the Elod and Thomas process, (c) the Towell process, (d) the Van der Jagt process, and (e) the Hayer-Gratze process. None of these processes has been introduced in this country for lack of sufficient data regarding their advantages under Indian conditions. Some work has also been done at the Travancore University. However, in view of the fact that the industry is distributed over a wide area and is entirely a cottage industry benefiting a large number of families, it is doubtful if such chemical and mechanical methods will give a fillip to the industry without disrupting the existing village economy. Simple machines to be operated by hand may, however, be evolved and introduced with advantage. Any improvement in transport facilities will solve the problem to a great extent. It may be mentioned that in Bombay and Bengal only 3-4 per cent and 0.06 per cent

of available husks are at present utilized for coir manufacture.

There are a number of other improvements which according to the Panel will improve the industry. Grading is one of the most important problems. At present the absence of proper grading and standardization is standing in the way of coir being quoted in the well-organized commodity markets of importing countries and is bringing a low price return. The present method should be changed to a scientific one involving the use of the well understood grades defined by estimation of moisture and foreign matter contents. However, the Travancore Government have sponsored a Licensed Warehouse Bill with a view to grading the product and affording financial facilities for the consumer.

The coir yarn industry can be improved by co-operative effort and better marketing facilities. The mats and matting industry is well established and does not need such steps. Another improvement which the coir industry needs is the introduction of a common standard of weights throughout the coir producing areas regarding fibre and yarn. At present these are measured in candies and maunds which differ from place to place.

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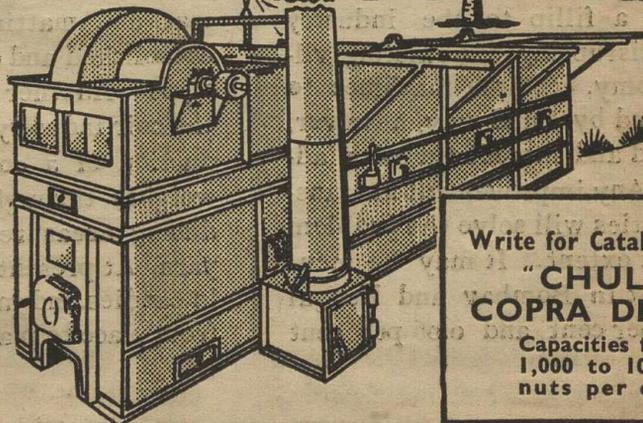
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PRESERVATION OF THE COCONUT POONAC

BY N. DESIKACHAR, M. Sc., F.R.I.C., A.I.I.Sc., A.I.Ch.E. (U. S. A.),

and

B. L. RAO, M. Sc., A. R. I. C.,

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The Tata Oil Mills Co., Ltd.,

TATAPURAM.

AS manufacturers of edible fats and soaps we are naturally interested in the problem of preservation of coconut cake which is one of the bye-products of our industry. The cake which is principally used as cattle-feed in our country would deteriorate and get infested, particularly in adverse weather conditions, before it reaches the consumer unless preserved properly. The preservation of the cake becomes increasingly difficult during the monsoonish weather on the west coast (which lasts for about 6 months) when the humidity is high and consequently the tendency for the cake to deteriorate is greater. We have, in our laboratories, made an attempt to study the different aspects of deterioration, the causes that contribute towards it and its prevention.

In the preservation of coconut cake the following aspects are to be taken into account:—

1. The tendency of the cake to become soft by the absorption of moisture.

2. The onset of rancidity.

3. Fungus growth.

4. Infestation of the cake.

Normally the cake that comes out of the expeller will have a definite percentage of moisture irrespective of seasons. One of the causes of spoilage, particularly the rancidity which occurs as a result of fungus growth is attributable to the increase in the moisture content of the cake owing to the surrounding atmospheric humidity conditions. We wanted to establish the moisture equilibrium condition of the cake under the worst humid conditions and observe its relationship to the causes of spoilage.

EXPERIMENT

With a view to study the rate of moisture absorption and also the conditions under which the deterioration sets in, samples of coconut cake with different moisture contents were exposed to the atmospheric condition when the humidity was about 95 per cent. Day to day the samples were weighed and their moisture content determined. The results are collated in the following table:—

PRESERVATION OF THE COCONUT PÖONAC

TABLE I

	Sample No. 1 % Moisture.	Sample No. 2 % Moist.	Sample No. 3 % Moist.	Sample No. 4 % Moist.	Remarks.
Start	7.42	4.82	10.64	17.4	No. 4 is soft.
1 day	10.98	9.67	12.74	17.70	
2 days	13.43	12.73	14.59	18.01	
3 "	14.02	13.91	15.08	17.56	The cakes have become soft.
4 "	14.48	14.51	15.31	17.22	
5 "	15.10	15.28	15.86	17.43	
6 "	16.25	16.56	16.61	17.55	
7 "	16.9	17.22	17.12	17.25	
8 "	17.25	17.58	17.42	—	Fungus growth in No. 4 and a sudden decrease in the weight of the cake observed.
9 "	17.42	17.72	17.45	—	
10 "	17.68	17.99	17.62	—	
11 "	17.73	18.07	—	—	Fungus growth in No. 3 and a sudden decrease in weight observed.
12 "	—	—	—	—	Fungus growth and a decrease in weight of cakes observed for No. 1 and No. 2,

We infer from the above:—

1) The moisture content of the cakes varied in such a way that at the end of about 10 days all the samples attained a moisture equilibrium with the surrounding atmosphere and recorded a moisture content of about 17 per cent. This condition which the cakes tend to attain depends primarily on the humidity of the surrounding atmosphere.

2) Samples 1, 2 and 3 became soft on the 4th day (sample 4 was soft

even at the time of starting of the experiment) when their moisture content was about 14 per cent.

3) After 10 days the growth of fungus set in resulting in a gradual decrease in the weight of samples primarily due to the breakdown of the carbohydrate and Lipoids and material loss was suffered. (An important aspect of this loss, viz., whether there is any nitrogen loss indicating thereby the destruction of the proteins will form

the subject matter of a separate investigation.)

4) With the growth of the fungus, the cake became rancid and the rancidity, as noticed by the odour, appeared to increase with aging.

5) In about 15 days infestation had set in and the samples were full of worms and insects which were identified as *Trogoderma Granaria*, popularly known as 'Khapra' beetle.

(At this stage the experiments were discontinued).

6) In all the 4 samples kept under observation, the infestation and the rancidity set in only when the moisture content of the cake was over 14 per cent.

PREVENTION OF SPOILAGE

For checking the infestation and the rancidity of the cake, the following methods suggest themselves based on the previous observations:-

1) Control of the humidity conditions.

2) Circulation of hot air through the cake to prevent the rapid absorption of moisture.

3) Fumigation of the surrounding atmosphere in the warehouse.

4) Fumigation of the cake itself with sulphur dioxide for a short duration.

5) Incorporation of chemicals such as D. D. T. and Gammexane in the cake.

Control of the humidity conditions of the warehouse and circulation of hot air through the cake are difficult to achieve as they call for large investments and hence they are not taken into consideration.

Fumigation of the enclosed space where the cake is kept, as in item No. 3, has been studied and found to be not effective in checking infestation.

Fumigation of the cake itself for any short length of time could be done easily either in batch operation or continuously. In batch operation it could be done by burning sulphur in closed chambers under the cake such that sulphur dioxide vapours pass right through the cake for the required length of time and then storing the cake in bags. The same operation could be made continuous by passing the cake from expellers either loose or in bags over a desired length of a closed chamber where sulphur is burnt.

The above experiment was done on a laboratory scale by fumigating the coconut cake with sulphur dioxide in a vessel for (1) 10 minutes, (2) 20 minutes, (3) 30 minutes and then keeping the treated samples for observation along with the fresh cake under storage conditions. The results of the experiment are tabulated as follows:—

PRESERVATION OF THE COCONUT POONAC

TABLE II

	Cake kept for observation after fumigation with sulphur dioxide for 10 minutes.	Cake kept for observation after fumigation with sulphur dioxide for 20 minutes.	Cake kept for observation after fumigation with sulphur dioxide for 30 minutes.	The cake taken as such.
I.	2.	3.	4.	5.
1st day	Fresh cake, smelling slightly of SO_2 .	Fresh cake, smelling slightly of SO_2 .	Fresh cake, smelling slightly of SO_2 .	Sweet smell of fresh cake.
4th day	Moisture 12.9% Sweet characteristic smell of the fresh cake.	Moisture 12.9% Sweet characteristic smell of the fresh cake.	Moisture 12.9% Sweet characteristic smell of the fresh cake.	Moisture 12.9% Sweet characteristic smell of the fresh cake.
10th day	do	do	do	do
13th day	do	do	do	Slightly rancid.
15th day	Slightly rancid.	do	do	Rancid.
17th day	Slightly rancid; few insects seen sticking to the sack outside. No insects in the cake.	do	do	Rancid; few insects seen sticking to the sack outside; no insects in the cake.
20th day	Slightly rancid; few insects seen sticking to the sack outside. No insects in the cake.	Sweet characteristic smell of the fresh cake.	Sweet characteristic smell of the fresh cake.	Rancid; few insects seen on the sack. Insects in the cake. Fungus growth seen in some pieces.
22nd day	Slightly rancid; insects seen sticking to the sack outside. Larvae seen in the cake. Fungus growth in a few pieces.	Sweet characteristic smell of the fresh cake. Few insects seen on the sack outside. No insects in the cake.	Sweet characteristic smell of the fresh cake. Few insects seen on the sack outside. No insects in the cake.	Rancid; insects seen on the sack outside. Larvae & insects seen in the cake. Fungus growth.
24th day	do	do	do	do
27th day	Rancid. Insects and Larvae in the cake.	Sweet characteristic smell of fresh cake. Insects and Larvae in the cake.	Sweet characteristic smell of the fresh cake. Insects and Larvae in the cake.	Rancid. Insects and Larvae in the cake.
	Moisture 14.56	Moisture 15.10	Moisture 14.8	Moisture 15.2

We would observe from these results that the causes which contribute towards the onset of rancidity seem to be different from those that bring about infestation and *they seem to operate independently of each other*. The rancidity in the C. N. cake appears to be mainly caused by the mould infection. This is checked to a considerable extent by the fumigation of the cake with sulphur dioxide. The cakes which had been fumigated for 20 minutes and 30 minutes retained their fresh and sweet odour even after 27 days, whereas the untreated cake and the one treated for 10 minutes became rancid in about 13 days. There was no mould growth in the former two samples while it did appear in the latter ones. The A. V. of the extracted oil of the samples (which is to a certain extent a measure of the rancidity) also indicated the freshness of the treated cakes as compared to the untreated ones. The infestation of the cake was also delayed to a certain extent by this treatment. The untreated cake became infested on the 20th day, whereas the two samples treated for 20 minutes and 30 minutes kept well till the 27th day.

We would infer from this experiment that sulphur dioxide fumigation could effectively check the onset of rancidity. It could also retard infestation, but not effectively check it. So we next tried the incorporation of well-known insecticides like

D. D. T. and Gammexane in the cake to see how far it would check infestation of the cake. Experiments were conducted both on the laboratory and on the plant scale incorporating D. D. T. in the recommended dosage to the cake and the samples observed for their resistance to infestation. The results were not encouraging although to some extent D. D. T. did retard the onset of infestation.

We do not think that D. D. T. would be of any great help in preventing the infestation of coconut oil cake because of the difficulties involved in working it into the cake. For obvious reasons, it cannot be incorporated along with the copra meal at the beginning of the crushing operation. It can neither be incorporated into the cake later on by taking recourse to powdering the cake since in this powdery form it is not easily saleable as the market does not take to it kindly and even if it did, the cake will have to bear an extra cost for which the consumers may not be prepared.

Gammexane also suffers from the same disadvantage, but it could serve as a fumigant just like So_2 . Hence the fumigation of the cake itself with Gammexane appeals to us as being worthwhile trying. No doubt, Gammexane is a reputed insecticide, but we do not know how far it is a fungicide. The experiment which we propose carrying out

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shortly will test it out. We will also try fumigation with So_2 in conjunction with Gammexane since we have already proved that the latter is a good fungicide and the spoilage of the cake lies both in the direction of its becoming rancid and getting infested.

COMPARISON OF THE KEEPING QUALITIES OF GHANI CAKE AND EXPELLER CAKE

There is a popular belief in the minds of many a farmer that the ghani cake is superior to the expeller cake. As a matter of fact on account of the high oil content of the ghani cake, it is more susceptible

to rancidity than the expeller cake. To investigate this we kept for observation two fresh samples of ghani and expeller cake having the following constants for oil and moisture:—

	Ghani Cake (Power driven)	Expeller Cake
1) Oil	10.86%	10.10%
2) Moisture	11.10%	10.82%

The samples were kept for observation both in an exposed condition and in gunny bags in our godown. Periodically they were examined for rancidity, infestation and moisture content. The data are collated in table III.

TABLE III

	Ghanicake kept exposed in the godown.	Expeller cake kept exposed in the godown.	Ghanicake kept in a sack in the godown under storage condi- tions.	Expeller cake kept in a sack in the godown under storage conditions.
	1	2	3	4
1st day	Moisture = 11.10 per cent S. C. S. C.	Moisture = 10.82 per cent S. C. S. C.	Moisture = 11.10 per cent S. C. S. C.	Moisture = 10.82 per cent S. C. S. C.
5th ,,	Moisture = 13.06 per cent S. C. S. C.	Moisture = 14.22 per cent S. C. S. C.	Moisture = 12.90 per cent S. C. S. C.	Moisture = 12.86 per cent S. C. S. C.
10th ,,	Moisture = 13.62 per cent S. C. S. C. S. S.	Moisture = 14.34 per cent S. C. S. C. S. S.	Moisture = 13.26 per cent S. C. S. C. S. S.	Moisture = 13.13 per cent S. C. S. C. S. S.
	Small brown insects were seen.		Few insects were seen stick- ing to the sack outside.	
20th ,,	Moisture = 14.52 per cent S. C. S. C. S. S.	Moisture = 14.53 per cent S. S. S. C. S. S.	Moisture = 13.49 per cent S. C. S. C. S. S.	Moisture = 13.28 per cent S. C. S. C. S. S.
	Few insects were seen.		Few insects seen sticking to the sack out- side.	A few insects seen sticking to the sack out- side.

TABLE III (continued)

	1	2	3	4
33rd ,,	Moisture = 15.08 per cent S. C. S. C. S. S. Few insects were seen.	Moisture = 14.76 per cent S. C. S. C. S. S. Few insects were seen.	Moisture = 13.92 per cent S. C. S. C. S. S. Few black in- sects seen.	Moisture = 14.27 per cent S. C. S. C. S. S. Few black in- sects.
43rd ,,	Moisture = 15.2 per cent S. C. S. C. S. S. Completely in- fested with in- sects.	Moisture = 14.54 per cent S. C. S. C. S. S. Infested with insects.	Moisture = 13.90 per cent S. C. S. C. S. S. Completely in- fested with in- sects.	Moisture = 13.80 per cent S. C. S. C. S. S. A few insects seen.

S. C. S. C. = Sweet characteristic smell of the fresh cake.

S. S. = Slightly soft.

We observe from this table:—

(1) There is a steady increase in the moisture content of both, but there is not much of a difference in the rate of moisture absorption of the two cakes.

(2) Ghani cake kept exposed in the godown was found to contain a few insects at the end of 10 days whereas expeller cake was free from it for about a month.

(3) Ghani cake kept in the gunny bags in the godown was found to contain a few insects on the 33rd day and became completely infested in about 43 days. Infestation in the expeller cake kept under similar conditions, set in about 40 days.

(4) On account of the dry climate prevailing at the time of experiment, both the ghani and expeller cake did not turn rancid even after

43 days and there was no fungus growth in them.

With a view to study this aspect, we tested the samples in artificially created humid conditions prevailing during monsoon. Both the samples were subjected to 100 per cent humid conditions. Ghani cake became rancid very soon in a few days and had thick fungus growth whereas expeller cake was comparatively fresh. These experiments warrant us to say that even when the oil and moisture contents of ghani and expeller cakes are almost same, the ghani cake is not superior to the expeller cake with respect to its keeping properties.

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(Continued from page 144)

yield. It may also be necessary to dig up the land and heap the soil into mounds after the first monsoon rains and level them up again before summer. These operations are attended to every year by good cultivators. In some of the gardens, basins are opened around the trees in the month of May or June, before the commencement of the south-west monsoon rains. Manure is applied in the basins and they are covered up after the monsoon. The ploughing of lands, common in parts of Trichur taluk, is found to be cheaper than the method of digging up the land and heaping the soil and spreading it out afterwards practised more generally in Cochin-Kanayanur and Cranganore taluks. But digging is said to be more thorough and effective than ploughing. In coconut plantations in Cochin-Kanayanur and Cranganore taluks catch crops are not generally grown. They are grown in some Villages in Trichur Taluk also.

The annual expenditure under this head in 1940 was lowest in Anthicad, namely, Rs. 3/- per acre and highest at Narakal, namely, Rs. 13/3/-. In 1945 and 1948 it varied from Rs. 16/- in Anthicad and Thianiam to Rs. 36/- in Chellanam and Chennamangalam. The annual average expenditure in the State under this head was of the order of Rs. 8/11/- in 1940, Rs. 25/6/- in 1945 and Rs. 26/8/- in

1948. It is seen that the expenditure under cultivation in 1948 had increased three times the amount incurred in 1940. The increase was primarily due to the increase in the wages of the labourers. Enquiries showed that the daily wage of an ordinary labourer of eight annas in 1940 had increased to more than a rupee and a half in 1948.

2) *Manuring.* Backwater silt is the manure more commonly applied in plantations located near the backwaters in the State. Usually the silt is applied at the rate of 5 basketfuls to a tree when the palms come up to the bearing stage. Whenever prawn dust is available cheap, silt and prawn dust are applied to the trees in alternate years. Prawn dust is not, however, generally used as it is not always available and is expensive. Farm yard manure and wood ash are used in some of the gardens as manure. In Cranganore, Anthicad, Manalur and other neighbouring villages it is usual to apply them at the rate of three to four baskets of farm yard manure and two to three tins of wood ash to a tree. In some of the plantations situated near the backwaters and rivers subject to occasional flooding which leaves behind enough silt, no expenses are incurred for the purchase of manure. The expenditure under this head in such cases would be rather low. It is, however, usual to apply river sand

to such gardens at the rate of two to five basketfuls per tree in order to improve the soil texture and facilitate proper drainage round the trees. The annual cost of manuring in 1940, 1945 and 1948 varied from Rs. 7/8/- per acre in Manalur and Anthicad to Rs. 20/- in Chellanam and Azhicode; from Rs. 25/- in Chennamangalam to Rs. 80/- in Azhicode and from Rs. 30/- in Chennamangalam to Rs. 80/- in Azhicode respectively, the corresponding annual averages being Rs. 13/9/-; Rs. 46/13/- and Rs. 58/12/-.

3) *Cleaning tanks and canals.* Even after the coconut trees commence bearing, cultivators arrange to clean the tanks and canals existing in their gardens and apply the silt to the trees as manure. The annual cost of cleaning these canals and tanks varied from Rs. 6/- per acre in Cranganore to Rs. 10/- in Azhicode in 1940, from Rs. 22/- in Narakkal to Rs. 30/- in Cranganore and Azhikode in the year 1945 and from Rs. 22/- in Narakkal to Rs. 38/- in Cranganore in 1948. No expenditure under this head has been indicated in the case of Anthicad, Manalur and Thianiam as the tanks were also used in those areas for supplying water for domestic purposes and for growing catch crops.

4) *Harvesting and collection of nuts.* In Cochin State nuts are harvested six to twelve times a year. It is

done every month in well-maintained gardens and about six times a year in plantations with laterite soil; the more general practice being eight to nine times a year. The harvesting of nuts is undertaken by professional tree climbers who have certain fixed rates for doing the work. In 1948 they charged Re. 1/6/- to Rs. 2/- plus 6 to 10 nuts for harvesting 100 trees. The annual cost of harvesting trees in an acre varied from Rs. 6/- in Manalur, Thianiam and Chellanam to Rs. 12/- in Narakkal and Chennamangalam in 1940; from Rs. 16/- in Anthicad to Rs. 36/- in Chennamangalam and Thianiam in 1945, and from Rs. 22/- in Cheranallur to Rs. 40/- in Narakkal and Chennamangalam in 1948; the average for the State being Rs. 8/- in 1940, Rs. 27/- in 1945 and Rs. 29/13/- in 1948.

OTHER ITEMS

Of the other items of expenditure mention may be made of the expenditure incurred for controlling pests and for supporting and binding heavy bunches with pegs and ropes. Expenditure on this account was Rs. 3/- per acre of trees in 1940 and varied from Rs. 12/- in Narakkal, Azhicode and Chennamangalam to Rs. 15/- in Chellanam in 1945 and from Rs. 12/- in Chellanam and Azhicode to Rs. 15/- in Narakkal, Chennamangalam and Kumbalangi in 1948. In five of the villages considered, no expenditure was incurred under this head.

LAND TAX

Land tax was charged at Rs. 13/2/- per acre of coconut garden.

TOTAL COST OF MAINTENANCE PER ACRE

The total cost of maintenance of an acre of coconut garden varied from Rs. 31/2/- in Anthicad to Rs. 64/2/- in Narakkal in 1940, from Rs. 87/2/- in Manalur to Rs. 199/2/- in Azhicode in 1945 and from Rs. 105/2/- in Anthicad to Rs. 201/2/- in Azhicode in 1948. The average annual cost of maintenance per acre was Rs. 48/9/-, Rs. 132/1/- and Rs. 153/1/- in 1940, 1945 and 1948 respectively. The cost of the maintenance in 1945 was about 272 per cent and in 1948 315 per cent of that in 1940.

COST PER THOUSAND NUTS

The cost of bringing up to bearing an acre of coconut garden and the annual cost of maintenance per acre in 1940, 1945 and 1948 in some of the

representative coconut growing areas in Cochin State have been indicated above. The aim of these statistics is, naturally, to determine the cost of production of a definite quantity of the produce in order to relate it to the prices obtained. Most of the cultivators dispose of their produce from the coconut gardens as nuts and the prices are generally fixed on the basis of 1000 nuts. It may, therefore, be advisable to reduce the cost of cultivation in terms of 1000 nuts. Statements Nos. IV to VI indicate the total investments made during the period of bringing the palms up to bearing including interest, share of the investment which should be adjusted against the annual income, annual maintenance charges, and net cost per 1000 nuts. In working out the above figures the following considerations have been taken into account. As an investment on a coconut plantation is a wasting asset, the owner has to recover the entire investment plus a fair rate of interest usually 6 per cent, during the yielding period of the plantation. The yielding period is taken as 60 to 80 years for inland areas and 50 years for backwater and reclamation areas. The total investment during the period of bringing the trees up to bearing stage, namely, about ten years in the inland areas and eight years in the backwater and reclamation areas, and the compound interest thereon have been reduced to an annuity bearing 6 per cent interest. This annuity has been added to the annual maintenance charges to arrive at the total annual cost per acre. The income from sale of cudjan leaves is then deducted from this total annual cost to obtain the net cost of production of coconuts. This net cost is



then divided by the average annual production of nuts per acre to arrive at the cost of production per 1000 nuts. On the basis of the average annual yield of coconuts in the areas in which investigations have been conducted, it has been estimated that the average annual yield per acre is 3,200 nuts. The cost of production of 1000 nuts in 1940 ranged from Rs. 25/14/- in Chennamangalam to Rs. 42/5/- in Cranganore; in 1945 from Rs. 49/4/- in Manalur to Rs. 88/- in Cranganore and in 1948 from Rs. 60/3/- in Chennamangalam to Rs. 110/13/- in Cranganore; the average cost being Rs. 31/3/- in 1940, Rs. 69/- in 1945 and Rs. 80/0/- in 1948 respectively. The annual average wholesale prices of 1000 unhusked coconuts in 1940, 1945 and 1948 were, however, Rs. 26/4/-, Rs. 103/9/- and Rs. 137/9/- respectively. Besides nuts and cudjan leaves the growers obtain petiole, spathes and catch crops from the coconut gardens, which need not be taken into account in view of the fact that no allowance has been made in our calculations for the services of the family members etc. in raising and maintaining coconut plantations.

CONCLUSION

It will be seen from the above that while in 1940 the cost of cultivation was Rs. 31/3/- per 1000 nuts, their average annual price was Rs. 26/4/-. These figures bear testimony to the general complaint before World War II that in the years preceding the War the coconut prices were low and that cultivation of coconut was unremunerative. The fall in price was due mainly to the general drop in prices of agricultural commodities, rivalry from competing oils like groundnut oil, whale oil, oil palm

nuts, the progress made in the cultivation of coconut in tropical islands and dumping into the country of cheap coconut and coconut oil produced at economic prices in large scale plantations in Ceylon employing scientific methods of production. Since 1941, however, as a result of the occupation by the enemy of some of the coconut producing countries, there has been an acute shortage in the supply of copra and coconut oil which has contributed to a steady rise in price of coconuts. Thus in 1945 and 1948 while the cost of cultivation of 1000 nuts was of the order of Rs. 69/- and Rs. 80/10/-, the prices (per 1000 nuts) were as much as Rs. 103/9/- and Rs. 137/9/- respectively. In other words, while in 1945 and 1948 the cost of cultivation increased to 222 per cent and 259 per cent of the 1940 figure, prices in the corresponding year increased to 395 per cent and 524 per cent of that in 1940. We may, therefore, conclude that the coconut growers have in recent years been obtaining good prices, even after making allowances for the general rise in the level of prices of agricultural commodities, high cost of labour, etc., and have been getting compensation for the fairly long period of depression and falling prices prior to World War II. The general shortage of oil in the world, increase in the demand for oil due to industrialisation of the country, particularly in respect of soap production, etc., have been the contributing factors to this happy state of affairs. It is hoped that the cultivators would avail of this opportunity properly for rehabilitating the industry so that the country may be independent and self-sufficient in the matter of its supplies of coconut and coconut products.

STATEMENT No. I.

Cost of cultivation of coconuts in an acre of coconut garden in certain villages
in Cochin State during 1940.

Items of Expenditure	Chellanom		Narakal		Azhi-kode		Chennamangalam		Kumbalangi		Cherannallur		Cranganur		Anthicad		Manalur		Thaniam		Average			
	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.		
A. Cost of bringing up to bearing																								
1. Cost of land	380	0	380	0	350	0	350	0	400	0	330	0	400	0	350	0	330	0	300	0	367	0		
2. Land Tax	52	8	52	8	52	8	52	8	65	10	65	10	65	10	65	10	65	10	65	10	60	6		
3. Cost of seedlings	10	0	7	8	10	0	10	0	7	8	7	8	9	6	7	8	7	8	7	8	8	7		
4. Digging pits & planting (including manuring)	4	0	2	4	3	12	1	10	2	10	3	0	3	4	2	8	5	8	3	2	3	2		
5. Fencing	10	0			10	0							6	8	7	8	7	8	4	0	4	9		
6. Watering					45	0	10	0	15	0	18	0	15	0	30	0	39	0	27	0	19	14		
7. Cultivation	71	4	63	0	51	4	75	0	56	0	60	0	72	0	23	2	50	0	34	8	55	10		
8. Manuring	110	0	105	0	67	8	49	0	66	12	90	0	93	12	67	8	67	8	123	12	84	0		
9. Cleaning canals or tanks	56	0	69	6	57	8			29	4	10	0	42	0							26	6		
10. Cost of levelling up, &c.	58	0	36	0			11	4									24	0			12	15		
Total (A)	751	12	715	10	647	8	559	6	642	12	634	2	707	8	553	12	646	10	565	8	642	5		
B. Cost of Maintenance																								
1. Cultivation	12	0	13	8	10	0	12	0	8	0	8	0	8	0	3	0	7	8	5	0	8	11		
2. Manuring	20	0	15	0	20	0	10	0	15	0	11	4	14	1	7	8	7	8	15	0	13	9		
3. Cleaning canals or tanks	8	0	7	8	10	0			9	0			6	0							4	0		
4. Harvesting and collecting	6	0	12	0	8	0	12	0	9	0	7	0	6	8	7	8	6	0	6	0	8	0		
5. Others	3	0	3	0			3	0	3	0											1	3		
6. Tax	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2		
Total (B)	62	2	64	2	61	2	50	2	57	2	39	6	47	11	31	2	34	2	39	2	48	9		

STATEMENT No. II.

Cost of cultivation of Coconuts in an acre of coconut garden in certain villages in Cochin State in 1945.

Items of Expenditure	Chellanom		Narakal		Azhi-kode		Chennamangalam		Kumbalangi		Cherannellur		Cranganur		Anthicad		Manalur		Thianiam		Average			
	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.		
A. Cost of bringing up to bearing																								
1. Cost of Land	600	0	600	0	750	0	750	0	750	0	800	0	750	0	700	0	500	0	750	0	695	0		
2. Land tax	52	8	52	8	52	8	52	8	65	10	65	10	65	10	65	10	65	10	65	10	60	6		
3. Cost of seedlings	30	0	15	0	15	0	15	0	11	4	7	8	9	6	11	4	7	8	11	4	13	5		
4. Digging pits, planting (including manuring)	11	8	4	8	8	10	3	8	4	15	3	0	4	4	2	10	7	12	3	6	5	6		
5. Fencing	40	0			10	0							9	6	7	8	7	8	5	10	8	0		
6. Watering					75	0	15	0	18	0	30	0	30	0	40	8	45	0	37	8	29	2		
7. Cultivation	144	0	100	8	140	0	120	0	98	0	98	0	104	0	57	0	80	0	90	8	103	3		
8. Manuring	220	0	205	0	252	8	67	0	115	8	150	0	135	0	120	0	120	0	202	8	158	12		
9. Cleaning tanks or canals	102	0	118	2	147	8			90	0	40	0	90	0										
10. Cost of levelling up etc.	200	0	145	0			47	8													58	12		
Total A.	1400	0	1240	10	1451	2	1070	8	1153	5	1194	2	1197	10	1004	8	864	6	1166	6	1174	4		
B. Cost of maintenance																								
1. Cultivation	36	0	24	0	30	0	36	0	24	0	24	0	24	0	16	0	24	0	16	0	25	6		
2. Manuring	40	0	60	0	80	0	25	0	42	8	56	0	45	0	45	0	30	0	45	0	46	13		
3. Cleaning canals or tanks	24	0	22	0	30	0			27	0			30	0							13	4		
4. Harvesting and collecting	27	0	35	0	34	0	36	0	24	0	18	0	24	0	16	0	20	0	36	0	27	0		
5. Others	15	0	12	0	12	0	12	0	14	0											6	8		
6. Tax	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2		
Total B.	155	2	166	2	199	2	122	2	144	10	111	2	136	2	90	2	87	2	110	2	132	1		

STATEMENT No. III

Cost of cultivation of coconuts in an acre of coconut garden in certain villages in Cochin State in 1948.

Items of Expenditure	Chellanom		Narakkal		Azhi-kode		Chennamangalam		Kumbalangi		Cherannellur		Cranganur		Anthicad		Manalur		Thaniam		Average		
	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	
A. Cost of bringing up to bearing per acre																							
1. Cost of Inad	75	0	75	0	80	0	75	0	75	0	80	0	75	0	70	0	70	0	75	0	75	0	
2. Land tax	52	8	52	8	52	8	52	8	65	10	65	10	65	10	65	10	65	10	65	10	60	6	
3. Cost of seedlings	40	0	30	0	20	0	15	0	15	0	15	0	9	6	11	4	7	8	15	0	17	13	
4. Digging pits, planting (Including manuring when planting)	12	0	4	8	12	0	5	8	4	12	3	3	6	3	2	14	8	12	3	14	6	6	
5. Fencing	60	0			15	0							9	6	7	8	7	8	7	8	10	11	
6. Watering					100	0	15	0	30	0	30	0	45	0	45	0	45	0	40	8	35	0	
7. Cultivation	174	0	189	0	170	0	192	0	152	0	152	0	152	0	93	0	128	0	113	8	151	8	
8. Manuring	245	0	262	8	330	0	105	0	215	8	210	0	242	13	225	0	180	0	213	12	222	14	
9. Cleaning canals or tanks	124	0	157	8	180	0			72	0	40	0	166	8								74	0
10. Cost of levelling up & c.	200	0	140	0	90	0	57	0									31	0			51	12	
Total	1657	8	1586	0	1769	8	1192	0	1304	14	1315	13	1446	14	1150	4	1173	6	1209	12	1380	6	
B. Cost of Maintenance per acre																							
1. Cultivation	36	0	27	0	30	0	36	0	32	0	24	0	24	0	16	0	24	0	16	0	26	8	
2. Manuring	60	0	60	0	80	0	30	0	65	0	52	8	70	0	50	0	60	0	60	0	58	12	
3. Cleaning canals or tanks	24	0	22	0	30	0			36	0	30	0	38	0								18	0
4. Harvesting and collecting	27	0	40	0	36	0	40	0	28	0	22	0	24	0	26	0	24	0	31	8	29	13	
5. Others	12	0	15	0	12	0	15	0	15	0												6	14
6. Tax	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	13	2	
Total	172	2	177	2	201	2	134	2	189	2	141	10	169	2	105	2	121	2	120	10	153	1	

STATEMENT No. IV.

Statement showing the cost of production of 1000 coconuts in certain villages in Cochin State during 1940.

Items	Chella-	Narak-	Azhi-	Chenna-	Kumba-	Chera-	Cranga-	Anthi-	Mana-	Thianiam	Average	
	nom Rs. As.	kal Rs. As.	kode Rs. As.	mangalam Rs. As.	langi Rs. As.	nallur Rs. As.	nur Rs. As.	cad Rs. As.	lur Rs. As.	Rs. As.	Rs. As.	Rs. As.
Investment during the period of bringing up to bearing in an acre.	751 12	715 10	647 8	559 6	642 12	634 2	707 8	553 12	646 10	565 8		
Compound interest on investment at 6%	340 12	329 4	306 0	269 2	402 15	394 1	421 11	366 9	412 3	340 5		
Total investment —	1092 8	1044 14	953 8	828 8	1045 11	1028 3	1129 3	920 5	1058 13	905 13		
Share of total investment to be adjusted against annual income.	69 4	66 4	60 8	52 9	63 4	62 4	68 5	55 12	64 0	54 13		
Annual maintenance charges.	62 2	64 2	61 2	50 2	57 2	39 6	47 11	31 2	34 2	39 2		
Total costs per year per acre	131 6	130 6	121 10	102 11	120 6	101 10	116 0	86 14	98 2	93 15		
Income from leaves	15 0	8 0	12 0	12 0	8 0	15 0	10 0	15 0	15 0	18 12		
Net cost of production of nuts per acre per year.	116 6	122 6	109 10	90 11	112 6	86 10	106 0	71 14	83 2	75 3		
Average number of nuts per acre per year.	Nos. 4000	Nos. 4500	Nos. 4000	Nos. 3500	Nos. 3500	Nos. 2500	Nos. 2500	Nos. 2000	Nos. 3000	Nos. 2500		
Cost of production of 1000 nuts.	29 1	27 3	27 6	25 14	32 1	34 8	42 5	35 15	27 12	30 0	31 3	

STATEMENT No. V.

Statement showing cost of production of 1000 coconuts in certain villages
in Cochin State during 1945.

Item	Chella- nom	Narak- kal	Azhi- kode	Chenna- mangalam	Kumba- langi	Chera- nallur	Cranga- nur	Anthi- kad	Manalur	Thaniam	Average
	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
Investment during period of bringing up to bearing in an acre	1400 0	1240 10	1451 2	1070 8	1153 5	1194 2	1197 10	1004 8	864 6	1166 6	
Compound interest on investment at 6%	619 7	539 1	630 9	528 15	734 12	763 10	739 8	678 6	534 4	742 9	
Total investment	2019 7	1779 11	2081 11	1599 7	1888 1	1957 12	1937 2	1682 14	1398 10	1908 15	
Share of total invest- ments to be adjust- ed against annual income	128 1	112 14	132 0	101 8	114 6	118 8	120 0	101 14	84 11	115 8	
Annual maintenance charges	155 2	166 2	199 2	122 2	144 10	111 2	136 2	90 2	87 2	110 2	
Total costs per year per acre	283 3	279 0	331 2	223 10	259 0	229 10	256 2	192 0	171 13	225 10	
Income from sale of leaves	31 4	32 0	44 0	28 0	24 0	28 0	36 0	30 0	24 0	28 0	
Net cost of produc- tion of nuts per acre	251 15	247 0	287 2	195 10	235 0	201 10	220 2	162 0	147 13	197 10	
Average production of nuts per acre per year	Nos. 4000	Nos. 4500	Nos. 4000	Nos. 3500	Nos. 3500	Nos. 2500	Nos. 2500	Nos. 2000	Nos. 3000	Nos. 2500	
Cost of production of 1000 nuts	63 0	54 14	71 12	55 14	67 2	80 10	88 0	81 0	49 4	79 0	69 0

STATEMENT No. VI

Statement showing the cost of production of 1000 coconuts in certain villages in Cochin State during 1948.

Item	Chellanom Rs. As.	Narakal Rs. As.	Azhikode Rs. As.	Chennamangalam Rs. As.	Kumbalangi Rs. As.	Cherannallur Rs. As.	Cranganore Rs. As.	Anthikad Rs. As.	Manalur Rs. As.	Thaniam Rs. As.	Average Rs. As.
Investment during period of bringing up to bearing in an acre	1657 8	1586 0	1769 8	1192 0	1304 14	1315 13	1446 14	1150 4	1173 6	1209 12	
Compound interest on investment at 6 %	740 15	690 9	784 7	568 9	778 0	817 14	806 14	703 4	719 2	762 6	
Total investment	2398 7	2276 9	2553 15	1760 9	2082 14	2133 11	2253 12	1853 8	1892 8	1972 2	
Share of the total investment to be adjusted against annual income.	152 3	144 6	162 9	111 11	126 1	129 3	136 8	112 12	114 12	119 8	
Annual maintenance charges	172 2	177 2	201 2	134 2	189 2	141 10	169 2	105 2	121 2	120 10	
Total costs per year per acre	324 5	321 8	363 11	245 13	315 3	270 13	305 10	217 14	235 14	240 2	
Income from sale of leaves	40 0	50 0	50 0	35 0	24 0	30 0	28 0	28 0	30 0	31 8	
Net cost of production of nuts per acre	284 5	271 8	313 11	210 13	291 3	240 13	277 10	189 14	205 14	208 10	
Average production of nuts per acre per year	Nos. 4000	Nos. 4500	Nos. 4000	Nos. 3500	Nos. 3500	Nos. 2500	Nos. 2500	Nos. 2000	Nos. 3000	Nos. 2500	
Cost of production of 1000 nuts	71 1	60 5	78 7	60 3	83 2	96 5	110 13	94 15	68 10	83 3	80 11

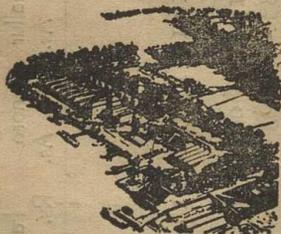


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