

STUDY ON CASHEWNUT IN INDIA

COMMITTEE ON NATURAL RESOURCES
Planning Commission
NEW DELHI

FOREWORD

The Indian cashewnut industry provides employment to several lakhs of people and makes a valuable contribution to our export earnings. It has expanded in recent years, but as this study conducted by the Committee on Natural Resources points out, India has the potential of a much larger increase in production of cashewnut. This increase will enable it to expand exports and also to make fruitful use of land in several areas of South India. The Committee has recommended a rapid survey of areas suitable for cashew plantation and a phased programme of plantation during the Fourth Five Year Plan. I do hope that this and other recommendations of the study will be found useful by all concerned with development of the cashewnut industry.

April 7, 1964

M. S. THACKER,
Member (N.R.).

STUDY ON CASHEWNUT IN INDIA

Preface

Cashewnut is an important commercial crop of India and an earner of valuable foreign exchange. Production and export trade of the crop have possibilities of considerable expansion because the plant can grow extensively in South India on areas of poor, sandy soil and hilly terrain and can even be used for soil conservation. The by-products like cashew apple have profitable uses in industry.

This study describes the various aspects of production and trade in the crop and gives a review of the research and development programmes undertaken in recent years. It is concerned especially with analysing the possibilities of increasing production through plantations in suitable areas, and other measures. Preparation of first draft of the study was entrusted to Shri T. S. Krishnamurti, Chief Development and Liaison Officer, Coconut, Arecanut, Spices & Cashewnut, Ministry of Food & Agriculture. The draft report was considered at a meeting of the Study Team on Cashewnut on the 5th to 9th February, 1964. Valuable contributions were made by the members of the Study Team in revising the draft. The revised report was considered at a meeting held on 6-4-1964 under the Chairmanship of Prof. M. S. Thacker.

The Indian Central Cashewnut Committee have given valuable assistance in preparation of the Study. I am thankful to the Committee and to all members of the Study Team for their cooperation.

New Delhi,
April 7, 1964.

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STUDY ON CASHEWNUT IN INDIA

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CHAPTER I

HISTORY, USES, CLIMATE, SOIL AND VARIETIES

The cashewnut tree was introduced in India from Brazil by the Portuguese. About 1560, Christopher da Costa recorded the presence of some trees in Cochin on Malabar Coast. It was introduced for covering bare hills in Goa. Primarily cultivated for the purpose of checking soil erosion, it gained commercial importance in 1920 when the first shipment of 10,160 metric tonnes of kernels was sent to U.S.A. The tree is mainly grown for the fruit, known as cashewnut, commercially important for its kernel and shell oil. The kernel is a rich source of protein, fats and vitamins. The roasted kernels are consumed as such or are used as an ingredient in confectionery and sweet dishes. There is a growing demand for salted kernels in recent years. In India, restaurants, coffee houses, hotels and clubs generally sell cashew in the form of salted or sugared and fried kernels.

Export trade in Indian cashew kernels has developed during the last 25 years and at present these are exported to the U.S.A., U.K., Italy, U.S.S.R. and other countries. The oil obtained from the shell, termed cashew shell liquid, is used as a water-proofing agent and as a preservative in the painting of boats, fishing nets and light woodwork. It is also used in the manufacture of insulating varnishes, industrial flooring, tiles and acid-proof cold setting cements, typewriter rolls, automobile brake linings and in the preparation of cement and adhesive ingredient pigments used in gums, inks, oil cloth, paints, varnishes, water-proof paper etc. Addition of 5 per cent of the oil to kerosene or high speed diesel oil has been found to be effective in anti-mosquito measures.

The cashew apple, which is in reality the enlarged fleshy, pear-shaped, fruit stalk that bears at its distal end, the fruit proper or the nut, forms another important product of the cashew tree. The apple is juicy with a slightly fibrous pulp. When ripe it is sweet, but when it is in an immature condition, it is highly acrid and acidic. The cashew apple is a rich source of vitamin C and also contains carotene. The juice can be made into a delicious syrup. It can be fermented and made into brandy. A variety of edible products such as fruit candy, canned cashew apple and jams have also been successfully made from the cashew apple after removing the astringent and acrid principles in the pulp.

The roasted outer shells of the nuts are generally used as fuel in cashewnut processing factories. The peelings from the kernel, after drying, are used as poultry feed. The tree yields a pale yellow to reddish gum known as 'cashew gum', which is used in book-binding. It also possesses insecticidal properties.

In South India, the cashew wood is commonly used for fuel purposes and also forms an ideal wind-break.

Climate:

Cashew is a tropical tree and comes under the group of crops which do not favour intense cold and frost. In low temperature, the trees show distress symptoms in the form of restricted growth, construction of inter-

nodes, sparse vegetative development, pinkish colouration, shrivelling of leaves, etc. Unusually high temperature also affects it adversely. Altitude is also a limiting factor, and the maximum altitude at which this plant has been profitably developed in South India is about 750 metres. Cultivation of cashew is concentrated on the West and East coasts of Peninsular India, in the States of Kerala, Madras, Mysore and Andhra Pradesh and the coastal districts of Maharashtra. It is also being grown in certain areas of Orissa, West Bengal and Assam.

The cashew tree can tolerate a variety of rainfall conditions. Thus it thrives in the sandy areas receiving only 60 to 75 cm. of rain in a year, as well as on hill slopes with rainfall amounting to more than 375 cm. But too much rain has often been found to affect the fruiting of the trees adversely. From practical experience, it has been found that coastal areas with a tropical climate and with rainfall between 125 cm. and 250 cm. provide the most favourable conditions for the tree. The rainfall should moreover be highly dependable. The most productive areas of cashew are confined to the tropical humid coasts not only in India, but also in Africa and S. America.

Soil:

The cashew tree does well in rich alluvial soils, sandy coastal soils and deep red loams, and grows even on hard lateritic soils. However, sandy soils and red laterites are in general preferred. On the other hand, it abhors clays and alkaline soils. These tendencies have led to concentration of the crop in areas of poor sandy soils on which no other crop can be grown.

Varieties:

The cashew plant which is botanically known as *Anacardium occidentale* belongs to the genus *Anacardium* of the family *Anacardiaceae* to which the mango tree also belongs. Though the tree exhibits large variations in economic characters such as yield, size of nut, kernel content, colour, size and shape of the apple etc., no systematic study of its varieties has been made so far. Classifications, based on some of the external features, have been attempted; but the occurrence of several intermediate forms renders any attempt at a rigorous classification infructuous. This subject still remains one for detailed investigation. A broad classification has been made on the basis of colour of the apple, and three categories viz. red, yellow, and mixture of red and yellow, have been distinguished.

CHAPTER II

CULTIVATION

Cashewnut is generally grown in small holdings on poor sandy lands, which are unsuitable for growing other crops. Usually, it is grown in the compounds of houses along with other trees like mango, coconut, arecanut etc. However, in recent years, growing of this crop in a systematic manner on plantation scale, has also been taken up.

The common practice of raising this crop is propagation through seed, sown *in situ*. When grown on plantation scale, small pits, .5×.5×.5 metres are dug in advance of the monsoon season, and allowed to weather for about a month. Burnt earth and ash are applied as manure. The spacing between plants ranges from 6 to 9 metres. With the first shower of the monsoon in June-July, the seeds are sown at the rate of 2 or 3 per pit. The seed germinates in about 20 days. Protection should be provided for the seedlings to prevent damage by stray animals. At the end of two months, surplus seedlings are removed, leaving only one in each pit. Care is taken to retain ultimately about 150 to 200 plants in an hectare.

In the cashew regions of South India, no after-cultivation care is given by cashew growers, except weeding once or twice a year. In some cases, digging round the plants once a year until they are four to five years old, ploughing in the alleys or even raising of intercrops have been practised. These help the trees in their growth and also increase yield. Of late, growers have begun to realise the importance of manuring and irrigation also.

Cashewnut is a highly cross-pollinated plant and as a general rule, seedling trees of unknown parental combinations cannot be relied upon to breed true. After careful selection of parent trees, vegetative propagation is the best means of obviating variation and unpredictable behaviour. Sexual and vegetative propagation methods like natural rooting, propagation through shoot-cutting, planting of stumps, air-layering, etc., have been tried in cashew research stations in the country. Air-layering has been found to be promising, as it leads to earlier fruiting; but further work has to be done before it can be recommended for widespread adoption.

In areas where the agro-climatic conditions are favourable, seedlings begin to flower even in the second year and small crops are obtained from the third or fourth year. But in most areas, a crop is obtained from the fifth year onwards. The normal life of a tree is about 35 years. A well-grown tree attains a height of 8 to 9 metres with a spread of 6 to 10 metres. Flowering takes place in the months of December and January. Light showers, at this time, are said to be beneficial; but prolonged cloudy weather is said to result in reduction of yield.

Yield:

The yield per tree depends upon a variety of conditions. For the same stock, the yield may vary from about .5Kg. of dry raw nuts per tree to as much as 18 to 22 Kgs. On an average, the yield per tree on the West Coast may be taken at 9 Kgs., and on the East Coast at 11 to 13 Kgs.

Harvesting:

The fruiting period for cashewnut can be taken to be about 6 months, from December to June or July. The fruit takes 45 to 60 days to mature. The nuts are harvested in the months of March to May; the harvesting period varying from place to place depending on the commencement of the flowering season. Nuts collected from the ground are dried in the sun for one or two days, and then stored.

CHAPTER III

PROCESSING

Cashewnut is generally used after roasting. The shell of the raw nut contains cardol and anacardic acid which cause severe burns on coming into contact with living tissues. By roasting, these chemicals are removed from the nut and the shell becomes brittle, facilitating extraction of the kernels. Processing of cashewnut mainly consists in roasting. It is a delicate and difficult process and unless properly done, the quality and recovery of kernels are adversely affected. With increasing economic importance of cashew shell liquid, attempts are being made to evolve processes which combine uniform roasting with the maximum recovery of shell liquid.

Four methods are generally employed for roasting. These are: (i) open pan method, (ii) earthenware method, (iii) rotary cylinder method and (iv) oil bath method. The first two, though simple and cheap, are disadvantageous, as there is no proper arrangement in these for recovery of liquid or for protection of the worker against fumes and oil. The rotary cylinder method is an improvement over these in that it is more efficient and hygienic. But, a large proportion of shell liquid is lost in it. The best method which combines good roasting with maximum recovery of shell liquid, is the oil bath method. In it, an oil bath of cashew shell oil, the temperature of which is maintained at about 200°C., is provided. Raw cashewnuts are held in wire trays and passed through the hot oil bath for about one minute. Due to the high temperature, the oil cells of the raw nuts burst and release the contents into the oil bath. At the same time, the shells get roasted to the desired degree which facilitates extraction of kernels and the overflowing oil is drained and collected. Although the method is efficient, it is costly and only a few big factories have adopted it so far.

After roasting, the shells are removed from the nuts and the kernels are extracted. Shelling has to be done carefully and skilfully, so that the kernels are not broken. The shelling operation is done by hand by employing a large number of labourers, mostly women. The kernels are then dried in the sun or in specially constructed hot air-chambers, to facilitate peeling or removal of the brownish skin or outer coating. This latter is also done mostly by women and children. The kernels after peeling are in a dry and brittle condition and are liable to breakage during package and transport. They are, therefore, allowed to absorb some moisture by keeping them in moist chambers before being finally packed into tins for export. On an average, the weight of the cashewnut shell comprises 70 to 72 per cent of the total weight of the raw cashewnut. The actual recovery of kernel is therefore, only about 25 per cent of the weight.

Grading:

For export purposes, grading is mostly done according to American Standards which are based on 'counts' or number of kernels per pound. Highly discoloured, immature and shrivelled kernels are discarded and sold as poultry feed. The kernels which have not split are designated as 'wholes' and the broken ones as 'splits'. The wholes are separated into six grades 210, 240, 280, 320, 400 and 450 of whole kernels per pound. The standard grade usually quoted by the American market is 320. The usual specifications of graded kernels are that they should be fully developed, ivory white in colour, and free from insect damage and black or brown spots.

Packing is done in tins, by the 'vita pack' method. By this method, the air inside the tins containing the kernels is exhausted and carbon dioxide is pumped in before the tins are sealed airtight.

For consumption within the country, no such grades are adopted, and the produce coming in the market is generally a mixture of different grades.

CHAPTER IV

PRODUCTION, IMPORTS AND EXPORTS

World area and production:

Even though the cashew tree grows in many tropical and sub-tropical countries, the nuts are collected on a commercial scale only in a few of these viz. Brazil, India, Portuguese East Africa, Tanganyika, Portuguese West Africa, French Equatorial Africa and Kenya. In recent years, Ghana has also shown some interest in the collection and marketing of cashewnuts on a small scale. Accurate information about the area under cashew trees and production of cashewnuts in different countries of the world is still lacking, but according to available estimates, the Brazilian crop is said to be relatively small, roughly about 1,800 tonnes. The bulk of the world's production comes from East Africa and India. The main producing countries in Africa are Portuguese, East Africa, 76,000 tonnes, Tanganyika 51,000 tonnes and Kenya 5,100 tonnes. Production in India ranged between 61,000 to 71,000 tonnes before the Second Five Year Plan period, but had risen to 1,17,850 tonnes by 1961. The cashew processing industry have developed only in India. It has not made much progress in the East African countries, and the major part of their production is exported as raw nuts. The annual import of raw nuts from East African countries into India is about 1,00,000 tonnes.

Production in India:

Cashewnut grows extensively in Kerala, Mysore, Madras and Andhra Pradesh. Reliable statistics of area and production are not yet available, and the information given here is based only on reports received from the State Governments, the Economic and Statistical Adviser to the Government of India and articles published in different journals. The estimated area and production at the end of the Second Five Year Plan period were 1.1 lakh hectares and 117 thousand tonnes respectively. The trend of expansion during the last few years can be seen in Table 1 on the next page.

Table—1

Area and production of Cashewnut in the main Cashewnut growing States

States	1954-55		1955-56		1956-57		1957-58		1958-59		1960-61	
	Area (hectares)	Production (tonnes)	Area (hectares)	Production (tonnes)	Area (hectares)	Production (tonnes)	Area (hectares)	Production (tonnes)	Area (hectares)	Production (tonnes)	Area (hectares)	Production (tonnes)
Andhra Pradesh	2201	1793	3899	3260	3286	2771	4060	3208	8090	..	9334	2275
Bombay*	2565	6427	1998	5007	2105	5275	2143	5370	2830	..	3683	..
Kerala	27082	37592	37464	56896	37390	58674	44035	69098	46130	..	55027	85800
Madras	41061	16896	29922	12040	26748	11816	29233	13391	31570	..	36587	15850
Mysore	183	226	193	274	4163	3565	4485	4248	6070	..	6022	11173
Orissa	..	..	..	..	..	..	..	..	810	..	735	615
Tripura	..	..	..	..	..	..	..	..	410	..	..	..
West Bengal	..	..	..	..	..	..	..	..	..	..	2091	1505
Andaman & Nicobar Island	..	..	..	..	..	..	..	..	..	..	47	6
TOTAL	73092	62934	73476	77477	73692	82101	83956	95315	95910	103630	113526	117224

*Now mostly Maharashtra and Part of Mysore.

Shortage of supplies and imports:

Although India leads other countries in cashewnut production, its total production has never been sufficient to feed the existing processing factories. Indian cashew factories have an overall installed capacity of about 2·03 lakh tonnes of raw nuts. Against this, the quantity reaching the factories is only about 61,000 to 71,000 tonnes. The balance is imported mainly from East Africa. Figures of import of raw cashewnut into India and export of cashew kernels for the last few years are given in Table 2.

TABLE—2

Imports and Exports of Cashewnuts

Year	Tonnes	Value in lakhs of Rs.
<i>Import of raw cashewnut into India</i>		
1953-54	65,000	422
1954-55	86,350	425
1955-56	63,000	483
1956 (Apr.-Dec.)	22,350	188
1957	97,550	737
1958	1,21,900	747
1959	91,450	607
1960	1,20,200	961
1961-62	89,350	591
<i>Export of Cashew Kernels from India</i>		
1953-54	27,100	1099
1954-55	34,550	1070
1955-56	31,350	1292
1956-57	25,450	1187
1957	34,600	1473
1958	39,650	1547
1959	38,150	1518
1960-61	43,800	1891
1961-62	41,600	1817

It will be seen that during the five years, 1957—62, the value of exports ranged between Rs. 15 and 19 crores and the value of the raw nuts imported was 1/3rd to 1/2 of this figure.

India at present has a virtual monopoly of cashewnut processing on an industrial scale. This position will continue so long as sufficient supplies of raw nuts, both indigenous and imported, are available to the processing factories. Raw nut is exported by East African countries because of their inability to undertake the processing of nuts on a competitive basis. The chief advantage of India in processing is its cheap labour. The African countries are now trying to develop mechanised processing which, if successful, might result in India not getting raw nut supplies. It is therefore, imperative that every effort is made to increase indigenous production to keep up India's leading position in the export trade in cashew kernels.

EXPORTS: Before the constitution of the Cashew and Pepper Export Promotion Council in 1955, the average export of cashew kernels from India was about 28,450 tonnes valued at about Rs. 11.3 crores. After the setting up of the Council, the exports have been steadily increasing both in quantity and value. The peak figure of 43,790 tonnes of kernel valued at Rs. 18.91 crores was reached in 1960-61 (Table 2). The increase has been achieved by expanding exports to traditional markets like U.S.A., U.K., Canada and Australia and by starting exports to new markets such as U.S.S.R., West and East Germany, Japan, Iran etc. In all, cashew kernels are now exported to about 45 foreign countries.

The efforts of the Council have also helped a great deal in augmenting the production and export of cashewnut shell oil which is an important by-product of the cashewnut industry. The cashewnut industry in India produces annually 6,100 to 7,100 metric tonnes of exportable variety of cashewnut shell liquid. The principal importers are U.S.A., U.K., Japan and Australia. U.S.A. imported 3,555 tonnes upto 1957-58. Economic recession in U.S.A. has resulted reduction in imports of cashewnut shell liquid in subsequent years and U.K. has become the biggest single buyer. Some other countries which are smaller buyers of cashewnut shell liquid are Sweden, Italy, France, West Germany and Singapore.

PRICES

Prices paid for cashewnut depend on the prevailing prices of kernels which in turn are determined largely by demand from foreign countries, especially U.S.A. This demand and the prices offered for cashew kernels in U.S.A. are influenced to an extent by prices of other competing nuts e.g. peanuts and walnuts. The supply position of cashewnut, level of production in India and in the East African countries also has an influence on prices but this is generally smaller than the influence of demand. The following table gives the Economic Adviser's index numbers of wholesale prices of cashewnuts for the years 1953—63:—

*Index number of wholesale prices
(Base 1952-53 = 100)
Cashewnut*

1953	.	.	.	.	.	79.0
1954	.	.	.	.	.	53.8
1955	.	.	.	.	.	89.0
1956	.	.	.	.	.	95.4
1957	.	.	.	.	.	85.8
1958	.	.	.	.	.	68.6
1959	.	.	.	.	.	77.3
1960	.	.	.	.	.	92.7
1961	.	.	.	.	.	81.4
1962	.	.	.	.	.	67.0
1963	.	.	.	.	.	70.5

It will be observed that prices throughout this period remained below the base level of 1952-53 and were also subject to considerable fluctuations from year to year.

Price differences on account of quality exist both in raw-nuts and kernels. Local nuts are considered superior and generally fetch a premium of 5 to 10 per cent over imported nuts. However certain areas in the country are noted for fully ripe and mature crop which gets a premium of 5 to 6 per cent over the average. Since production of cashewnut is spread more or less over the whole year, seasonal differences in prices are generally small. Prices are slightly higher during the four months of winter, November to February, when consumption in India is at its peak.

CHAPTER V

RESEARCH AND DEVELOPMENT PROGRAMMES

(i) Research

Investigations are in progress in the various Cashew Research Stations to determine high yielding varieties and types as well as to evolve optimum cultural practices and effective methods for control of pests and diseases. Some useful findings of economic value have resulted from these investigations. One promising result is propagation by 'air-layering', which enables quick production of vegetative plants from parent trees of known performance i.e. high yield and quality nuts. Air layers attain bearing age within two years, as against four years taken by the seedling trees; but the root system is comparatively weak.

The research stations have secured collections of exotic varieties as well as of indigenous types. The station at Ullal in Mysore State maintains 119 cashew selections. Two indigenous selections from Chromepet and Pattukottai in Madras State, and exotic selections from Mozambique and Singapore have been found to be promising. The station at Bapatla in Andhra Pradesh maintains 124 selections obtained from various parts of this country as well as from Africa, Mexico, Brazil, Lindi (America) and Ceylon. An indigenous selection from West Godavari District and an exotic one from Ceylon have given encouraging results in the matter of growth and yield. The station at Vengurla in Maharashtra possesses 46 collections, mostly of indigenous types. In most of the research stations, comparative trials to assess the relative superiority of seedlings, layers and inarches, have indicated that the layers are superior. The results of rooting trials of air-layers and shoots undertaken in Kottarakara in Kerala State have indicated that the use of indol-acetic acid in concentration of 250 ppm. leads to faster root growth. Other observations on the floral biology and life history of pests and disease-causing fungi are in progress. The tea-mosquito (*Helopeltis antonii*) has been found to be the primary cause for the drying up of leaves inflorescence and shoots. Spraying cashew trees with 0.25 per cent BHC wettable powder (1 lb. BHC 50 per cent in 20 gallons of water) or Parathion 0.25 per cent at the time of first flush and again at flower bud appearance, has proved to be beneficial in checking die-back disease and flower scorching.

Investigations carried out in the Central Cashewnut Research Station, Ullal (Mysore State), have also indicated that yellow apples are often less astringent, heavier and softer than red apples. It has also been noticed that there is wide variation in the weight, size, juice content, etc., of the apples, and that the larger the apples, the larger the nuts, and that the heavier and larger the apple, the higher is its juice content.

Development

(ii) The First Five Year Plan:

Early in 1951, the Planning Commission brought to the notice of the Ministry of Food and Agriculture the fact that attention paid to the development of six important dollar earning crops of South India, viz., pepper, cardamom, ginger, turmeric, cashewnut and lemon grass was grossly inadequate. The Ministry of Food and Agriculture accordingly constituted a high level Committee to study the situation and to suggest the means necessary for developing the production and marketing of these crops. The report of this Committee was submitted in 1953; but by this time a good portion of the first plan period had elapsed and no major development programme could be undertaken in it. However, the Government of India, through the Indian Council of Agricultural Research, took up the task of improving cultivation methods, and increasing production of cashewnut by initiating research and developmental schemes on the crop. Accordingly, proposals were made for starting five research centres in the States of Kerala, Mysore, Andhra Pradesh, Bombay and Assam. However, only three of these were started during the First Five Year Plan period. The research station at Kottarakara in Quilon District (Kerala) was started in November 1952. Its programme included investigation on the different aspects of cashew cultivation with a view to evolving suitable practices and techniques for increasing the yield of cashewnut, survey of areas, selection and perpetuation of selected types, evolving suitable nursery techniques, testing selected clonal progenies, studies of factors influencing blossom and fruit set and studies on response of cashew trees to fertilizers. The station at Ulal (Mysore State) started functioning in June 1953 with the object of improving the cashew crop through agronomical, botanical and horticultural investigations. Survey of different cashew growing tracts in the Mysore State to collect, identify and determine the different aspects of pests and diseases affecting the crops and to conduct trials on suitable remedial measures, were also included in the work of the station. The station in Andhra Pradesh commenced in November 1955 at Bapatla with the object of improving cashewnut in the State by various agronomic and other improved practices and undertaking the introduction and production of new economic types through selection and hybridisation.

A Special Officer for the development of spices including cashewnut, was appointed in 1955 with the object of chalking out programmes for the development of cashewnuts and spices and to watch the progress of development and research schemes. In 1957, this Officer was replaced by a full time Cashew and Spices Development Officer. In 1955, at the instance of the Spices Enquiry Committee, the Government of India established an Export Promotion Council for pepper and cashewnut at Cochin, the chief port of export of these commodities. The main objects of this Council were to promote the export of pepper and cashewnut from India by suitable propaganda, quality control and other means. At present, there is an Export Promotion Council exclusively for cashewnut.

(iii) The Second Five Year Plan:

During the Second Five Year Plan, a systematic programme of development of cashewnut aimed at increasing production to 1,07,700 metric tonnes by the end of the plan period was undertaken. This target was

exceeded and as indicated in Table 1 above, production at the end of the Second Plan period was estimated at over 1,17,000 tonnes.

Two more research stations at Vengurla in Maharashtra, and Katya-tholi in Assam were started during the Plan.

Developmental programmes were actively pursued in Kerala, Mysore, Madras, Andhra Pradesh, Maharashtra, West Bengal, Assam and Madhya Pradesh. Incentives provided to the growers were, distribution of crop loans, assignment of lands on lease and supply of pedigree plant material.

With a view to utilising all available loans for the cultivation of the crop, separate schemes were drawn up for covering forest and non-forest areas in the different States. The schemes for non-forest areas of Andhra Pradesh, Maharashtra, West Bengal, Mysore and Madras and for forest areas of Andhra Pradesh, started functioning during the Second Plan Period.

(iv) *The Third Five Year Plan:*

The research, development, export promotion and other activities relating to cashewnut started during the Second Five Year Plan were continued during the Third Five Year Plan.

The need for establishing a Central Organisation for the improvement and development of spices and cashewnuts which are important foreign exchange earners had been felt by the Government of India for some time. Accordingly, the Government of India set up in 1961 an Indian Central Spices & Cashewnut Committee, to deal with all aspects of research, development and marketing of these crops.

During the Third Plan period, an intensive programme of development was proposed. An additional area of over 3.24 lakh hectares was to be planted and a provision of Rs. 1.9 crores was made for various development schemes. The State-wise distribution of the target of additional areas to be planted with cashew trees is given in Table 3 below:—

Table—3
Target for additional area in the Third Plan
(State-wise)

State	Non-forest (In '000 hectares)	Forest (In '000 hectares)
Madras	4.05	4.05
Kerala	4.05	2.02
Maharashtra	202.34	..
Mysore	30.35	8.09
Andhra Pradesh	2.63	20.23
Orissa	40.47	..
Assam	2.02	..
West Bengal	2.02	..
Madhya Pradesh	0.20	..
Andaman & Nicobar Islands	0.40	..
Tripura	0.81	..
TOTAL	289.34	34.39

However, on the basis of the actual estimated achievements during the first two years of the Plan, it has since been found necessary to reduce the target to 2·23 lakh hectares.—

Table—4

Targets and achievements for the first two years of the Third Five Year Plan.

State	Target (Hectares)			Achievements (Hectares)		
	1961-62	1962-63	Total	1961-62	1962-63	Total
Madras (Forest)	809	809	1,618	1,297	1,052	2,349
Madras (Non-forest)	809	809	1,618	1,556	2,827	4,383
Mysore (")	6,070	6,070	12,140	6,030	6,094	12,124
Gujarat (Forest)	81	81	162	..	81	..
Madhya Pradesh	40	40	80	..	*55	..
Tripura	170	170	340	129	146	275
Kerala	809	809	1,618	2,428	N.R.	..
Maharashtra	40,468	40,468	80,936	38,175	38,175	76,350
Andhra (Non-forest)	526	526	1,052	410	66	..
Assam	405	405	810	224	†166	390
West Bengal	405	405	810	243	48	291
Andaman & Nicobar Islands	81	81	162	99	22	121
TOTAL	50,673	50,673	101,346	50,591	48,732	99,323

*Estimates for 1961-62 and 1962-63.

N.R.—Not reported.

†—Area upto December, 1962.

On the basis of the additional area planted during the Second Plan period, which is expected to yield after a period of 4-5 years, the production by the end of the Third Plan is estimated to be 122,930 tonnes of raw nuts. The additional production from the Second Plan acreage has been estimated at a conservative figure of 1/10th tonnes per acre only. The Ministry of International Trade has fixed an import target of 101,600 tonnes of raw nuts per year during the Third Plan period. Taking this into account, the total quantity of raw nuts, both indigenous and imported, handled at the end of the Third Plan is estimated at about 224,530 tonnes.

(v) Need for further work:

Reviewing the measures so far taken towards the development of cashewnut in the country, through research and development programmes, it is found that special attention is required in a number of directions.

Research

The Research Stations which have been functioning for some time and the new stations set up during the Second and Third Plan periods generally cover the following programme.

- (i) Survey of existing cashewnut plantations in South India with a view to spot out-standing parent trees and choice seedlings and types.
- (ii) Isolation of promising types among indigenous and exotic introductions.
- (iii) Standardisation of propagation methods.
- (iv) Hybridisation to produce new forms for maximising production.
- (v) Study of factors influencing flowering, and fruit set.
- (vi) Study of the influence of soil nutrients and moisture on the growth and yield of cashew trees.

Studies on varietal collections of individual types have been done and promising types located. Descriptions according to a comprehensive key which will lead to a proper classification of distinct types are, however, necessary. Propagation work has also advanced to a stage where methods are more or less standardised. However, concrete results from most of the above-mentioned programmes, have yet to be obtained. Investigations on the fundamental and applied aspects as well as methods for controlling pests and diseases of the crop need to be pursued. Setting up of cashew progeny orchards for dissemination of high yielding plant material and publication of information on prevention and control of pests and diseases are two important steps needed as these will help the cashew growers in extending the area under cultivation and improving the yield and quality of the crop. The cashew tree exhibits large variation in economic characters such as yield, size of nut, kernel content, colour, shape and taste of apple etc. Improved varieties which combine at least some of these desirable qualities are yet to be isolated. All these items of work have to be pursued.

Utilisation of Cashew Apple:

Excepting a small part of the total production of cashew apple, which is now utilised for consumption as raw fruit or for preparation of beverages and alcohol, the entire production is wasted. As a result of experimental work carried out at the Central Food Technological Research Institute, Mysore, methods have been devised for removing the astringent and acrid principles in the juice and utilising it in preparing beverages and in the canning industry. The Institute has also worked out the economics of utilisation of the apple and its juice as a cottage industry and as a small scale industry. But these results have not so far been followed up. It appears essential to undertake trials on commercial utilisation of the apple and juice by setting up pilot plants in important producing areas, particu-

larly in forest areas where compact plantations of cashewnut are coming into bearing. Utilisation of the juice for fermenting and conversion into alcoholic liquors needs very early attention. Intensified propaganda will have to be undertaken to popularise the products of the cashew apple. The apple cannot stand injury or transport, and it is essential to utilise it *in situ* as far as possible. On the present estimates, about 2.54 metric lakhs tonnes of apple are expected to be available from the trees annually.

As regards cashew shell liquid, apart from providing for a higher recovery of the liquid by introducing improved methods of processing of raw nuts, further work will have to be undertaken on possible industrial uses within the country. Almost the entire quantity now produced is exported. Its utilisation in producing exportable finished goods will be in the national interest. The National Chemical Laboratory at Poona, the Indian Institute of Science, Bangalore, and private industries have done some work on these lines; but this work requires intensification.

Collection of raw nuts and processing offer a number of problems for careful attention. It is well known that the primary producer gets only a small percentage of the price paid for raw nuts by industry. Recommendations have been made with a view to reducing the profit of the middlemen and to ensure to growers a proper share of the factory price; but no efforts have been made so far for organising the process of collection. The organisation of cooperative institutions for the collection and processing of nuts is necessary. Besides collection of nuts, it is worthwhile promoting cooperative factories for processing, which may be located in areas where new plantations are being raised.

One of the major handicaps in cashew development is lack of reliable information on existing production and on the scope for further extension of cultivation. As has already been emphasised, the existing gap between production and the requirements of raw nuts for processing, has to be filled as early as possible. It is desirable to aim at bringing the required area under cashew cultivation by the end of the Fourth Plan period. A reconnaissance survey of areas suitable for growing cashew trees is essential. It is suggested that such a survey should be undertaken and completed within a period of one year. The information contained in the Report on Wastelands of the Committee on Natural Resources will be very useful in this connection. With this information and statistical data regarding productivity of the existing areas, a properly phased development programme of planting the entire available area within the Fourth Plan period could be undertaken. While deciding upon the acreages to be planted to cashewnut the area required for other tree crops should also be taken into consideration. The coastal areas of Peninsular India are particularly suitable for cashew cultivation and new plantations should be concentrated in these. Resources should not be wasted on cashew cultivation in areas which are not climatically and otherwise suitable *e.g.* Bihar, Madhya Pradesh and interior of Orissa where either due to the incidence of cold or hot winds the plant does not thrive.

Demonstration work on the proper methods of raising cashew plantations and their maintenance requires more attention. In the Fourth Plan, a good deal of emphasis should be laid on organisations of demonstration plots, including adoption of improved agricultural practices and control measures against pests and diseases.

It is noticed that provision for loans under the Third Plan is not being utilised in certain states to the extent expected, due to some procedure involved in the distribution of loans. The procedures have to be simplified, with a view to ensuring that loans are granted within the shortest possible time after applications are received.

CHAPTER VI

SUMMARY

The cashewnut tree was introduced in India by the Portuguese in the 16th Century from Brazil. In 1954, 73125 hectares were under this crop in the States of Madras, Kerala, Maharashtra, Andhra Pradesh and Mysore. In 1958 the acreage rose to 95950 hectares out of which 46150 hectares was in Kerala, 31580 hectares in Madras, 8100 in Andhra Pradesh, 6070 in Mysore, 2835 in Maharashtra, 810 in Orissa and 405 in Tripura. Production rose from 62,934 metric tonnes in 1954 to 103,630 tonnes in 1958 (and further to 116,840 tonnes in 1960-61).

Cashew factories in India have an installed capacity of 2.03 lakh tonnes of raw nuts. But only about 61,000 to 71,000 tonnes of raw nuts are available to the factories from indigenous production. The deficit is met by imports of raw nuts from East African countries. During the years 1957-62, imports ranged between 91,440 and 122,000 tonnes of raw nuts valued at between Rs. 6 and 10 crores. Not only can India be made self-sufficient in the total requirements of her factories; but much more can be produced so that more factories are established. Cashewnut tree flourishes in coastal sand dunes of Peninsular India which are most suitable for its cultivation. These are marginal lands where apart from cashewnut only casuarina and coconut palms can grow. Out of these three, cashewnut is the hardiest followed by casuarina and coconut palm. Considering the demand for these three tree crops, appropriate areas should be earmarked for them.

It is desirable to find out how much area can be made available for growing cashew trees in the coastal belt of Peninsular India. This is the type of work which must be done in the remaining period of Third Five Year Plan. During the Fourth Plan, it is desirable to make a sizeable investment so that the entire available area is planted. This will be a valuable asset in earning foreign exchange which the country so badly requires.

It will also result in fruitful utilisation of marginal and Waste-lands, especially along the East and West Coasts of Peninsular India. These areas are best suited for cashew cultivation, and new plantations should be concentrated in these. There is a very great demand for cashewnuts in the temperate countries of Europe and America, and the production of the crop can be increased 3-4 times without any risk.

Cashew trees are best grown from seed and as such nurseries are not required as in the case of other tree crops.

Loans require to be more quickly disbursed, and procedures require to be simplified.

Cashew apples are largely wasted. The possibility of using them in processing industry has been established by the experimental work carried out at the Central Food Technological Research Institute, Mysore. Difficulty lies in collection and transport as the fruit is easily perishable. As such pilot plant trials should be undertaken in areas where there are compact plantations.

CHAPTER—VII

RECOMMENDATIONS

S. No.	Recommendation	Action to be taken by
1	Cashew trees grow best in the coastal areas of the States of Kerala, Madras, Andhra Pradesh, Mysore, Maharashtra, Orissa and West Bengal. These are areas in which there are extensive stretches of coastal sand dunes and lateritic terrain and the climate is tropical. It is best to confine all developmental effort to these areas. The targets of additional area to be covered during the Fourth and Fifth Plan Periods may be fixed at 4.5 lakhs acres per plan period.	Ministry of Food and Agriculture and State Governments.
2	A reconnaissance survey of potential areas for growing cashew trees should be undertaken in the States mentioned in Recommendation No. 1, which should be completed within the period of the Third Five Year Plan.	Do.
3	After making allowance for areas required for growing coconut palms and casuarina, areas should be specifically earmarked for growing cashew trees in the Fourth Five Year Plan.	Do.
4	4 Forest schemes for growing cashew trees are better managed and large compact areas can be tackled. As such due place should be given to them in the Fourth Five Year Plan.	Do.
5	The procedure for grant of loans to cultivators should be simplified so that they are made available within a month of application.	Do.
6	Demonstration plots in which the benefits of manuring and plant protection are demonstrated should be organised in all the growing areas.	Do.
7	Progeny orchards should be established for making available plants of superior performance.	Do.
8	To safeguard the interests of growers regulated markets should be established in all the cashew growing states and cooperative institutions for collection and processing of nuts and cooperative processing factories should be organised.	Ministry of Community Development and Cooperation and State Governments.
9	The growing of cashewnut in Kerala in the areas between tanks and agricultural land should be investigated.	Indian Central Spices and Cashewnut Committee.
10	Cashew apples can be used for manufacture of 'brandy' and steps should be taken for their commercial utilization in this manner for purposes of export.	Ministry of Food and Agriculture and State Governments.

Bibliography

1. Sebastine, K.M. (1955) . The immigrant economic plants of India-Proceedings of the Indian Academy of Sciences, Vol. XLII.
2. Rao, V.N. Madhava (1958) . Studies in the vegetative propagation of cashew. Ind. Jour. Agri. Sci. Vol. XXVIII p 575.
3. Khan, K. Fazlullah (1958) . Cashewnut attains new dimensions in Independent India-Cashew and Pepper bulletin. November.
4. Khan, K. Fazlullah . . Handbook of cashewnut cultivation and processing (unpublished).
5. Wilson, Popenve (1920) . Tropical and sub-tropical fruits. Macmillan & Co.
6. Lal, Girdhari and Jain, N.L. Cashew apple—an important raw material for food processing industry (paper submitted for seminar on cashew at Mercara—1958)
7. Abraham E.V. (1959). . The Killer insects of cashew Indian Farming, June.

**Publications of the Committee of Natural Resources,
Planning Commission**

(1) Committee on Natural Resources, Organisations and Problems proposed for Study (1962).

(2) Natural Resources of India (A brief statement) by M. S. Randhawa (1963).

(3) A Coordinated Study of Organisations concerned with the Surveys of Natural Resources, e.g., The Survey of India, Geological Survey of India, Soil and Land Use Surveys, Forest Surveys, Cadastral Surveys and Town Planning Surveys (1963).

(4) Study on Wastelands, including Saline, Alkali, and Water-logged Lands and their Reclamation Measures (1963).

(5) Study on Cotton in India (1963).

(6) Study on Groundnut in India (1963).

(7) Study on Utilisation of Urban Wastes (1963).

(8) Study of Coconut in India (1963).

(9) Survey and Utilisation of Agricultural and Industrial By-products and Wastes (1963).

(10) Study on Jute and Mesta in India (1964).

(11) Land Resources of India, Volume I by S. P. Raychaudhuri (1964).

(12) Study on Arecanut in India (1964).