SOUVENIR

Central Plantation Crops Research Institute

Kasaragod 670124 Kerala India

Edited by :

Nair MK
Prem Kumar T
Hali R

Published by :

The Publication Committee
and
The Publicity Committee
International Cashew Symposium
Central Plantation Crops Research Institute
Kasaragod 670124 Kerala India

Cover design :

Farm Information Bureau
Govt. of Kerala Trivandrum

Printed at :

St. Joseph's Press Trivandrum

Sponsors

of the

Symposium

Indian Council of Agricultural Research,

New Delhi,

International Society for Horticultural Science,

Hague,

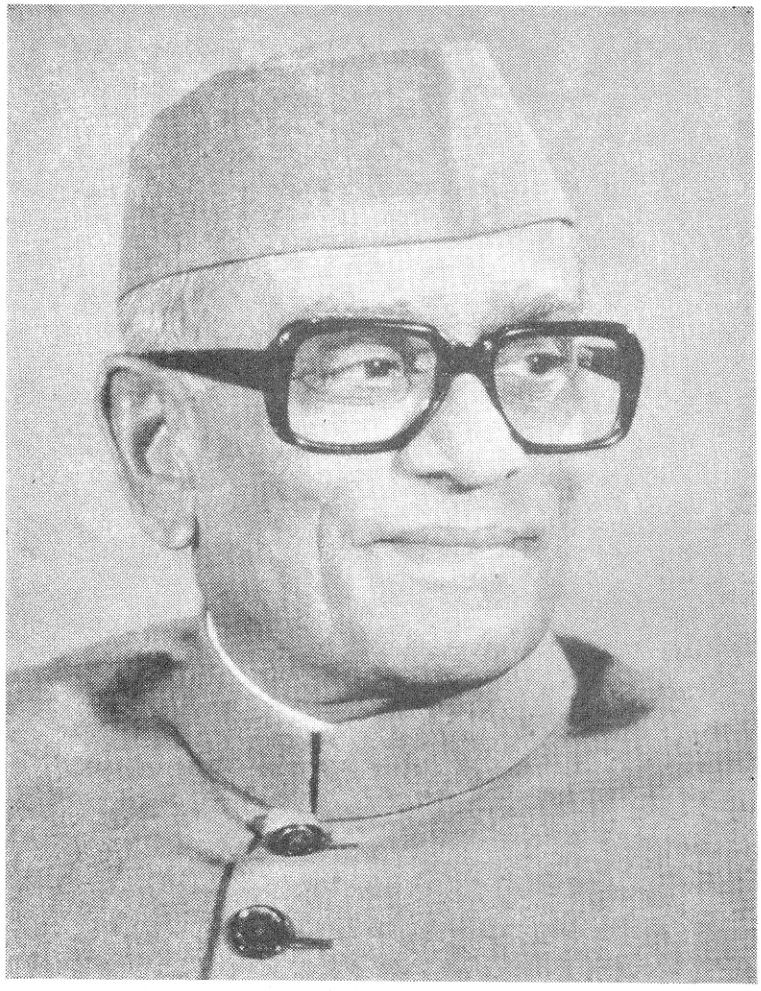
Indian Society for Plantation Crops,

Kerala.

सत्यमेव जयते

राष्ट्रपति भवन नई दिल्ली भारत

RASHTRAPATI BHAVAN NEW DELHI INDIA



I am glad to know that an International Cashew Symposium is being organised jointly by the Indian Council of Agricultural Research, the International Society for Horticultural Sciences and the Indian Society for Plantation Crops at Cochin from the 12th March, 1979. I send my greetings to the organisers and participants and hope the deliberations will be helpful and fruitful.

My best wishes for the success of the Symposium.

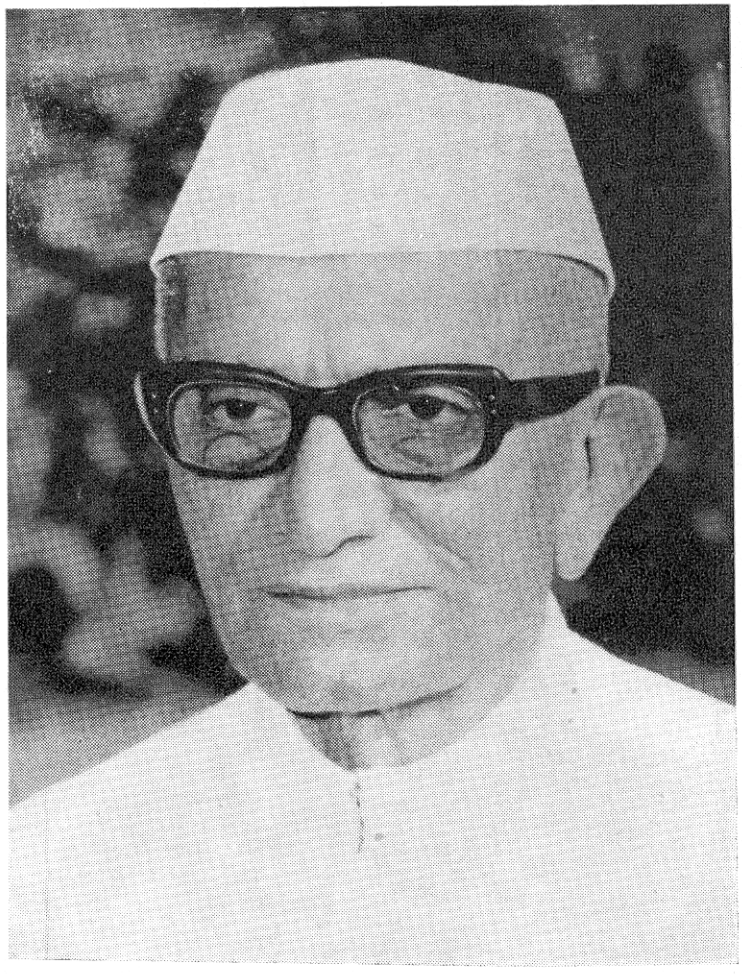
(N. SANJIVA REDDY)

New Delhi
20 January, 1979

सत्यमेव जयते

प्रधान मन्त्री भारत

PRIME MINISTER,
INDIA.



In order to sustain the high level of our cashew exports, it is necessary to increase the domestic production of raw cashewnut.

I am glad that International Cashew Symposium is being held in Cochin, and I hope that it will be able to consider imaginative measures being taken to spread the knowledge of the improved techniques of productivity of the cashew crop in India.

I send my greetings to the delegates and wish them success in their deliberations.

Morarji Desai

(Morarji Desai)

New Delhi,
20 January, 1979

सत्यमेव जयते

MINISTER OF
AGRICULTURE & IRRIGATION
GOVERNMENT OF INDIA

Cashew, introduced into India by the Portuguese in 1498, has today become one of our major export items, fetching a sizeable foreign exchange.

I am aware of the problems that the crop and the industry around it are facing today. The major problem is the nonavailability of the raw material in sufficient quantities for our processing units. I understand that we are able to run the factories only for about three months in a year.

Some steps have been taken to find solutions to this problem. A Committee was constituted in 1976 by the Indian Council of Agricultural Research under the Chairmanship of Dr. K. N. Raj, which suggested a programme of pest control in Cashew. The Cashewnut Development Directorate at Cochin has a massive development programme for increasing the cashew production. The Tree Crops Development Project of Kerala, partly financed by the World Bank, also aims to bring large areas under high-yielding varieties. An All-India Co-ordinated Spices and Cashewnut Improvement Project with headquarters at the Central Plantation Crops Research Institute, Kasaragod, is also in operation.

Extending areas of cultivation as well as increasing the yield of existing plantations deserve immediate attention. Cashew can be cultivated in almost all soils from the sandy sea-coast to the laterite hill slopes up to an elevation of 700 metres. Good varieties and improved agronomic practices can result in higher yields. These are problems for the scientists and developmental specialists.

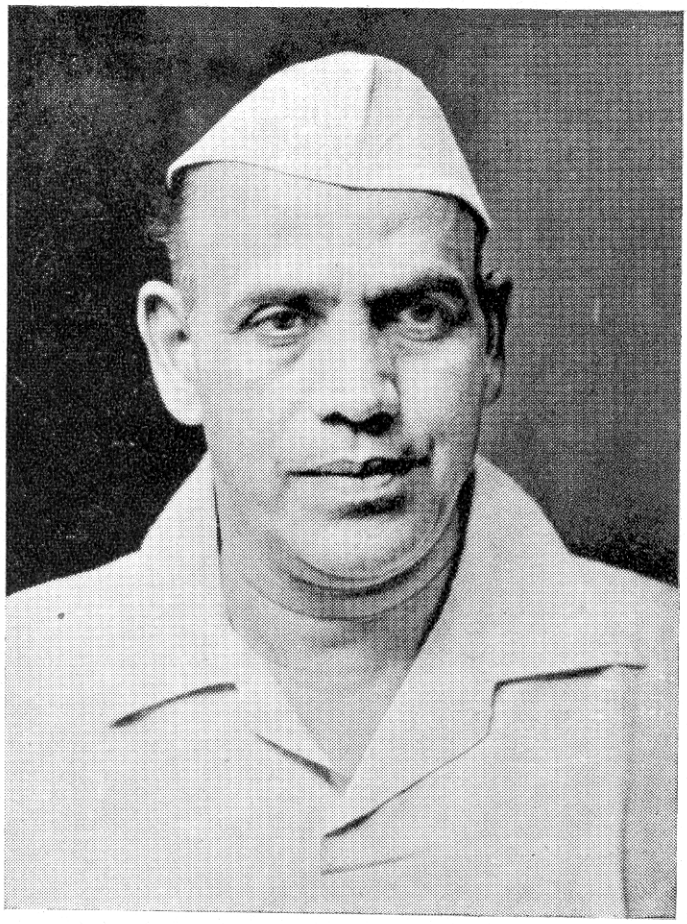
I hope your discussions will take care of all these aspects.

I wish you all success.

Surjit Singh Barnala

(Surjit Singh Barnala)

New Delhi
19 January, 1979



MINISTER OF COMMERCE
CIVIL SUPPLIES & CO-OPERATION
GOVERNMENT OF INDIA

I am happy to know that the Indian Council of Agricultural Research, the International Society for Horticultural Sciences and the Indian Society for Plantation Crops are jointly organising an International Cashew Symposium at Cochin from 12th to 15th March, 1979. It is creditable that an International Symposium on Cashew, which is of considerable importance to India and a number of developing countries in the tropical region, is being organised for the first time.

Low productivity and high cost of processing and marketing had pushed up the price of cashew in 1977–78 and as a result, there was stiff consumer resistance and substitution by other edible nuts like almonds, which had recorded a decline in prices in the meantime. To help cashew to recover the lost ground, we will have to put in extra efforts particularly at the production level and we are already considering raising cashew plantations in the coastal states of India.

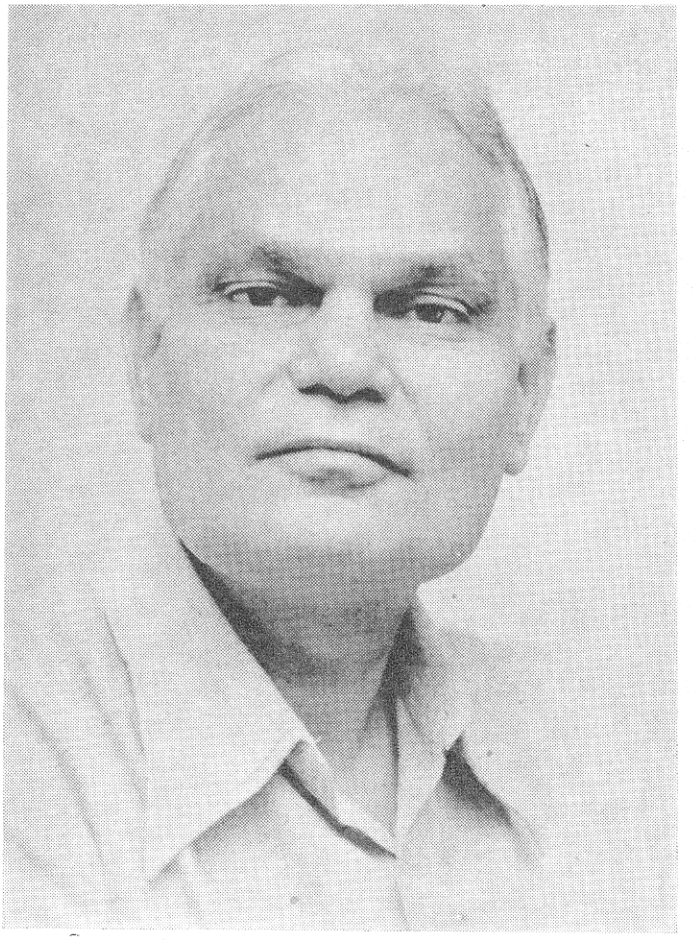
I am sure that the Symposium will make purposeful recommendations for increasing the productivity of cashew, for more dynamic marketing of cashew kernels and for better utilisation of by-products.

I wish the Seminar all success.

(MOHAN DHARIA)

New Delhi
23 February, 1979

MINISTER OF STATE FOR
AGRICULTURE & IRRIGATION
GOVERNMENT OF INDIA



The International Cashew Symposium is an important and timely event and I am glad you are bringing out a Souvenir on the occasion.

The problems around this crop are now well known. Our indigenous production is inadequate in relation to the needs of the processing facilities that we have created. While we can process about 4.5 lakh tonnes, our annual production is only 1.8 lakh tonnes.

To keep our factories going, we were importing raw nuts from East African countries. This source is now drying up as these countries have developed their own processing facilities, affecting not only our position as an exporter,but also creating a serious problem of unemployment among workers traditionally employed in cashew processing.

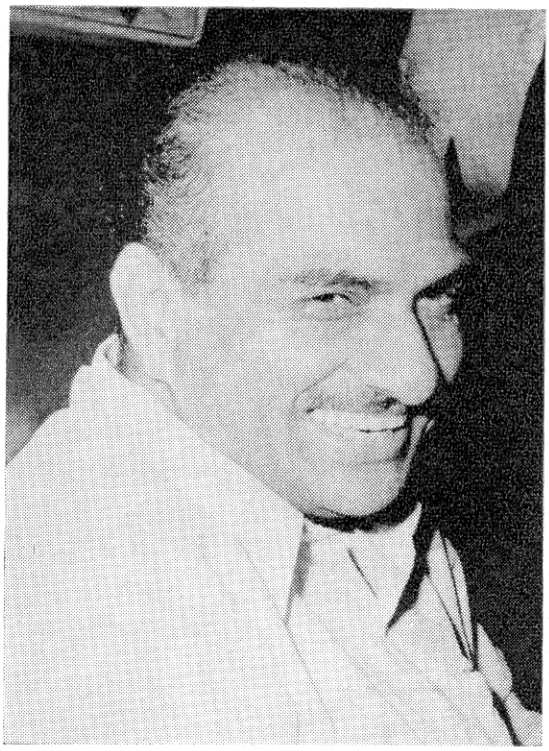
This calls for a close look at the status of cultivation of this crop. It is high time that our concept of cashew as a waste-land crop, primarily to check soil erosion, is changed and that is treated as a horticultural crop. Its cultivation has to be extended to non-conventional areas. Both the west and east coasts of India can be planted with cashew, coconut and casuarina, thereby helping to develop thriving coastal communities. We have to see how, through a combination of sound management and judicious fertiliser application, the yield can be increased.

These are all issues before the scientists and specialists. I hope your deliberation will cover all these points.

I wish you all success.

(Bhanu Pratap Singh)

New Delhi
19 January, 1979



CHIEF MINISTER
GOVERNMENT OF KERALA

I am glad to know that an International Cashew Symposium is being organised at Cochin during 12th to 15th March, 1979. It is most appropriate that Scientists, Technologists, Farmers and Traders connected with cashew are meeting to discuss the problems at a time when the cashew industry is facing some problems. I am sure that the problems will be discussed thoroughly and measures suggested for improving the situation.

I am happy that the organisers of the Symposium are bringing out a Souvenir to mark the occasion. I send my best wishes for the success of the Symposium.

(P.K.VASUDEVAN NAIR)

Trivandrum
1 March, 1979

MINISTER FOR AGRICULTURE
GOVERNMENT OF KERALA

Cashew has a pre-eminent position among the cash crops grown in Kerala. Out of the total production of 1.80 lakh tonnes of raw cashewnuts produced in the country, Kerala's share is about 72%. At present India accounts for 60% of world export of cashew kernels earning a foreign exchange of about Rupees 143 crores.

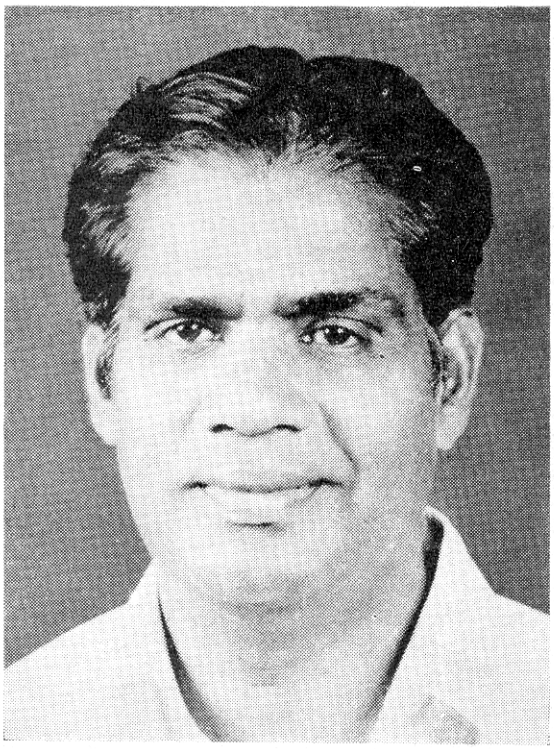
India has a capacity to process 4.5 lakh tonnes of raw cashewnuts leaving a gap of about 2.7 lakh tonnes between the indigenous production and demand of factories. Because of this the processing industry is solely dependent on import of raw cashewnuts from East African countries. However, with the establishment of processing units in African countries and entry of Brazil in the world market the import of raw nuts dwindled and the export of processed kernels decreased sharply from 59,000 tonnes upto 1975 to 39,000 tonnes in 1977. It is obligatory for us to depend on the indigenous production for our raw material production.

I am glad that for the first time ever an International Cashew Symposium is being organised in Cochin during 12–15 March 1979 to discuss the various problems connected with cashew production and industry. I am sure that an international forum like this representing scientists, technologists and exporters will discuss the problems threadbare and suggest measures to overcome the present cashew crisis.

I wish the symposium all success.

Trivandrum
1 March, 1979

(A. L. JACOB)



MINISTER OF INDUSTRIES
& FORESTS
GOVERNMENT OF KERALA

I am very glad to know that the Indian Council of Agricultural Research in association with the International Horticultural Society, Hague, and the Indian Society for plantation Crops is organising an International Symposium on Cashew to discuss the present crisis in Cashew Industry and the steps to be taken to augment production. The subjects selected for discussion have utmost importance in the present day Kerala life and economy. I hope that the Souvenir proposed to be published on this occasion would be a valuable document and wish the endeavour all success.

(P. S. SREENIVASAN)

Trivandrum
15 February, 1979

FOREWORD

In international trade, cashew occupies the third position, coming after hazelnut and almond. India, Tanzania and Mozambique are the leading producers of raw cashewnuts. Until recently, much of the processing of raw nuts was done only in India, but now processing industries have grown in East Africa. Hence the most urgent need in India is the stepping up of cashew production within the country so that the labour-intensive processing industry does not suffer disintegration. This will call for a three-pronged strategy consisting of the following major components :

First, there is an immediate scope for stepping up the yield of the already existing cashew plantations through better plant protection and improved nutrition. In the short term, this will give the maximum payoff. There is a considerable range of variation in the yield of cashew in different

states of the country. Thus, the average yield per tree ranges from 0.2 kg in Orissa to 5.5 kg in Kerala. This indicates the yield-gap existing even at current levels of technology.

Secondly, there is need for re-planting some of the existing old cashew plantations with superior clones. Some of the new strains have given yields of the order indicated below :

Strain	*Yield per tree in kg*	*Place*
Hybrid 2/11	17	Bapatla
Hybrid 2/12	19	Bapatla
BLA 139/1	34	Anakkayam
Hybrid 19	22	Vengurla
Vengurla 2	43	Vengurla

These strains need to be multiplied and popularised.

Thirdly, the area under cashew can be greatly extended without affecting the area under other crops. For example, all along the East and West Coasts, cashew can be planted along with casuarina and coconut. Such plantations, together with the introduction of mariculture techniques, could help to promote thriving coastal communities.

I hope the International Cashew Symposium will help to analyse the available data and suggest approaches to increasing the production and productivity of cashew in all countries where this wonderful plant can be grown.

M. S. Swaminathan

(M.S. SWAMINATHAN)

INTRODUCTION

Cashew, along with rubber and cacao, belongs to a select group of plants that are native to the New World, but have adapted themselves better in the Old World. Cashew grows wildly in parts of Brazil. The Portuguese found the local people using its apples and nuts. They introduced it into India in the early sixteenth century. From India, cashew has been subsequently taken to throughout the tropical world. India, Mozambique, Tanzania, Brazil, and Kenya are the leading producers of cashew in the world.

Tree nuts have been one of the oldest sources of food for man. Though statistics about their production are of doubtful accuracy, according to FAO estimates, cashew leads them today in world production with nearly 6 lakh tonnes raw nuts annually. It ranks also third in international trade of tree nuts with 20% of market, after hazel nuts (29%), and almonds (21%).

Cashew has attained its pre-eminent position only since the last ten years. Up until 1920, there was hardly any international trade in cashew. This was because cashew could not withstand long distance transport and prolonged storage. In the mid 1920's, the position changed dramatically with the development of a process for vacuum packing of processed nuts which increased the stored life considerably.

However, research in cashew is only about three decades old, and organized research about ten years. The present International Cashew Symposium (Cochin South India, 12–15 March 1979) is the first attempt to bring together cashew scientists and technologists from around the world. They will review the work done so far, determine the problems, and plan future course of action. Let us hope that the deliberations will succeed in these.

The Organisers of the Symposium have great pleasure in presenting the Souvenir before you.

MK Muliyar
Chairman
Publicity Committee
International Cashew Symposium

CASHEWNUT—THE NUTTIEST NUT

A WOMAN DID IT

Lord Brahma, God of creation, was enjoying a nap, exhausted, after his creations of all beautiful flowers, fruits, monkeys and man. Saraswati, seeing her husband at rest, stealthily turned her hand at the job he left unfinished. She took the saffron blush of mango, softness of orange, the template of a pear and fashioned them into a fruit. She was enjoying herself with her creation when she found her husband slowly waking up. She felt guilty, and only then she realised her mistake of leaving the nut outside the fruit. She hurriedly dimpled the top of the fruit, stuck the nut and left it hanging upside down on a tree. As Brahma woke up he found his consort sitting there innocently.

Legend says that cashew was thus created and ever since it was lying upside down in the manner.

Cashew-
World problems and prospects

Development of world trade and processing

Small quantities of cashew kernels were imported into the USA as early as 1905. World trade started after representatives of the Central Food Corporation 'discovered' these nuts during their mission to India in the early 1920's. The first shipment consisted of a few tinfuls of kernels only, but in 1923 a load of 45 tons was shipped to the USA. At that time, it took 45–50 days by ship to reach USA from India and the first shipments of kernels arrived infested with weevils. After that, no shipments to New York took place until 1928, when it was found that nuts stored in air-tight containers filled with carbon dioxide gas could be kept in good condition for about 3 to 4 months. Soon after the first successful shipments the industry in India started developing and various processing factories were established. Besides regular shipments to the USA, small consignments were also sent to several European countries, particularly to the United Kingdom and the Netherlands.

By 1941, the Indian export of cashew kernels had increased to nearly 20,000 tons. During the three year period ending 1940–'41 nearly 74,000 tons of nuts, including 28,000 tons of raw nuts imported from Africa, were processed in India annually, yielding about 18,000 tons of kernels. By that time India had established a monopoly position in the processing of cashewnuts and the export of cashew kernels. Due to the war, export came to a standstill in 1941, but by the end of 1943 the United States Government permitted imports of cashew kernels again on the condition that for every 1½ lb. of kernels the exporters would also supply 1 lb. of Cashewnut Shell Liquid, a strategic war material used for brake linings of motor vehicles. In 1944, the unlimited export of cashew kernels was resumed.

JG OHLER

JG Ohler obtained his degree of "Ingenieur" (M.Sc.) in tropical agriculture in 1954, from the Agricultural University, Wageningen, The Netherlands. Ohler has wide experience in scientific cultivation of tropical crops in general and cashew and coconut in particular. After working in tropical region for seven years, Ohler joined the Royal Tropical Institute at Amsterdam in 1962 and is at present the Senior Scientific Officer and Project Co-ordinator in the Department of Agricultural Research of the Institute.

After the war, world production and consumption of cashew increased sharply and it soon became the world's second most important dessert nut, after almonds. Due to the availability of an abundance of cheap skilled labour, India has so far been able to maintain its monopoly position for cashew processing. However, the production of raw nuts increased faster in East Africa than in India, and in 1960 Mozambique took over from India as the main supplier of raw cashewnuts to the processing industry. To overcome the dependence on India for the export of their raw nuts, the East African Countries started to develop their own mechanized processing techniques. In 1966, the first cashew processing unit was established in Tanzania, viz., the Tanita factory in Dar es Salaam. Soon after that, the mechanized processing industry developed strongly in Mozambique and by 1970 India began to feel the competition from this country. Recently the first mechanized processing factories were erected in West Africa, and Brazil increased its processing capacity considerably.

In 1969, the USSR took the place of the USA as the largest buyer of Indian cashew kernels. This situation was attributable in part to the terms of India's bilateral trade agreement with the USSR, but it was also due to the emergence of African Countries as exporters of processed cashewnuts and their increased shipments to the USA.

Other East European Countries such as the DDR and Yugoslavia became important buyers and also in Japan consumption increased considerably.

Table 1 shows that by 1971 world export of cashew nuts had increased to more than 400,000 tons per year, or about 100,000 tons of kernels.

Table 1. World export (1000 tons) of selected edible tree nuts in shell; yearly averages and per cents of totals, 1962-1975

Sort of nuts	*1962–1966*	*%*	*1971–1975*	*%*
Almonds*	290	27	415	26.5
Brazil nuts	35	3	50	3
Cashewnuts	278	26	412	26.5
Hazel nuts	210	20	355	23
Pecans	101	9	109	7
Pistachios	13	1	30	2
Walnuts	150	14	195	12
Total	1,077	100	1,566	100

* Figures for almonds have been computed from original figures presented in tons of kernels, using an estimated kernel content of 40%.

World production and consumption of cashewnuts

The main suppliers of this fruit are the peasants who collect the nuts from the trees growing (sub) spontaneously in the area. Many of these farmers, however, have planted cashew trees around their houses or even have small groves of their own. The area under cashew is steadily increasing because of growing demand and rising prices and in addition to planting cashew on a small scale,plantation scale cultivation also started. In Mozambique, most of the cashew planting in the years before independence was still carried out individually by small holders, but during that period (about 1970) large-scale plantings began in Brazil and East Africa. In Brazil, these large plantations are mainly private enterprises, whereas in Tanzania all 'ujamaa' villages in the cashew growing regions are scheduled to establish new, large plantations on a co-operative basis. Recently, important plantings have been carried out in West Africa, while India is planning to step up its production, mainly to become less dependent on the East African raw nut supply.

Data on total world production of raw nuts are virtually non-existent, mainly because of lack of sufficient information on the areas covered by cashew trees as well as on home consumption in the producing countries. However, a reasonably accurate insight in the production for trade purposes can be obtained by comparing the many data available on import and export of cashew nuts and kernels. In addition to giving a historic review of the production and consumption in various countries, a prognosis has been made of the increase in production in the next 25 years.

These estimates of future production are based on existing cashew acreage in the various countries as well as on programmes already planned for new cashew plantations. It goes without saying that these estimates are rather arbitrary and subject to dispute; they are not made to accurately predict the level of increase, but to indicate the scope of possible developments in future, and this information is badly needed by those planning national and private cashew enterprises. The reader may draw his own conclusion from the information presented.

Table 2 gives a survey of past and predicted figures on world production of cashewnuts, excluding those for home consumption in the producing countries. It shows that between 1955 and 1975 world production increased by an average of 14% or 17,000 tons per annum and that the average annual increase in production between 1975 and 2005 is estimated to be 6% or 26,000 tons. Possibly, world production in the years to come could be higher than indicated in this table, especially after Mozambique would have reinstated itself fully after independence and re-established its former position in growing and marketing of cashew. In the meantime, however, Mozambique is still suffering from various infrastructural difficulties and as a result the cashew production available for trade in 1978 is expected to be only 60,000 tons or about one third of its potential production. In addition, unfavourable climate conditions affect the yields in this country as well as in Kenya and Tanzania. Only in Brazil and India yields are expected to be slightly higher than predicted for 1978 (Forte diminution, 1978).

Table 2. Estimated world production of cashewnuts (1000 tons)

Year	*World*	*Mozambique*	*Tanzania*	*India*	*Brazil*	*Kenya*	*Madagascar*
1955	125	54	18	47	2	2	..
1960	160	63	37	50	2	5	..
1965	280	119	65	80	4	8	..
1970	370	115	110	95	31	13	1
1975	470	166	115	110	44	22	5
1980	535	145	122	130	84	30	10
1985	750	215	135	130	207	35	15
1990	910	235	222	130	229	40	20
1995	1,000	255	240	140	260	45	25
2000	1,120	300	250	150	284	50	30
2005	1,260	350	280	175	290	50	40

Present 1977/78 high prices of cashew kernels will almost certainly stimulate the planting programmes in various countries. But cashewnuts compete with other nuts, and high nut prices may induce increased production of cashew as well as of several other nuts. Consequently, large supplies may result in decreasing prices in the future. The present costs of processing cashew, which are much higher than those of other nuts, allow little flexibility in cashew kernel prices. This implies that it is of great importance to develop cheaper, but as efficient or preferably improved, cashew production techniques. Processing costs can be reduced in first instance by using nuts that are easy to process.

Trends in production are related to trends in consumption, and these in turn will depend on the world economic situation. With increasing standard of living in developing countries a large potential consumer market for cashew kernels may develop, especially in cashew producing countries where the nut is well-known.

Table 3. Cashew consumption per capita (g/year) in 1962-1967 and 1972 various countries (Cashew marketing 1968; Naville 1973).

Country	*1962-67 (mean)*	*1972*
Canada	89	265
USA	162	226
Australia	147	199
The Netherlands	42	154
East Germany	217	102
USSR	46	62
United Kingdom	59	54
West Germany	21	40
Belgium	20	33
France	11	20
Japan	5	17
Italy	3	–

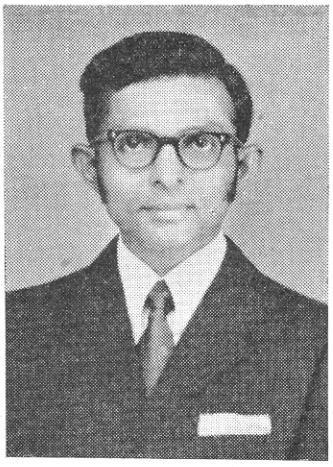
Table 3 shows that within the period 1962–72 consumption per capita in cashew-importing countries has increased considerably, except in East Germany and the United Kingdom. In the Netherlands, consumption in 1972 was almost four times higher than in 1962.

Cashew in the Eighties

The Eighties will down on us in another nine months time. I don't expect any revolutionary changes on the cashew scene in such a short time. These are not easy times for cashew. But, there are some silver linings on the sky. In India, all agencies of the government have been seized of the problems facing cashew. Elsewhere, on the international cashew scene also, there is an awareness about the value of cashew and the problems facing it. Let us examine these briefly.

Tree nuts have been one of the oldest sources of food for man. Today cashew leads them in world production with about 4,50,000 tonnes of raw nuts, and ranks third in international trade with 20% of market, after hazel nuts (29%), and almonds (21%). Tables 1 and 2 give the production of cashew in the world, and in the various countries.

Cashew is indigenous to Brazil in South America. The Portuguese first introduced cashew into India in the early 16th century. From India, it was subsequently taken to several other tropical countries. Though the usefulness of cashew apple and nuts was known to man right from the time it was taken up for cultivation by him, there was no organized international trade in cashew until the mid twenties. This was because cashewnuts, being rich in fat (more than 45%), has only a poor keeping quality, and it was also very susceptible to stored pests. In the mid-twenties, the process for vacuum-packing was developed and this paved the way for the rapid development of international trade in cashew. From an annual export of less than 50 tonnes in the early twenties, it rose to 10,000 tonnes by early thirties. During the Second World War, there was a slump in international trade of cashew. This trade again picked up rapidly in the late-forties. This went on uninterruptedly till the early-sixties.



NM NAYAR

NM Nayar, graduated in agriculture from Delhi University in 1953. From 1953 to 1959 he was working in the Department of Agriculture, Kerala State. In 1959 he proceeded to USA and did his graduate studies leading to Ph.D. in Plant Breeding from Louisiana State University. On his return to India, he worked in various capacities in the Kerala State Agricultural Department, Central Potato Research Institute, Simla, and Central Rice Research Institute, Cuttack till 1968. From 1970 to 1972 he worked in the Institute of Plant Breeding, University of Gottingen on a Senior Research Fellowship from Alexander von Humboldt Foundation. In 1972 he took up the post of Joint Director, Central Plantation Crops Research Institute, Vittal and was appointed to the position of Director of the Institute at Kasaragod in August 1977. He has to his credit over 50 scientific publications. Besides being a member of a number of scientific societies, he is also the Editor, Journal of Plantation Crops, right from its first publication in 1972.

India had an almost absolute monopoly in the international trade of processed nuts till early-sixties. At that time, the export of processed nuts had reached 40,000 tonnes. Processed cashewnuts constitute about one fourth of raw nuts. The indigenous production of cashew was then about 70,000 tonnes of raw nuts. India has also been importing big quantities of raw nuts, mostly from East African countries to sustain the international trade in cashew. The quantity that was being imported varied widely, but it was about 54,000 tonnes, in the fifties and over 100,000 tonnes in the sixties. The maximum quantity of raw nuts imported into India in any one year was 2,04,000 tonnes of raw nuts in 1968.

Table 1. World production of raw cashewnuts (1975)* (quantity in metric tonnes)

Year	*Total*
1947	76,000
1957	1,75,000
1967	2,82,000
1972	4,14,000
1975	3,96,000

**Source*: Cashew Export Promotion Council, Cochin, India

Table 2. Production of raw cashewnuts in important producing countries (1975)* (quantity in metric tonnes)

Country	*Quantity*
India	91,000
Mozambique	1,27,000
Tanzania	1,02,000
Kenya	25,000
Brazil	46,000
Others	5,000
Total :	3,96,000

**Source*: Cashew Export Promotion Council, Cochin, India

The processing of cashew in India is done in over 200 factories located along the west coast of India, mostly centered around Quilon. Though called as factories,most of the shelling, peeling, polishing and grading is done by deft manual labour. In the fifties, processes were developed for mechanical processing of cashew. Two of these are marketed by Sturtevant Engineering Co., London based on the know-how developed by the Tropical Products Institute, London, and the Oltremere System developed by the firm Oltremere Bologene, Italy.

In view of the attractive prices that cashew has been fetching in the international market, several cashew growing countries have been installing these mechanical cashew processing units for processing the nuts produced in the respective countries. In 1975, it was estimated that mechanised processing units with an installed capacity of over 250,000 tonnes of raw nuts annually have been installed in various countries. Several countries are now negotiating for installing additional mechanical processing units, some with UNDP assistance. The 200 and more factories in India have an installed capacity for processing more than 450,000 tonnes of raw nuts annually. Thus, the world production of raw nuts should reach more than 750,000 tonnes immediately, if all the cashew processing units round the world have to work satisfactorily. The world production may have to go upto one million tonnes by end eighties.

In the meanwhile, cashew has also been facing increased competition from other tree nuts, particularly macadamia. This nut, which is a native of North-Eastern Australia comes up well in cooler tropics and is now being cultivated in increasing areas in Australia, USA (Hawaii) and in certain East African countries. If cashew has to maintain its present position *vis-a-vis* the other tree nuts, then the price of processed cashew will also have to be brought down substantially.

Thus, we see that the production of raw nuts in the world should attain one million tonnes

and also that it should be made available at a much cheaper rate by end eighties if cashew has to sustain its present position in the world market. This can be achieved only by increasing the production of raw nuts and reducing the cost of cultivation and processing.

India was the first country in the world to initiate cashew research in the mid-fifties. Cashew research efforts in the first 15 years in India were of sporadic nature. In the early seventies, with the launching of the All India Co-ordinated Spices and Cashewnut Improvement Project and the initiation of cashew research by the CPCRI, cashew research in India was organised on systematic lines. In the meanwhile, some cashew research, particularly on basic aspects of flowering and seed production was also being done in East Africa and Brazil.

The results of cashew research carried out so far in India have resulted in the development of 17 cultivars which are capable of yielding upto 30 kg raw nuts per tree annually by about the 7th–10th year. Some of them in full bearing can yield upto 50 kgs. Cashew is not, fortunately, affected by any serious disease so far. However, tea mosquito and stem borers are important pests of cashew. More recently, thrips and some fruit borers are also becoming important. Tea mosquito normally causes a reduction in yield of 25– 30%. Methods have now been developed for controlling tea mosquito. Likewise, manurial recommendations have also been made for cashew. The results of some mini-kit trials carried out under the All India Co-ordinated Spices and Cashewnut Improvement Project during 1975–77 have shown that adoption of just two of the recommended practices viz., control of tea mosquito, and manuring of cashew, can boost up the production 2–3 fold. One, only need to imagine what great potentialities exist in increasing cashew production, if its cultivation can be taken up on scientific lines using improved cultivars and by following the recommended manurial and plant protection schedules. We can confidently assume that with these, we can attain the desired production of one million tonnes raw nuts by end eighties.

There are also other problems that need solution. These involve identifying high yielding cashew types which will yield their harvest within a short period of say, 3–4 weeks, as against the present 3–4 months. This is because it has been estimated that about 40% of the cost of raw nuts is taken up by harvesting charges alone. This could be brought down considerably if the bulk of cashew harvest can be obtained within a short period of about three weeks. In addition to identifying varieties with a shorter flowering period, this can also be attained by proper hormonal treatments. Work on both these lines, for identifying types with restricted flowering period, and for developing hormonal sprayings, are now under way.

There is also a need to reduce the cost of production by reducing the cost of processing. According to an estimate about 40%of the retail price of processed cashew is taken up by processing and marketing costs. There is thus a need to progressively adopt mechanised processing, particularly in India to reduce the cost of processing. This should however be done progressively so that no hardship is caused to the cashew factory workers.

The present mechanical processing also needs some further development and sophistication. This is because the breakage percentage of processed kernels goes to 30–40 with mechanised processing. Possibly, this could be reduced substantially if we can evolve cashew nuts which are bolder and less curved. Work to identify such types has also been initiated.

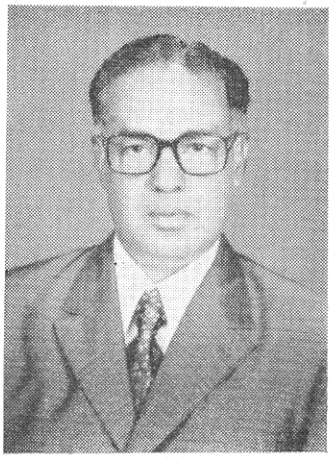
The foregoing account would show that the outlook on cashew in the eighties need not be bleak if all the agencies interested in promoting cashew will face the problems in an integrated manner to develop cashew cultivation and research on sound lines. Let us hope that the deliberations of the Symposium will go a long way in achieving this.

All India co-ordinated cashewnut improvement project - its aims and achievements

Cashew, *Anacardium occidentale* L. is a native of Brazil and was introduced to India in the 16th century. Like any other introduced species, cashew also got naturalised under more favourable conditions found along the coastal regions of Peninsular India. Systematic cultivation of cashew started only recently after recognizing the economic importance of the crop. Even today over 95% of the raw nuts collected for processing are estimated to be from wild growth of cashew trees.

Cashew processing industry had its beginning in Mangalore and the first consignment of cashew kernels was reported to have been exported even before the First World War in 1914. Eventhough cashew was cultivated in several other countries for the past many years, until about two decades ago, except India no other country seriously entered the field of processing cashew. In early 1960's India had the monopoly in processing and supply of cashew kernel to the world market. The situation is fast changing. In the early 70's India was commanding over 60% in world export of cashew kernel with only 16% share in the world production of raw nuts. During the last three decades Indian export has been growing much faster than the Indian production of raw nuts. Obviously this is not a healthy growth. Moreover the major producing countries of the African Continent supplying raw nuts to India, are progressively increasing their processing capacities and necessarily India has to face competition with the very same countries in world market.

The expansion of cashew processing industry has been phenomenal and not on sound footing. The raw nut production, however, has not kept pace with the increase in processing capacity.



MC NAMBIAR

MC Nambiar started his career as a Research Assistant in the Department of Agriculture in Madras after his graduation from the Agricultural College and Research Institute, Coimbatore. In 1951 he joined the erstwhile Central Coconut Research Station, Kasaragod as a Research Assistant and in a span of twenty years became its Director before the station merged with the reorganised Central Plantation Crops Research Institute. He has been the Project Co-ordinator for All India Co-ordinated Spices and Cashewnut Improvement Project right from its inception in 1971. He was the President, Indian Society for Plantation Crops for the term 1976–1978. Nambiar has published more than 30 scientific papers in leading Indian and International journals.

In India the present processing capacity is estimated at about five lakh tonnes per annum while, the indigenous production of raw nuts is less than 1.5 lakh tonnes thus leaving a gap of 3.5 lakh tonnes.

Our strategy to achieve self sufficiency in raw nut production, therefore, should be to increase the production to meet our immediate requirement and production programme directly correlated to the future expansion of the industry. The demand for cashew kernel in the affluent countries of North America, Europe, Japan and USSR has been growing rather rapidly. The world demand for cashew kernel is projected at 2,35,000 tonnes by 1980 as against the export availability of 1,08,600 to 1,19,600 tonnes in 1975. Thus there appears to be an assured world market for cashew kernel provided India could keep down her production cost and compete successfully with the other exporting countries.

While immediate increase in yield can be achieved by adopting improved management practices including fertilizer application and plant protection measures, stability and long range increase in production could be achieved only by adopting an integrated production programme based on technology developed under the All India Co-ordinated Cashewnut Improvement Project of the Indian Council of Agricultural Research.

Research on cashew can be considered to have commenced with the sanction of *ad hoc* schemes by ICAR from 1951–52 onwards in the three centres of erstwhile Travancore, Madras, and Bombay Presidencies and later extended to Andhra Pradesh and Assam also. The research work done in the country have been largely on varietal collection, hybridization work and a few *ad hoc* trials on agronomic requirements. These isolated trials had not really made any appreciable impact on production. Realising that this important commercial crop lacks research support, the ICAR sanctioned an All India Co-ordinated Project for the improvement of cashew during the IV Five Year Plan period with main centre at Kasaragod and five sub-centres located in different agroclimatic regions, viz., Bapatla in Andhra Pradesh, Vridhachalam in Tamil Nadu, Vittal in Karnataka, Vengurla in Maharashtra and Mannuthy in Kerala. During V Five Year Plan one more centre was added at Bhubaneswar in Orissa to cover red soil areas of East Coast.

As in any other crop improvement project, the aim of the cashew improvement project is to develop a total management for improving the yield of cashew per unit area. With this objective in view, research programmes have been drawn up and implemented at different centres. The research programmes envisage: (1) evaluation of germplasm assemblage and identification of superior types based on yield and quality of nut and apples, (2) hybridization and selection to evolve high yielding types, (3) standardisation of vegetative propagation methods for multiplication of superior types clonally, (4) standardisation of agronomic practices for different agro-ecological region and (5) evolving plant protection measures against important pests and diseases.

1. High yielding selections

Over 800 germplasm accessions assembled at different centres have been evaluated for yield and quality of nut and apple. Substantial variability has been recorded in plant type, percentage of perfect flowers, fruit set per panicle, number of fruits harvested per panicle, size of the nut and shelling percentage, colour, shape and juice content of the apple. Based on evaluation, 24 elite trees have been identified for immediate multiplication and distribution to the cultivators. Extensive cashew plantations are raised mostly on marginal lands and invariably by marginal farmers. A programme of total replacement of the seedling material with clonal material appears to be an impracticable proposition at present. The other alternative is to supply seedlings raised from seeds of elite trees with proven progeny performance. Preliminary evaluations based on progeny performance of 16 selections show that seedling progenies of Vridhachalam types M 10/4, M 6/1, M 14/3, and M 76/1 and of one type from Anakkayam, BLA 139/1 performed better at all the centres.

Thousands of progenies of each of these elite trees are available in compact family blocks in

the plantation of the Department of Forestry, Andhra Pradesh. These are being evaluated and the seeds from the promising lines would become available for large scale distribution.

Hybrids

Breeding programmes undertaken at Vengurla, Bapatla, and Anakkayam have helped to evolve high yielding hybrids. Two hybrids 2/11 and 2/12 evolved at Bapatla and 3 hybrids, H–3–17, H–3–19, and H–4–7 evolved at Anakkayam and Hybrid No. 5,8, 11, 19, 24, 25, 26 and 92 evolved at Vengurla are high yielders with good quality nuts and apples. All of them have recorded more than 10 kg of nuts per tree per year by about eighth year of their orchard life. Since cashew could be vegetatively propagated by budding and grafting, immediate advance in yield could be possible by exploitation of the hybrid vigour.

Clonal propagation

The possibility of both seed and clonal multiplication in cashew is a distinct advantage for fixing the hybrid vigour in the crop. During the last five years a very high percentage of success has been reported in veneer grafting. The best method appears to be to get the buds and grafts ready before June and plant them in the field with the onset of South West monsoon. The pioneering work done by the Forest Department, Goa has indicated the possibility of budding of cashew in March-April under controlled condition and transplanting the bud grafts to the field with the onset of monsoon. Trials to work out the management practices for clonal propagation and field management under different agro-ecological conditions are in progress.

Fertilizer requirements

Based on the available data on nutrient removal by the plant and response to fertilizer application in the field trial, a recommendation of 250g N, 125g P_2O_5 and 125g K_2O per plant per year has been adopted for cashew trees yielding about 5 kg nuts/year. For trees giving more than 10 kg a higher level of fertilizer application is recommended. A comprehensive fertilizer experiment has been laid out at different agro-ecological conditions to determine the fertilizer requirement for different types of soils.

Plant protection

Tea mosquito is an important pest in cashew and accounts for more than 30% of the crop loss. Control measures against this serious pest and other major pests of cashew have been evolved. A community action for the control of the pest is, however, necessary since spraying insecticides in patches is not found to be effective in controlling the pest. Where extensive areas are to be covered, it is advisable to go in for aerial spraying of insecticides. It is found to be effective and cheaper. Apart from the lower operational cost, the coverage of extensive areas wtihin a short period is an added advantage in the control of tea mosquito in cashew plantations. Stem borer is another important pest, for the control of which phytosanitary measure is found to be more effective.

Thus technology is available to increase our production of cashewnut per unit area. What is more important is the effective transfer of the technology developed under the All India Co-ordinated Cashewnut Improvement Project to the field level.

Strategy for stabilising the cashew industry in India

As at present, cashew is one of the few versatile tree crops that offer considerable potential for foreign exchange earning and employment generation. In spite of this, the attention given to its production, processing and marketing both by public and private sectors has been far from satisfactory. This has resulted in a virtual crisis in the cashew industry. There is no lack of understanding of the problems facing this industry. A gathering of officials and non-officials representing the different interests in cashew which met at Ernakulam on 15th September, 1976, for a one day Seminar on 'Increasing Cashew Production and Productivity' came out with very practical suggestions to solve the foremost problem of raw nut shortage in the country. The various agencies had given the assurance of their participation on the following action programme suggested by the conference.

1. Transfer of the available known technology to the fields both by departmental agencies and through community efforts.
2. Increasing the efficiency of production so as to bring down the cost of production.
3. Expansion of area under cashew.
4. Fixing minimum yield targets for different states.
5. Better utilisation of by-products.
6. Financial assistance to small farmers and subsidy for new plantations.
7. Participation of processing industry in development programmes.
8. Co-ordination of marketing and development activities through a Board on lines with Coffee and Tea Boards.

KVA BAVAPPA

KVA Bavappa had a brilliant academic career and stood first in the University for his graduation. He started his research career as a Research Associate in rice and later on shifted to arecanut. As the Arecanut Specialist of the erstwhile Central Arecanut Research Station he standardised the selection procedures in arecanut on sound biometrical principles. When research on plantation crops was unified he became the first Director of the Central Plantation Crops Research Institute in 1970 and continued in the post till 1977 when he was selected as a Spices Expert under the UNDP/FAO Project in Sri Lanka. Bavappa was also the Founder President and first elected President of the Indian Society for Plantation Crops. So far,he has published 92 research and research management papers in national and international scientific journals.

If action had been initiated on a priority basis, these would have yielded very useful results by now. This does not seem to have happened. Ironically, the situation appears to be worsening in the recent past.

National Authority for cashew

It is evident that the cashew industry has no right leadership which can authoritatively implement the decisions taken and advise the government on various policy matters on a national basis for its betterment. When cashew earned an all time record of 1432.2 million rupees in foreign exchange during 1977 there was no better pointer for India to jump into crash programmes for forging ahead the industry. This has not happened and may not happen in the near future if the multitude of private and public agencies continue to deal with the production, processing and marketing problems in isolation. The different areas of thrust have been identified and if they remain as pious resolutions locked up in shelves, time is not far off when India may be pushed back from international cashew trade as it happened in the case of pepper and cardamom. It is immaterial whether we call this agency a Board,a Corporation, an Authority or something else but it is very important that it comes into existence as early as possible so that the existing constraints both at national and international planes are removed.

Land ceiling holiday

When tea, rubber, coffee, cardamom, cinnamon cacao, etc. were exempted from the purview of land ceiling, the rationale behind including cashew under land ceiling seems to be more due to historical reasons than economic considerations. Compared with other plantation crops on net return per unit area basis, cashew is still a marginal crop. Farmers are bound to search for more remunerative crops for the limited land available. Due to this very reason large scale area expansion is unlikely in the private sector. No doubt, with the free distribution of cashew seedlings and the limited amount given as subsidy to start the planting, there is bound to have some increase of area in the smaller holdings. We may be misguiding ourselves if we lean too heavily on such areas as potential producers of cashew. One of the quick ways of bringing the available private lands under cashew is to exempt the crop from land ceiling for a period of, say five years ensuring that such areas will continue to be outside land ceiling.

Healthy competition of private and public sectors

Until such time a single agency which can effectively direct and control the various aspects of cashew industry comes into existence it may be suicidal if *ad hoc* changes are made on purchasing and distribution of raw nuts, processing and marketing systems. Nationalisation or monopoly handling by the public sector is not likely to improve the situation for obvious reasons. If there is any apprehension about the exploitation of the interests of the producer and labour by trade, a better course would be the establishment of a corporation or co-operative which can enter into the appropriate area of the industry as and when there is a need for the same in an effective manner. The outstanding example of such a situation is the establishment of 'CAMPCO' by public and private participation which salvaged the arecanut industry from its price crash in 1973–74 and narrowed down the gap between the share of the producer and the consumer in every rupee of the produce transacted.

Need for international understanding

The development of cashew processing industry in East African Countries particularly Tanzania and Mozambique and the emergence of China and Brazil as cashew exporters, have reduced the raw material availability in the world market. This has affected the cashew industry of India which still has to import a sizeable quantity of raw nuts for feeding its processing factories. The cost of production of cashew is already high in India compared to other cashew producing countries which can bring in cut-throat competition. In the interest of all the cashew producing countries, it will be useful to have an understanding about making available raw nuts to the different countries where there are established processing factories, the minimum price at which cashew will be released for the consuming countries, the regions in which each of the producing countries may market its nuts and such other vital problems of mutual interest. Forming 'Cashew Community' similar to those in coconut and pepper can go a long way in achieving this objective.

It is most opportune that the International Cashew Symposium is being held at a time when concrete action programmes both at national and international levels are called for stabilising the industry.

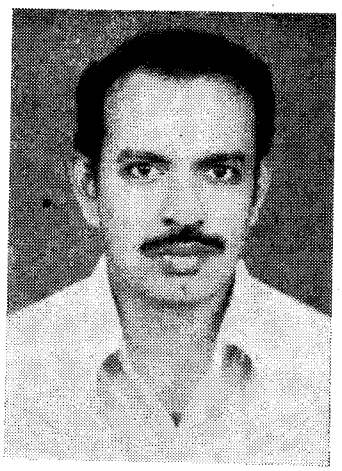
Cashew development programmes under the Kerala Agricultural Development Project

The Kerala Agricultural Development Project (KADP) is the first project to be implemented in the agricultural sector with financial assistance from the World Bank. It was prepared by the Agriculture Department of the Government of Kerala with the assistance of a FAO/IBRD Co-operative Programme Mission which visited India during 1975. The total cost of the project is Rs. 63 crores of which Rs. 27 crores will be received by way of IDA credit. The span of the project is seven years. The project is under implementation since April, 1977.

The project has, as its main objective, the improvement in productivity of major foreign exchange earning tree crops like coconut, cashew and rubber and also pepper with emphasis on improving the economic status of the small - holder - farmer. This paper deals with only the Cashew Development Sub-Project under KADP.

Cashew is one of India's major foreign exchange earners. India produces about 140,000 tonnes annually and imports an equal quantity for processing before export. The import of raw nuts has been declining as the main suppliers have developed their own processing facilities. Kerala produces about 118,000 tonnes of raw cashew per annum from about 105,000 ha, which works out to nearly 84% of national production. The average cashew yield in Kerala is 1.1 tonnes per ha which can be increased substantially with improved management. Hence Kerala is considered the ideal state with the best prospects for increasing national production.

The Cashew Development Sub-Project included in KADP is to be implemented by the Plantation Corporation of Kerala Limited



TN JAYACHANDRAN

TN Jayachandran, Director, Special Agricultural Development Unit, Kerala Agricultural Development Project, Trivandrum did his M.A. (Economics) from the University of Travancore in 1956 and Master's Diploma in Public Administration, from the Indian Institute of Public Administration, New Delhi in 1960. He also has a diploma in Development Studies from the Cambridge University, U.K., to his credit. He worked as Lecturer in Economics in the Kerala Varma College, Trichur, and Deputy Collector to the Kerala Government Service before he was appointed to the Indian Administrative Service in 1967. He has spent one academic year under the Wolfson College, Cambridge University, U.K. and also visited Tokyo and South Korea. He took up his present assignment right from the Project's implementation in January, 1977.

a company owned by the Government of Kerala. The object of the sub-project is to increase production and productivity of cashew by better management and also to demonstrate the potential of cashew cultivation by using improved varieties and techniques. The sub-project consists of the following components: (1) Rehabilitation of 2280 ha of cashew plantation owned and operated by the Department of Agriculture, Kerala; (2) New planting of 1470 ha of cashew on reserve forest land to be made availabe by the Forest Department; and (3) Establishment of a pilot plant to test the techniques and economics of processing cashew apple.

Rehabilitation programme

It has been indicated that improved farm techniques such as cultural, manurial and plant protection practices are very effective in increasing the nut production from the bearing plantations. It would appear that at least 40% of the crop lost annually could be saved merely by undertaking prophylactic spraying against pests and diseases. The rehabilitation programme under the project is to demonstrate the financial viability of cultivating cashew on a scientific basis. Plantation Corporation of Kerala has taken over the cashew plantation of 2280 ha in the Cannanore District owned and operated by the Department of Agriculture, during February 1977. Due to government budgetary constraints the Department of Agriculture has not been able to maintain the plantation properly. The Corporation would rehabilitate the plantation by applying scientific management practices including replanting of 250 ha with high yielding varieties to replace uneconomic trees, adequate fertilizer application and regular sprayings against pests and diseases. Since the take-over of the plantation by the Corporation, scientific maintenance methods have been adopted as a result of which 300 tonnes of cashewnut could be procured during the season of 1978.

New planting programme

The new planting programme is meant not only to expand production of raw nut by increasing area under cashew but also to demonstrate the benefits of scientific cultivation practices to those given to other commercial crops. New planting of cashew would be taken up in about 1470 ha of reserve forest land made available to the Plantation Corporation by the Kerala Forest Department.

For both rehabilitation and new planting the planting material used is selected from trees possessing characteristics like high yields, short flowering period, compact panicle, high percentage of perfect flowers, good fruit-set and large and uniform nut size. The planting intensity is 200 plants per ha. It is proposed to adopt a system of adaptive thinning to ensure adequate spacing between trees depending on the canopy growth of each tree. Fertilizer application is in accordance with recommendation of the Department of Agriculture. An area of 500 ha has already been planted up by the Plantation Corporation so far.

Pilot plant for cashew apple processing

The pilot plant for cashew apple processing is expected to demonstrate economic uses of cashew apple, which is now largely wasted. It is proposed to set up a pilot plant with a capacity for processing four tonnes of fruits per day, for making cashew apple brandy and also to try out an integrated process for preparation of jam, juice concentrate, candy and chutney. The Plantation Corporation of Kerala has already got a feasibility study prepared by the Central Food Technological Research Institute, Mysore. The plant is being set up in Muliyar village (Kasaragod) of Cannanore District.

The Cashew sub-project of the KADP is being implemented by a department of Plantation Corporation headed by a General Manager (Cashew). The required administrative and technical staff have already been put in position. The cost of the sub-project over a period of seven years is estimated at Rs. 1.62 crores and the economic rate of return of the sub-project has been estimated at 39%. The successful implementation of the sub-project is expected to attract more assistance from the IDA for implementation of new projects on cashew. A new Cashew Development Project has been prepared by the Government of Kerala and submitted to the Government of India for consideration for World Bank assistance.

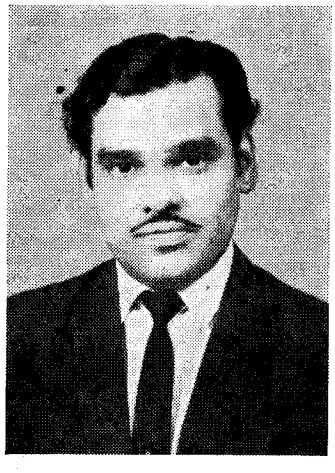
Production and foreign trade of Indian Cashew

Cashew-botanically known as *Anacardium occidentale,* was introduced to India by the Portuguese about 400 years ago mainly to prevent soil erosion. But gradually it gained commercial importance and now cashew kernel is one of the major export commodities from India, earning foreign exchange to the tune of Rs. 1480 million in 1977–78. Cashew industry is both export oriented and labour intensive, employing more than two lakh employees. The total requirements of raw nut as per the present capacity of the cashew industry in the country is estimated at about five lakh tonnes. The total production in the country is estimated at about 1.80 lakh tonnes out of which 1.25 to 1.50 lakh tonnes enter the export trade, the rest being consumed locally.

Production

Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Goa, Maharashtra and Orissa are the major and West Bengal, Tripura and Pondicherry are the minor cashew growing states in the country.

Schemes for the development of cashew were first initiated during the Second Five Year Plan. The development schemes implemented during the Second and the Third Five Year Plans were mainly for increasing the area under cashew in both departmental and non-departmental areas of the major cashew growing states. These programmes were sought to be accomplished by giving various incentives and assistance to the growers such as planting materials at cost price and subsidised rates. The Department of Agriculture, Horticulture, Soil Conservation and Forest in the respective states were responsible for increasing the area under cashew in government lands. The area under cashew increased from 1,03,573 ha at the end of the First Five Year Plan to 2,45,134 ha at the end of the Third Five Year Plan. During this period the production also increased from 58,969 tonnes to 93,320



L KRISHNASWAMY

L Krishnaswamy who is the Deputy Director (Marketing) in the Directorate of Cashewnut Development, Cochin passed his M.Sc. (Ag.) in Agricultural Economics with a First Class in 1962. He took his Ph.D. degree in Agricultural Marketing in 1974. He served under the Market Research Scheme in the Directorate of Marketing and Inspection and the Directorate of Economics and Statistics of the Ministry of Agriculture, Government of India and as Special Officer in the Department of Agriculture, New Delhi before moving to Cochin. He has published a number of papers mainly on Agricultural Marketing and Co-operatives and visited Brazil, Argentina, Mexico and USA.

nnes. The area under the crop could further be increased to 2,64,302 ha and the production to 11,280 tonnes at the end of 1968–69.

More intensive effort on the cashew development programmes was put from Fourth Five Year Plan onwards. Since then significant improvement has been made in the development of cashew cultivation in the various cashew growing states in the country both under the Centrally Sponsored Schemes and State Sector Schemes. During the Fourth Five Year Plan period the area and production of cashew increased to the level of 3,64,041 ha and 1,40,000 tonnes respectively. The various cashew development schemes in the Fifth Five Year Plan viz., Centrally Sponsored Schemes, Central Sector Schemes and State Sector Schemes also contributed to increase the area and production under cashew to the level of 4,17,296 ha and 1,79,305 tonnes in the year 1976–77. Statewise area and production of cashew are given in table 1.

Table 1. Statewise area and production of cashew (1976 - 77)

Name of State	*Area in hectares*	*Production in metric tonnes*
Kerala	1,18,139	1,29,021
Karnataka	36,534	15,175
Tamil Nadu	97,130	11,470
Andhra Pradesh	25,100	12,500
Maharashtra	79,808	3,634
Goa	32,517	6,500
Pondicherry	322	42
Orissa	24,487	940
West Bengal	2,506	Neg.
Tripura	753	23
Total	4,17,296	1,79,305

Import of raw nuts and export of cashew kernels

The year-wise import of raw nuts and export of cashew kernels and the percentage of indigenous production reflected in the export trade for the period from 1967–68 to 1977–78 are given in table 2.

It may be observed from the table 2 that about two third of the processed nuts were imported till the year 1973–74 and only one third of it was met by the indigenous production.

From the year 1974–75 onwards the percentage component of the indigenous nuts which entered in the export trade has been gradually increasing. This is due to more effective collection of raw nuts coupled with increased production and the decrease in imports. India imports raw nuts mainly from Tanzania, Mozambique and Kenya. The main reasons attributed to the dwindling imports of raw nuts are that Mozambique, which was having an exportable surplus of 50,000–70,000 tonnes during early 1970's, could not even collect the raw nuts for their own processing capacity itself. To cite an example, during 1977 season they programmed to collect 1,85,000 tonnes but actually it was reported that they collected only 65,000 tonnes. Likewise in Tanzania, the procurement machinery changed from the Co-operatives to the hands of the Cashewnut Authority of Tanzania. (CATA). Against an average estimated collection of 1,20,000 to 1,30,000 tonnes, CATA could collect only 90 to 95 thousand tonnes in 1977. Thus the exportable surplus from the original level of 90,000 tonnes after retaining 25,000 tonnes for their own processing, has dwindled considerably coupled with China's entry into raw cashewnut market. Here again some organisational changes and drought conditions are attributed for lower production/collection. Similarly, Kenya used to have exportable surplus of 10 to 15 thousand tonnes out of their total estimated production of 25 to 30 thousand tonnes. But they could export only 1,100 tonnes during last year and no exports during the current year. The reasons are that Kenya had established a mechanical processing unit during 1976 October–November and utilised about 20,000 tonnes of their production for their own processing. Unfortunately even the balance exportable surplus was not available to us due to reduction in their total production during 1976–77 due to drought and complete crop failure there.

The export of cashew kernels started with the first shipment of about 50 tonnes from India

Table 2. Import and Export of cashew kernels

Year	*Export of cashew kernel in tonnes*	*Raw nut (24%) equivalent*	*Import of raw nut in tonnes*	*Component of indigenous production in tonnes*	*Percentage of indigenous production reflected in export*
1967–68	51,039	212,663	168,218	44,445	20.89
1968–69	63,661	265,254	195,528	69,726	26.28
1969–70	60,625	252,604	163,426	89,178	35.31
1970–71	50,284	209,516	169,359	40,157	19.16
1971–72	60,378	251,575	169,985	81,590	32.43
1972–73	66,278	276,158	197,938	78,220	28.32
1973–74	52,293	217,887	150,249	67,638	31.04
1974–75	65,025	270,937	160,358	110,579	40.81
1975–76	53,640	223,500	137,196	86,304	38.61
1976–77	51,565	214,851	74,131	140,723	65.49
1977–78	39,111	162,962	60,194	102,768	63.06

to U.S.A. during the first quarter of the present century. Since then the growth of exports has been phenomenal. In 1960 India was supplying 95 per cent of the world demand by exporting 39,436 tonnes with the U.S.A. as the biggest buyer followed by the U.S.S.R., U.K., Eastern Europe, Canada, Australia and West Germany. However, India's share of world exports fell to 69 per cent in 1970. The loss of the pre-eminent position held by India was due to the rapid strides in mechanical decortication in East African countries which have caused for the shrinkage of supplies to India. It may be observed from the above table that the quantum of export of cashew kernels in the last decade varied from 50,000 to 66,000 tonnes annually. As the average recovery percentage is about 24, to keep up the present tempo of exports at 66,000 tonnes of cashew kernels, the processing factories will require 2.76 lakh tonnes of raw nuts. In addition to this, the quantity required for local consumption is estimated at 40,000 tonnes. Therefore, the total requirement of raw nuts at-least to maintain the present level of exports including local consumption would be more than three lakh tonnes and the total requirement to feed the factories would be five lakh tonnes. Accordingly the Sixth Five Year Plan proposals have been drawn up with the dual objectives of increasing the production to the level of three lakh tonnes during the plan period itself and achieving the ultimate production target of five lakh tonnes in the long run to feed the existing capacity of the processing units in the country.

Cashew Corporation of India - task and challenge

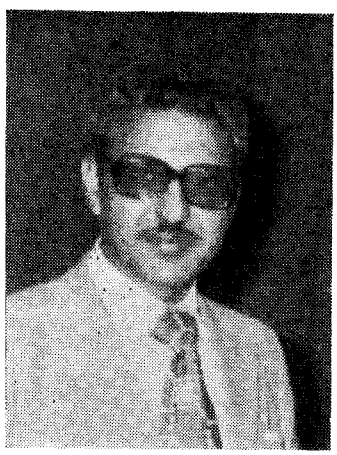
The importance of the cashew industry to the Indian economy is two-fold; its labour intensive character providing, as it does gainful employment to more than 150,000 workers and its export orientation, earning for the country, a substantial amount of foreign exchange with a record performance of Rs. 1476 million for 1977–78. The spectacular growth of the industry since its humble beginnings in 1920's has an undercurrent of a crisis of one type or the other. Each crisis has provided an opportunity for displaying the industry's resilience in holding its own in the increasingly competitive international cashew market.

A new factor in the 1970's in the Indian cashew industry is the emergence of the Cashew Corporation of India, a Government of India Undertaking, following the Government's decision to canalise the imports of raw cashew through the Corporation with effect from 1st September 1970. Organisationally structured to service the import requirements of export oriented cashew industry, it is now poised for a multi-faceted role of import, development of indigenous production and exports so as to discharge its commitment of service to the industry.

Imports

An assured global market, a consistent rise in world consumption of cashew kernels and the traditional skills of processing provided an ideal environment for the growth of processing capacity in India far in excess of the indigenous availability of raw cashew. The gap in supplies was bridged by imports, mostly from the East African belt of Mozambique, Tanzania and Kenya. Dependence on imports became so marked, that the imported supplies accounted for two-thirds of the industry's requirements.

While the need for imports was ever-growing the supply base in East Africa was getting



BS THACKER

Basant Shivji Thacker is the Chairman, The Cashew Corporation of India Ltd., Managing Director, State Chemicals and Pharmaceutical Corporation of India Ltd., and the Executive Director, The State Trading Corporation of India Ltd. Thacker is a Fellow of the Institute of Chartered Accountants(England & Wales)., A. T. I. I., and A. C. S. He is responsible for management and development of international trade in various commodities and products handled by the State Trading Corporation of India Group Companies and advising Government on related policy issues.

eroded following the setting up of the mechanical decortication units particularly in Mozambique. Similar developments in Tanzania and Kenya were on the cards. With the prospect of supplies tending to become critical, it became necessary to set up a centralised agency of import for ensuring equitable distribution of the scarce raw material for sustaining exports of cashew kernels. It is the above need which led to the formation of the Cashew Corporation of India.

Set up with a paid-up capital of Rs. 5 million in 1970, CCI has augmented the capital base to Rs. 150 million by two issues of Bonus Shares. During the past eight years its imports have aggregated to one million metric tonnes, valued at Rs. 2056 million.

While during the five year period ended 31st December, 1975, imports have averaged at 1,67,000 metric tonnes; there has been a perceptible fall in the level of imports since 1976 primarily due to the poor crop in the East African belt compounded by lower crop collection. Increase in processing capacity in Tanzania and Kenya and sustained purchases of large quantities by China also caused a shrinkage of supplies. The drop in availability reached such serious proportions that the imports in 1978 were as low as 23,000 metric tonnes. Notwithstanding these setbacks, CCI is continuing its efforts to maintain a reasonable level of imports by exploring the possibilities of long-term contracting and of participation in joint ventures for raising cashew plantations.

In an effort to diversify the supply base, CCI has been making earnest attempts to tap the non-traditional areas, particularly in West Africa. The results of the first hand assessment of the potential in Nigeria, Senegal, etc. are encouraging. But the flow of imports from these areas can be developed only after the necessary infra-structure of collection, warehousing and shipping is created.

The Corporation also paid special attention to the important task of ensuring equitable distribution of imports to the different sections of the industry. The distribution policy by linking the allocation to the accepted labour strength of the eligible factories and making compliance with the state laws by the processors as a condition, has ensured a fair deal for the labour. Further, utilisation of the imported raw nuts exclusively for exports is ensured by making its obligatory on its 67 allottees covering 255 factories to effect export of kernels equivalent of 125 per cent of allocation of raw nuts.

Development of indigenous production

Realising the need for self-reliance, CCI has prepared a blue print of financial assistance to the state sponsored, viable schemes of cashew cultivation and earmarked an amount of Rs. 40 million out of its free reserves. Its discussions with the state agencies and repeated appeals for early formulation of the cashew production schemes resulted in the preparation of necessary project reports by the agencies in Kerala, Andhra Pradesh, Karnataka and Orissa. These schemes are in the advanced stage of techno-economic evaluation. Their implementation will bring in additional area of about 45,000 ha under cashew, increasing the country's production by about 40,000 metric tonnes.

Exports

The price slump during end 1975 triggered the activity of the Corporation in the field of exports with the help of the Foreign Offices of the State Trading Corporation of India Ltd. From a level of exports of about Rs. 2 million during 1974–75, exports increased to Rs. 16 million in 1975–76, Rs. 36 million in 1976–77 and Rs. 40 million in 1977–78. During 1978–79 the value of contracts concluded has crossed the mark of Rs. 100 million. The major highlight of the export performance during 1978–79 has been bulk contracting by the Corporation especially for shipments to USA with its stabilising effects on the international kernel prices. The Corporation plans to further increase its role in the export efforts through close co-operation with its business associates in India and the Foreign Offices of the State Trading Corporation of India Ltd.

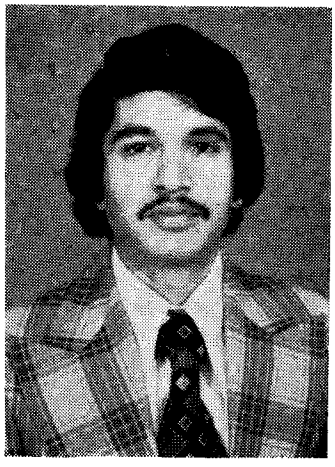
A Perspective of Cashew Industry in Karnataka

India is one of the most important countries growing cashewnut, with an area and production of about more than four lakh hectares and 1,85,810 tonnes respectively. The other important countries are Mozambique, Tanzania, Kenya and Brazil. Of late, India's importance in the world trade of cashew kernels has fallen from 95 per cent (1960) to 58.4 per cent (1974) owing chiefly to the setting up of mechanised units for processing in the East African countries as also the recent entry of China in the market. Also the situation regarding the raw materials for cashew processing industry has become vulnerable.

Karnataka is only next to Kerala in its cashew production. The important cashew growing districts are Dakshina Kannada, Uthara Kannada Kolar, Shimoga, Belgaum, Dharwar and Tumkur. There are varying estimates about area under cashew in the state. However, a rough estimate would place the figures at 76,000 ha (inclusive of area planted by Forest Departments under cashew. Appendix–I). As against a total number of 300 cashew processing industries in India, Karnataka's share to the total stands at 13.

The annual processing capacity of these units is approximately 30,000 tonnes. But, a tentative estimate of production in the state taking an average of 100 plants/ha yielding about 2 kg each, would place the figure at about 12,000 tonnes, thereby creating a gap of 18,000 tonnes between the production and the requirement for the processing industries. This gap has to be bridged by solving the problems which beset the cashew industry.

Various approaches could be considered. Under the short term measures in this direction, the control of tea mosquito occupies a prominent place. Though it is particularly severe in West



S IKRAMULLA MAHMOOD

S Ikramulla Mahmood did his Masters degree in Agricultural extension and joined the Department of Horticulture as a Probationer. He is now working as Senior Assistant Director of Horticulture (Development and Extension) in the Department of Horticulture, Lalbagh, Bangalore.

APPENDIX–1 **Area under cashew in Karnataka**

Division	*District*	*Area (in ha)*
BANGALORE	Bangalore	234.80
	Kolar	2696.00
	Chitradurga	12.00
	Tumkur	240.00
	Shimoga	2953.20
		6136.00
MYSORE	Mysore	208.40
	Mandya	848.80
	Coorg	480.00
	Chickmagalur	822.00
	Dakshina Kannada	61256.80
		64096.00
BELGAUM	Belgaum	982.00
	Bijapur	44.80
	Dharwar	152.80
	Uttara Kannada	5382.40
		6568.00
RAICHUR	Raichur	15.60
	Bellary	12.00
	Gulbarga	..
	Bidar	..
		27.60
	STATE TOTAL	76,827.60

Coast, the damage due to the attack of the tea mosquito in other cashew growing regions of Karnataka is also considerably high. As the area under private compact holdings of more than 0.2 ha is only 10,179 ha out of the total area of 76,000 ha, a considerable number of cashew plants must have been established as stray plants on road sides, tank bunds, river banks, etc. This factor has made many a farmer to take very little needed care regarding the cashew cultivation.

The next important factor that can be considered for increasing the production of cashewnut in Karnataka is the fertilizer application. At present the cashew cultivation is considered fit to be relegated to the unproductive and barren lands. Though a shift in strategy is needed to grow cashew in better soils, the importance of fertilizer application in increasing overall production cannot be overemphasized. Also, the concept of correct dose, time and method of application is relevant in this context and has to be taken to farmers by greater extension efforts. At present, due attention is not being paid by farmers owing chiefly to the smallness of holdings having cashew as a pure crop as also due to the fact that majority of cashew growers are small and marginal farmers, who normally find finance to be a great constraint.

As regards the long term measures, the expansion of area under the crop is one aspect; while, the availability of genuine, high yielding plant materials/seeds, is another. As vegetative methods of propagation suited to different cashew growing areas in Karnataka are yet to be standardised, the seedlings are still being used to a great extent, by many. But, it should be ensured that the raised seedlings conform to the criteria of seeds being collected from genetically superior parent trees selected after due study of yield performance.

Among various measures to improve the cashew production in Karnataka, the expansion of area under the crop is likely to be a major aspect. This is in keeping with the recommendations of National Commission on Agriculture to increase the area under cultivation by another 1,30,000 ha.

It can be said that the Department of Horticulture in Karnataka is playing an important role in this direction. Apart from a State PlanScheme, there are three Centrally Sponsored Schemes under operation. The cashew development scheme (State Plan Scheme) which went under operation from the II Five Year Plan period has for its aim the raising and distribution of quality seedlings to the cultivators, thereby the objective of bringing more area under cultivation by using genuine planting material is somewhat ensured. The approximate total number of seedlings distributed during 3rd, 4th, and 5th Five Year Plan periods stands at 116 lakhs.

The scheme for laying out demonstrations in cultivators field (Centrally Sponsored Scheme) has for its object the education of cultivators regarding improved package of practices on cashew by conducting demonstrations at government cost.

The scheme for vegetative propagation (Centrally Sponsored Scheme) adopts new techniques of vegetative propagation (*in situ* budding/veneer grafting/side grafting) to improve the quality of planting materials.

The establishment of cashew progeny orchard (Centrally Sponsored Scheme) has been taken up with objective of raising high yielding trees consisting of seedlings from high yielding mother trees identified at the research stations. This serves as a propagation centre to a large extent.

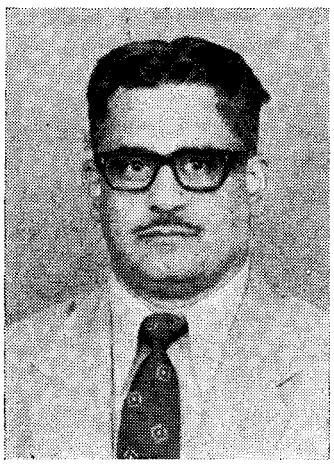
In addition to the above, the Department of Horticulture, in Karnataka has proposed a project for the development of cashew in Karnataka with the assistance from the World Bank. The main objectives of the proposed project are to increase the yield per hectare by intensive package programme—also by increasing the plant population to 200 plants per hectare by gap filling and by replacing the genetically inferior trees.

Under the project, it is proposed to bring an area of 10,000 hectares under cultivation over a period of five years. Also, it has been proposed to rejuvenate an area of 3500 hectares. The expected increase in yield due to these is put approximately around 12,800 tonnes.

Scope of cashew as a forest plantation in Karnataka

In Karnataka pioneering work of raising cashew in abandoned forest waste lands has been done almost about seventy years ago with an idea of arresting the shifting sands on the banks of Cauvery river at Talkad in Mysore district. The foresters raised the cashew seedlings in special type of brick containers to avoid direct sowing in hot sandy soils and transplanted the whole plant with containers in the sand. The havoc of shifting sand has been prevented to a considerable extent by their sincere efforts. Large extent of hilly and slopy grounds has been covered by vegetations preventing soil erosion. Such extensive afforestation provided livelihood to a large number of local population. Rigid protection of younger plantations supported a good stand of grass which otherwise was a barren land and that grass could be cut and fed to the village cattle. It is with such broad outlook that the foresters have covered vast areas and it is estimated that about 28,000 ha are under cashew scattered all over the state, out of which more concentrated areas are in South Canara and North Canara. These forest plantations are fetching an annual revenue of about Rs. 8 lakhs by way of lease. The foresters who deal with evergreen trees, and valuable rose wood, teak and sandal wood consider cashew fruits and nuts just as a forest by-product.

As time passed on, other men cast their commercial eye on this casual exotic. In Goa cashew has gained commercial importance as it gives them the cashew fenni. In other areas it provides nuts so tasty that the foreigners have been intending in large quantities. A number of cashew processing factories have sprung up. Keen competition has set in boosting the price of cashew kernel as high as Rs. 50/– per kg. Evidently this introduced species has become a prized crop and a pet child of agricultural scien-



MD MAHADEV

MD Mahadev took his M.Sc. degree in Botany from the Central College, Bangalore and started his career as a Research Assistant in the Forest Research Laboratory, Bangalore. Since his induction into the Indian Forest Service, he has worked in various capacities in the Forest Department of Karnataka State and is at present the General Manager of the Karnataka Cashew Development Corporation Limited.

tists and forest officials. They have started research centres, opened small seed orchards and have been tackling the problems from several angles to increase production in their respective centres. The foresters who are basically not trained in crop improvement technique are trying to take the advice of the scientists. But they find certain, hurdles while carrying out large scale operations in the field. The seeds and seedlings of high yielding varieties are not available in large quantities so as to cover extensive areas in the forest. Survival of even the limited supply of clonal progenies which can be secured at high price, has been poor in the forest plantations. Transport and handling costs are very high. The dosage and mode of application of fertilizers to cashew plantations of different age groups planted in varying soil types are not clear even to the agricultural scientists. The distribution of cashew trees is so uneven and scattered both in the forests and in private fields that the aerial spray alone is not practicable to control tea mosquito. Hand spraying also has to be done both by the foresters and farmers to control the pest completely and effectively. Many farmers have half a dozen or even fewer trees in their yard. Even presuming that we could somehow tackle all these problems the availability of water readily on the site poses further problems. Could there be dusting ? The foresters are eagerly looking forward to the scientists for practical and foolproof prescriptions which should also be economically sound. As these operations involve considerable amount of expenditure, we will have to adopt correct technique of plant protection in the forest plantations without wastages.

Whatever may be the hurdles visualised by a forester, still he has the monopoly on this crop in Karnataka state. He has raised very large areas of cashew plantations and is still extending the areas at a very fast rate. Instead of planting in very poor soils, lands with better soil fertility will be taken up for future plantations so that the yield could be increased. The gaps in the older plantations will be filled up to ensure cent percent stand. The dead and dying trees will be replaced. Sufficient propaganda has reached the ears of the forester and as such he is no longer treating cashew as a casual wanderer of barren and lateritic hill slopes but as a very useful and highly prized crop. He is aware by now that from the cashew plant he can get tasty nuts to eat, shell oil for industrial purposes, and liquor from the apple. We expect the scientists concerned with cashew production and industry to give us the guide lines on these aspects. Then this forest produce, which is being given the place of a minor forest produce at present can become a major forest produce of Karnataka. All the same, the basic principle of forming a tree canopy covering the land surface will be maintained by a forester. With this sole object, the Karnataka Cashew Development Corporation is formed in our state.

Scope of cashew in forest plantations of Orissa

Cashew was introduced as a garden or horticultural crop in the coastal areas of Puri and Ganjam Districts in the last century. The Forest Department started its first regular casuarina plantation near the Puri town along the sea shore in 1916. In these plantations, the dead casuarina from third year onwards were replaced with cashew as it needed only to dibble two or three seeds of cashew in gaps just before the onset of rains. This operation was quite successful and later on became a regular working plan for the Casuarina Plantation Working Circle.

The largest and most valuable cashew estate at Balukhand (Puri) now owned by the Orissa Forest Department extending over an area of 1546 ha was established in the above manner. Cashew in this estate not only occurs in pure plantations over large patches where casuarina failed completely but also as mixed crop with casuarina. Cashew was found to thrive on coarse sand with poor water regime where casuarina and many other tree species had failed.

The Balukhand estate now has a total of about 1,60,000 cashew trees with more than 30 cm girth at the base. Cultural operation and manurial application are seldom practiced here. Inflorescence blight occurs quite commonly. The Forest Department in the recent years has found it more convenient to auction the right of collection of nuts. Even so, this estate has yielded quite handsome revenues. The yield of nuts and the revenue obtained from this estate in the last four years were as follows:

Year	*Yield of nuts in tonnes*	*Income in Rs.*
1975	87·840	61,700
1976	160·640	1,94,300
1977	124·348	2,77,100
1978	162·822	10,39,900

SS DAS

SS Das had his initial training in Superior Forest Service course at Dehradun. Subsequently he underwent post-graduate training in forestry at the Commonwealth Forestry Institute, University of Oxford. Since then he has served in the Orissa State Forest Department as State Silviculturist, State Planning Officer and Conservator of Forests. At present he is the Director, Plantations, Orissa Forest Corporation Ltd., Cuttack.

With manuring and plant protection measures, the yield from the above estate would have increased considerably.

The ease with which cashew can be raised and its adaptability to areas inhospitable to almost all other tree species, prompted the Forest Department to plant it on a large scale in soil conservation plantations on barren hill slopes in the Koraput district in 1956. These plantations are now managed by the Soil Conservation Department of the State.

Balukhand contains the oldest cashew plantations raised by the Forest Department. Encouraged by the results at Balukhand, the Soil Conservation Department has also raised extensive plantation of the species on coastal sand near Konarak as also on the barren lateritic wastes within about 60 km from the sea. The total area of all such plantations under Orissa Forest Department is now about 6,000 ha.

As indicated in the preceding paragraphs cashew has been used by the State Forest Department to cover barren land where casuarina or any other species had failed. It has also been found to be a very useful species for shelter-belt plantations along the sea coast. Along with casuarina this forms an effective barrier against cyclonic winds. At the same time it adds value to an otherwise unproductive plantation. In such plantations cashew can either be mixed with casuarina or planted in alternate strips. The most effective plantation would however, be in a chequered pattern where the lines are of casuarina and the remaining space is planted with cashew. This way the latter will get all the overhead light for its growth and fruit production.

There are a large number of forest blocks in coastal districts of Orissa mainly to meet the fuel and timber requirements of the region. Due to continuous deforestation, the soil has become depleted and efforts of the Department to rehabilitate these blocks with fresh plantations have met with little success. It will be desirable to raise cashew plantations in these depleted soils, since as stated earlier cashew comes up well even under the depleted sandy soils in coastal Orissa. It is hoped that the successful establishment of cashew plantations in these areas will have a definite impact on the economic growth of the region as cashew will provide employment to a large section of the weaker segment of the society. It is also expected that besides earning valuable foreign exchange through increased cashewnut production, this will also induce growth of cashew–based small scale industries like decorticating factories and cashew apple processing units.

CASHEW–THE FIRST HISTORICAL REFERENCE

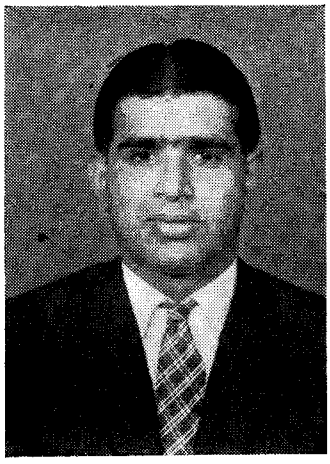
In 1558 F. Andre Thevet referred about cashew in his book "The Oddities of Antartic France otherwise known as America, and of the Many Lands and Islands discovered in our times."

"....The country in other respects is far too good to belong to such brutes (cannibals inhabiting the land) as it bears fruit in abundance and roots and vegetables together with great numbers of the tree they call ACAJOUS, which bears fruit as large as your fist and shaped like a goose's egg. Some make from these a beverage, though the fruit itself is scarcely edible, having an unripe flavour. At the base of the fruit hangs a sort of nut, as big as a chestnut and the shape of a kidney. As to the kernel therein it is excellent to eat when lightly cooked. The rind is full of oil very bitter tasting of which the savages can extract a far greater quantity than we can from any of our nut shells. The leaf of this tree resembles a pear, but a little more pointed and reddish at the tip. Further this tree has reddish bark, very bitter, and the natives make no use of the wood, which is somewhat soft. In the Cannibal Islands where it grows in abundance, it is used for firewood, there being little others. That is all I have to tell about ACAJOUS together with the illustration here shown...."

Cashew Export - its past present, and future

Cashew has been grown in India for the past four centuries but the production and export of cashew kernels did not commence until the beginning of this century. Between 1900 and the outbreak of the First World War in 1914, very small quantities of unpeeled cashew kernels, (with the testa) were exported from India mainly to Marseilles and occasionally to London, packed in mango-wood cases, lined with newspaper. Shortly after the First World War a few trial shipments were made to New York, but because of the high susceptibility of cashew kernels to infestation, the shipments arrived at destination mostly in an infested condition. It was not until the mid 1920's that packing of cashew kernels in tins from which the air removed and replaced with carbon dioxide was introduced, thus making exports of infestation-free cashew kernels possible as being done now. Thereafter exports increased slowly but steadily with a break during the years of the Second World War. The growth of Indian exports of cashew kernels after the Second World War was steady and sustained, thanks to a growing liking for cashew kernels among users and to a large extent to the support and encouragement of the importers and salters in U.S.A.

Besides India, the main raw cashewnut producing countries in the world are Mozambique, Tanzania, Kenya, and Brazil. Several other tropical countries also now produce raw cashewnuts but in small quantities. Among the major producers, Mozambique was traditionally the largest producer of raw cashewnuts and until the early 1950's production in other countries was nominal. At that stage apart from India and Brazil no other country was undertaking commercial processing of raw cashew nuts and the produce of Mozambique, Tanzania and Kenya naturally found its way to India where abundance of cheap skilled labour enabled the processing industry to grow and meet the growing



D BALASUBRAMANIAM

D Balasubramaniam at present the Chairman, Cashew Export Promotion Council, Cochin joined the Peirce Leslie India Ltd., in 1945. The credit for the Company winning Certificates of Merit of the Government of India for outstanding export performances during 1968–69, 1969–70 and 1971–72 should go entirely to the quality of leadership shown by Balasubramaniam. He was also closely associated with the Calicut Chamber of Commerce and Industry, as its Hon. Secretary and Executive Committee Member for a number of years. Balasubramaniam has been a Member of the Committee of Administration of the Cashew Export Promotion Council since 1966 and in September 1975 became its first non-official Chairman, which position he continues to hold. He was President of the Cochin Chamber of Commerce and Industry, Cochin, and Deputy President of the Associated Chambers ot Commerce and Industry of India, New Delhi in 1976–77.

demands for cashew kernels. The Indian processing industry was able to absorb the entire raw nut poduction in the above countries in addition to its own indigenous production. India thus enjoyed a near monopoly in the processing and export of cashew kernels to world markets until the early 1960's when the East African Countries also entered the processing field. With the introduction of mechanical processing methods these countries steadily stepped up their processing and export of cashew kernels with the result that India now supplies not more than 40 to 50% of the world off-take of cashew kernels.

India's export performance in the last 30 years reveals a distinct progression during each successive period until 1975 as will be seen from the following :

Period (Annual average)	*Export in tonnes*
1947–50	19,300
1951–55	28,000
1956–60	37,000
1961–65	49,500
1966–70	55,600
1971–75	59,800

However, exports started declining from1976 and in the last three years Indian exports of cashew kernels were:

1976	55,950 tonnes
1977	38,750 ,,
1978	24,000 ,, (provisional)

In addition to the development of cashew processing industry in the raw nut producing countries of East Africa, the entry of China as a competitor to India in the procurement of the available surplus of raw cashewnuts also contributed to the fall in availability of raw cashewnuts from these sources for processing in India. As a consequence, import of raw cashewnuts which had reached an average of 1,79,000 tonnes during the ten-year period 1965 to 1974, dropped to 1,36,000 tonnes in 1975, 76,000 tonnes in 1976, 64,000 tonnes in 1977 and only 24000 tonnes (provisional) in 1978. Although in the meantime indigenous production of raw cashewnuts in the country had shown appreciable improvement, the huge deficit in the imports has contributed to a steep decline in India's export of cashew kernels. It does not look as if the availability of raw cashewnuts from East African Countries will improve appreciably in the foreseeable future and the indications are that in the coming few years India's exports are likely to remain stagnant at around the 30,000 tonnes level.

As will be observed from the earlier paragraphs India's exports of cashew kernels in 1977 were only 38,750 tonnes. This was not merely due to shortage of supplies but was essentially the result of stiff consumer resistance experienced in most of the consuming countries during the year. On account of poor crops in East Africa, severe shortages were experienced during 1976 and 1977 and cashew kernel prices rose to dizzy heights in 1977 and became out of line with the prices of other competing nuts. As a result of erratic supplies, the trade itself was badly dislocated and at every stage in the chain of supplies from the raw nut producing stage to the consumer stage, severe problems were encountered. This not only forced consumers to look for cheaper nuts but even the importers and salters exhibited a marked prejudice against cashew.

The Cashew Export Promotion Council of India has played a significant role in popularising cashews in world markets during the past 18 years. The Council regularly undertake market studies and surveys for cashew kernels and cashewnut shell liquid in foreign countries and sends trade missions to prospective overseas markets. It also participates in international fairs and exhibitions and undertakes extensive publicity campaigns through newspaper and other media. The Council also acts as an intermediary between exporters in India and buyers in foreign countries and uses its good offices for settling disputes arising in the course of trade from time to time.

Cashew by now has earned a place of importance in the list of snack items of the people the world over. Its appetising taste, pleasing flavour and above all its nutritive value have given it the pride of place among edible nuts. However, continued promotion is useful to improve consumer demand. With more countries emerging as suppliers of cashew kernels to the market there is a case for future propaganda work being jointly undertaken as the benefits of increased consumption will be available to all producing countries.

Cashew Kernels : Quality control and pre-shipment inspection

When the Parliament enacted the Export (Quality Control and Inspection) Act, 1963, it signified a historic event in the field of Indian export efforts. In excercise of the powers conferred by Section 6 of the Act, cashew kernels were brought under the purview of compulsory quality control and pre-shipment inspection. In the beginning, the scheme was operated by the Cashew Export Promotion Council. Later, with effect from 1–2–1966, the Govt. of India established the Export Inspection Agencies under the technical and administrative control of the Export Inspection Council to undertake the pre-shipment inspection and quality control schemes. From 1–4–1966, the operation of quality control scheme of cashew was taken ovel by the Agencies.

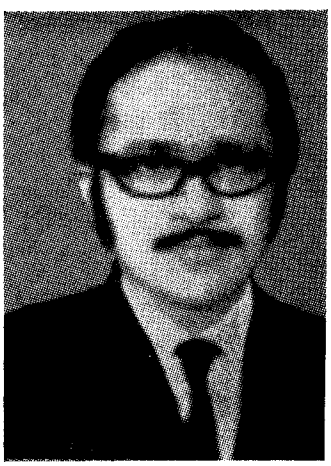
Inspection Agencies

The five Export Inspection Agencies established by the Govt. of India to undertake quality control and pre-shipment inspection of various items notified under the Act, including cashew kernels are located at Cochin, Bombay, Delhi, Calcutta and Madras.

Basis of inspection

The grade specifications have been laid down vide notification No. S.O. 1022 dated 26–3–1966. Currently, there are 25 different grades of cashew kernels recognized for export.

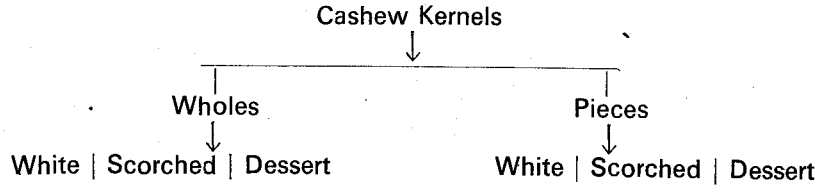
In order to ensure that the kernels reach the destination in acceptable condition, minimum requirements have also been prescribed for the packing materials used to ensure that the packages withstand the hazards of handling.



BABY JACOB

Baby Jacob, Assistant Director in Export Inspection Agency is now stationed at cochin. Jacob has over fifteen years of experience in the field of quality control and pre-shipment inspection of cashew kernels.

Cashew kernels are broadly classified as shown below :



It has been stipulated vide Govt. of India notification dated 29–1–1977 that :

1. the tin containers used for packing cashew kernels shall be fabricated out of prime quality tin sheets of 30 SWG (0.3150 mm) and each container shall weigh not less than 1 kg.
2. The corrugated fibre-board cartons used for packing shall be of 5–ply and satisfy the following requirements :
   Bursting strength (kg/cm^2 min.) .. 12
   Substance (g/m^2 min.)
   (a) for corrugating medium .. 150
   (b) for combined weight of liners .. 450
   Type of flute .. A,B,C, or any combination of these
   Puncture resistance beach units .. 175

Wooden boxes used for packing shall satisfy the following requirements :

1. The boxes shall be clean and dry
2. The boxes shall be treated against insect infestation and be free from mould growth
3. The head planks used for the boxes shall have a thickness of 12 mm and other planks 6 mm.

Two tin containers of 11.34 kg (net weight) are put in a cardboard carton having sufficient strength characteristics, and strapped. Wooden cases are used only on special request from the importers.

The operation of quality control of cashew kernels does not merely confine to final product inspection but includes the maintenance of adequate levels of sanitation and hygiene in the processing premises. Over the years it has been possible to inculcate a sense of self-discipline in the processing units by persuading the proprietors to adopt good manufacturing practices. Metallic wares have been introduced in the processing department. Pneumatic Foreign Matter Segregators (PFMS) have been installed in all the filling units. Anti-infestation and disinfestation operations are carried out under the technical guidance of Export Inspection Agency officers. All these measures ensure the wholesomeness of the produce till it reaches the ultimate consumer.

Methodology of inspection

After preparation of a consignment of cashew kernels for export, the exporter is required to file an intimation for inspection with the nearest office of the Export Inspection Agency. On receiving the intimation, the inspecting officers visit the unit and draw samples at random from the consignment using statistical random table. Each tin in the consignment bears the grade designation labels supplied by the Agency, across its bung. Labels used will be counter-checked by the inspecting officers for grade, serial nos, etc. with the serial nos. declared in the intimation. The samples drawn are thoroughly examined for:

1. Visual characteristics—like colour, size etc.
2. Physical aspects—like count, percentage of smaller pieces etc.
3. Organoleptic characteristics
4. Freedom from insect infestation and/or mould growth
5. Chemical aspects whenever specifically required by the importers.

Whenever the consignment is found to satisfy the requirements of inspection, a certificate of export-worthiness is issued by the Agency covering the consignment. This certificate is to be produced to the Customs while filing the shipping documents.

Roasted and salted cashew kernels

In view of the prospect of export of roasted and salted cashew kernels, compulsory quality control and pre-shipment inspection was introduced for this item with effect from 29–1–1978. The notification has specified the minimum requirements of raw materials, preparation of the product, handling of cooking utensils and the acceptance levels on chemical analysis of the product. Taking into account the shelf life of the product, the following acceptance levels have been fixed.

Free Fatty Acid	..	0.4% (as oleic acid) on the weight of extracted fat
Peroxide value	..	2 meq. 0_2/kg. of extracted fat.

Labelling, packaging, sealing and other requirements of the product have been dealt with in detail in the notification.

Impact of quality control

Operation of quality control and pre-shipment inspection in cashew kernels for about 15 years now has shown distinct impact in the following areas :

1. *Increase in the unit value of the product*

The unit value of cashew kernels in the world market which was only Rs. 3,800 per M.T in 1962–63 has risen to Rs. 38,000/– per M.T. in 1977–78. Though this phenomenal increase has been the cumulative result of several factors, the contribution of quality consistency is significant.

2. *Creation of confidence among the importers*

By the third party guarantee offered through pre-shipment inspection and certification, the buyers could look forward to receive goods as per the declared specifications.

3. *Inculcation of quality consciousness among the processors*

One of the significant achievements of the introduction of quality control is the awareness created among the processors that quality is the most important ingredient in sustaining foreign markets.

4. *Processing discipline*

During their visits to the various processing units, the inspecting officers could bring home to those engaged in the processing activity the importance of plant sanitation and hygiene. Today metallic wares are used in most of the processing units. At every filling table a Pneumatic Foreign Matter Segregator is installed. The workers in the grading and filling departments wear headgears. Polythene laminates are used to cover the kernels. All these steps have built up discipline in the processing operations.

5. *Higher productivity*

Wastage is avoided through timely advice given by the officers of the Agency at every stage of processing. Inspection is not confined to the examination of the final product alone, but technical guidance is imparted on every aspect of processing, by the Agency officers during their visit to the unit.

6. *Building better image for Indian products*

It is a matter of great satisfaction that complaints from buyers have become far and few since the introduction of compulsory quality control and pre-shipment inspection in cashew kernels. Over the years it has been possible to build up an image of quality consistency in the markets which has resulted in sustaining the market and also in expanding it. In the wake of the competition from the African countries and also from Brazil and China, who have taken to processing of cashewnuts, the imperative need of a better and brighter image of Indian products cannot be overemphasised. It is in this context the quality control in cashew kernels assumes paramount importance.

Cashew - The changing phase

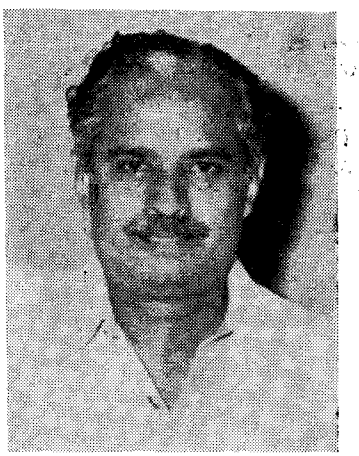
Cashew has several distinctions to its credit as a cash crop. But no other cash crop in the country acclaimed as a dollar earner has been ear-marked for growing exclusively in land unsuitable for raising any other crop.

Till the dawn of seventies the farmers were never exhorted to follow intensive farming practices to boost up the cashew yield. The crop thus never received systematic manurial, irrigation and plant protection care from the producers. In the days of yore cashew was recommended for cultivation not for harvesting nuts but for checking soil erosion. We preferred to import raw nuts from other countries for meeting our industrial and export trade requirements. Still the crop was generous to us. Even in the midst of these heart burning indifferent treatments it continued to flower and bear.

In Kerala one will come across more than two associations of growers for every crop. Sometimes even before the crop cover an area of thousand hectares, one will hear the cry to protect the interest of the growers which includes even those who are thinking to grow the particular crop. But nobody till a couple of years back even dared to be identified as a cashew grower though cashew growing in the state claims a history of over 400 years.

The situation has now made a marvellous change. The acute shortage experienced to import raw nuts has given a new life to the cashew care in the country. Kerala, the home of several cash crops lost no time to sense the new money spinning capacity of cashew. The cashew growing has rightly caught up the imagination of the farmers and the following few are the new hopes which promise a bright future for cashew.

* During the last seven years Kerala has brought over 73,000 hectares newly under cashew. The



R HALI

Hali after graduating from the Agricultural College, Bangalore in 1956 joined the services of the Rubber Board as Rubber Instructor and subsequently the Department of Agriculture, Kerala. He is now the Principal Information Officer, Farm Information Bureau, Kerala State. He has published hundreds of popular articles on agriculture in leading dailies and weeklies and initiated broadcasting of Farm News in Malayalam over All India Radio.

area under cashew in 1972–73 was only 1,01,490 hectares.

* The enthusiasm evinced by the growers is really remarkable. The official programme was only to bring 65,800 hectares under cashew during the period.

* Cashew has become a crop dear to the small farmers also. In Kerala this is a must for the development of any crop. 73,000 hectares newly brought under cashew is spread over in the lands of 7.2 lakh farmers.

* The seedlings required for the entire area were raised scientifically by the Department of Agriculture. Seednuts were procured from mother plants of high yielding character. Never before in the history of cashew cultivation such an element of scientific care was taken on a massive scale. The entire new plant population was thus received a scientific care at the very initial stage. This perhaps is more important than the millions of rupees given as subsidy for meeting the initial cultivation expenses for the first three years to farmers.

* Every crop becomes dear and near to the heart of the farmer only when it starts netting good income to him. Thanks to the price fixing policy of the Government. Cashew is no more an orphan in the market. Before the crop is matured the price is fixed and this assured prices brings in benefit not only to producers, but also to the co-operatives which are engaged in the procurement and storage.

* The traditional method of giving away the right of collection of the nuts by the grower to the itinerant merchants is thus facing a challenge in the rural areas. This is evident from the fact that the several farmers come forward to give two sprays to control tea mosquitoes rather than giving away the right of collection to the merchant. This alone will help to boost up the yield by 50%. It can rightly be considered as a harbinger of special cashew care by small farmer.

* The small farmer and his family now pay more attention to cashew. Samuel of Kottarakkara has only less than a hectare of dry land. He preferred to collect and raise 27 cashew air layers. According to him air layers grow fast and give better yield and from six-five–year old young trees he gets an yield of over 10 kg of raw nuts per tree and he is of the opinion that "if proper care is given cashew will give excellent return and so to me cashew is as important as all other crops I grow in my 1.5 acre dry land." Millions of small farmers scattered over the different districts of Kerala are fastly developing a similar attitude to cashew. This is the brightest spot of cashew's promising future.

Cashew in the economy of Goa

HY KARAPURKAR
Director of Agriculture, Goa, Daman and Diu,
Panaji, Goa

The total cultivated area of the Union Territory of Goa, Daman and Diu is about 1,50,848 ha which comprises of 79,380 ha of cereal and pulse crops and 71,468 ha of horticultural crops. Fruit crops together occupy 47.5% of the total cultivated area.

The important fruit crops grown in the territory are cashewnut, coconut, arecanut, mango, and pineapple. Cashewnut occupies an area of 40,552 ha of which 32,513 ha is owned by private individuals and the remaining 8039 ha is owned by departmental plantations (forest). Thus 56.7% of the fruit crop area is occupied by cashew. Taluka-wise distribution of cashew in Goa district is presented in Table 1. Cashew is not grown in Daman and Diu districts.

Table 1. Taluka wise distribution of cashew in Goa District

Taluka	*Area under cashewnut (ha)*
Bicholim	7760
Pernem	7550
Sattari	4982
Bardez	4110
Ponda	6030
Salcete	1709
Tiswadi	3966
Sanguem	2828
Quepem	1084
Canacona	533
	40552

Cashew crop was first introduced in Goa, by the Portuguese, some 450 years ago, with the main object of preventing soil erosion. From Goa it spread to other parts of peninsular India.

Cashew is grown mostly on hilly slopes where other crops cannot be grown. It is a hardy crop. Till the liberation of the territory (in 1961) this was a neglected crop. No proper care was taken for the improvement of the crop and consequently, the production was very poor.

At the time of liberation, the raw cashewnut production was about 3000 tonnes which had now shot up to 8000 tonnes. This is due to various developmental activities started since 1963–64.

From 1963 till 1969, the developmental activities were carried out as a state sector item only. Cashewnut seeds and polythene bags were distributed to progressive cultivators, for raising the seedlings in their nurseries for their own planting as well as for distribution to other needy cultivators in the village.

From 1968–69 onwards seedlings were raised in nurseries on Government farms. Under this programme quality planting material (seeds) is selected, procured and used for raising seedlings at five Government farms. Till 1970 about 45.88 lakh seedlings were distributed with a 50% subsidy on sale of cashew seedlings. From 1971 to 1975, 21.96 lakh seedlings were distributed. The subsidy was abolished in 1976. From 1976 to 1978, 10.08 lakh seedlings were distributed, at cost price.

From 1969 to 1974, 31,427 cashew air layers were distributed under the 'Centrally Sponsored Scheme for vegetative propagation.' From 1976 to 1978, 250 ha were covered under a patch budding programme.

Besides, other Centrally Sponsored Schemes like package of practices and prophylactic control measures against pests were implemented in the Fourth Five Year Plan by establishing 300 demonstration plots and covering an area of 3469.4 ha under plant protection schemes. From 1975 to 1978, 100 demonstration plots have been established in private cultivators' fields.

In 1977–78, a new scheme for the expansion of area of cashew under private lands in non-departmental areas was taken up. During 1977–'78, 875 ha were covered and 1235 ha will be covered during 1978–79. Cultivators get Rs. 120/ha during the first year and Rs. 180/ha during second year as subsidy towards the cost of seedlings, inputs and labour charges.

Goa is the only place in the country where the cashew apple is used for liquor production, locally known as Uraq and Fenni. Fenni has now become very popular all over the world. Cashew apple production has gone up from 33,000 tonnes in 1961–62 to 88,100 tonnes today. About 6.21 lakh bulk litres of Uraq and 4.94 lakh bulk litres of Fenni are produced in Goa. The Government gets a revenue of Rs. 15 lakhs annually.

There are ten cashew processing units in Goa, with a capital investment of Rs. 60 lakhs (Rs. 40 lakhs for machinery and Rs. 20 lakhs in the processing unit) employing 1200 persons. The total processing capacity of these units is about 13,000 tonnes whereas only 8000 tonnes are processed today.

In 1978, 100 tonnes of kernels were exported to U. S. A. the Middle East and European countries. The same year 1500 tonnes of kernels were exported to neighbouring states of Maharashtra and Karnataka and 200 tonnes were consumed locally.

Cashew is susceptible to various pests. Among them tea mosquito affects the tender shoots. In severe cases about 40% of the crop is destroyed. For the quick and effective control of tea mosquito, the aerial spraying work on cashew, first of its kind in India, was taken up in Goa in 1976 covering about 2500 ha of departmental plantations. In 1977, an area of 5472 ha was aerial sprayed.

In the economy of Goa, thus cashew plays an important role. Cashew kernels worth Rs. 360 lakhs and cashew liquor worth Rs. 116 lakhs are produced annually.

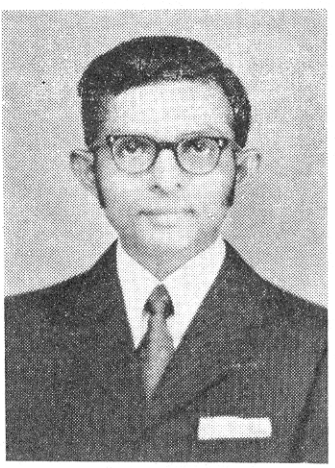
INTERNATIONAL ORGANISING COMMITTEE

Chairman : Swaminathan MS

Convener : Nayar NM

Members : Ahamed Bavappa KV
Arakeri HR
de Bakkar
Bhagavat SR
Bhattacharya AK
Bhoja Shetty KB
Channa SS
Kaleeswaran N
Kanungo K
Karapurkar HY
Kempanna C
Krishna Rao C
Madhava Menon T
Meloth Narayanan Nambiar
Ohler JG
Parvatikar RR
Pylee MV
Rao PS
Salvi PV
Seshadri AR
Shantaram Narayan Zantye
Singh JP
Somayya VG
Subba Rao TV
Sukhdev Singh
Sundaram SG
Thacker BS
Thomas VJ
Tindal
Venkataraman A
Venkataraman TM

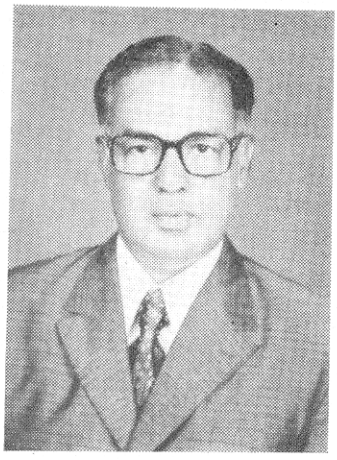
CHAIRMAN



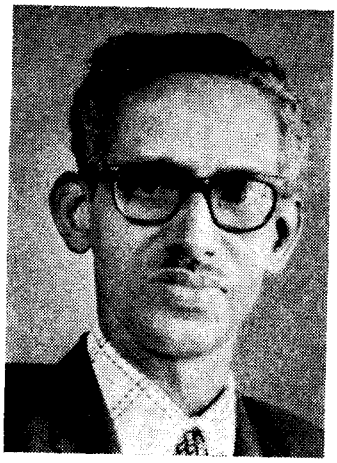
CONVENER

NATIONAL ORGANISING COMMITTEE

Chairman : Swaminathan MS
Vice-chairman : Nayar NM
Convener : Nambiar MC
Members : Ananth KC
Appa Rao A
Balasubramaniam D
Bhaskaran UP
Das SS
George KV
Joseph MS
Krishnamurthy B
Krishnamurthy K
Krishnaswamy L
Madhava Rao VN
Mathew AG
Nair KG
Nair KK
Panicker GK
Prabhu MS
Rao AL
Ravindran R
Shaw CB
Silas EG
Singh JP
Vijayan Nair T
Vinod Rai
and chairmen and conveners of other committees.



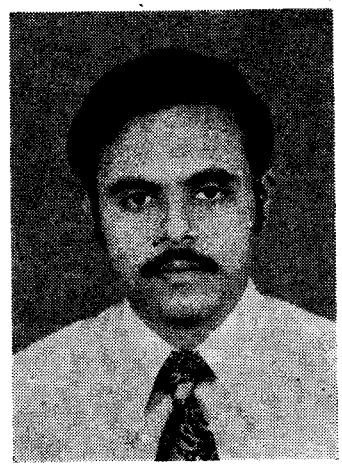
CONVENER



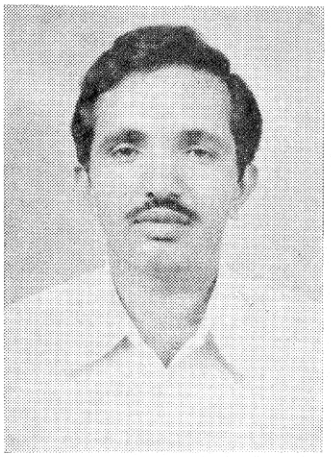
VICE–CHAIRMAN

PROGRAMME COMMITTEE

Chairman : Nayar NM
Vice-chairman : Nair MR
Convener : Khan HH
Members : Chandra Mohan R
Kumaran PM
Murthy KN
Nagabhushanam S
Naik BG
Pillai GB



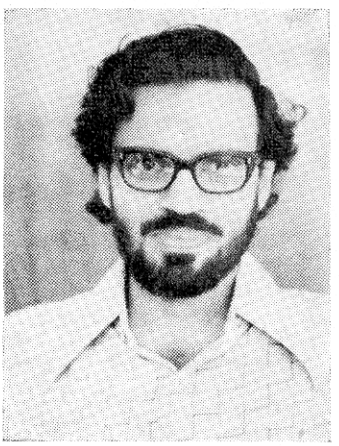
CONVENER



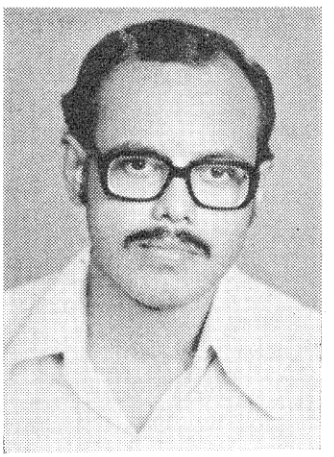
CHAIRMAN

PUBLICATION COMMITTEE

Chairman	:	Nair MK
Convener	:	Haridasan M
Co-convener	:	Prem Kumar T
Members	:	Achuthan Nair N
		Balakrishnan T
		Bhaskaran Nair K
		Bhaskara Rao EVV
		Hali R
		Josy Joseph
		Nambiar KKN
		Pillai GB
		Ravindran PN
		Sarma YR



CONVENER



CO-CONVENER

CHAIRMAN

VICE-CHAIRMAN

CONVENER

PUBLICITY COMMITTEE

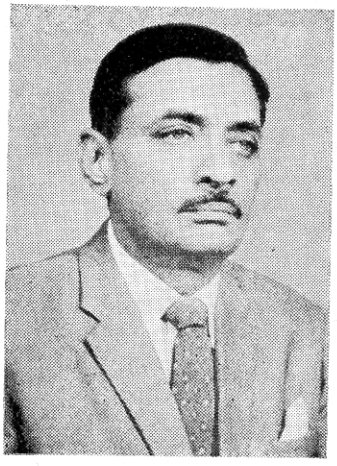
Chairman : Muliyar MK

Vice-chairman : Shankaran KE

Convener : Antony KJ

Members : Achuthan Nair N
Baby Jacob
Gopalakrishnan NK
Hali R
Jayasankar NP
Kandoran MK
Krishnaswamy L
Krishna Pillai R
Kunjunny Raja K
Kurian GK
Markose VT
Murthy KN
Nair MK
Nambiar KKN
Panicker GK
Rajan KK
Ramachandran N
Ravi Varma KT
Rawther TSS
Warrier MKD

RECEPTION AND REGISTRATION COMMITTEE



CHAIRMAN

Chairman : Kurian GK

Vice-chairman : Radha K

Members : Chandra Mohan K
Gopinathan Pillai N
Joseph KV
Kamala Devi CB
Mathen K
Menon MA
Ramakrishnan Nair TV
Srinivasa Bhagavan

VICE-CHAIRMAN

CHAIRMAN

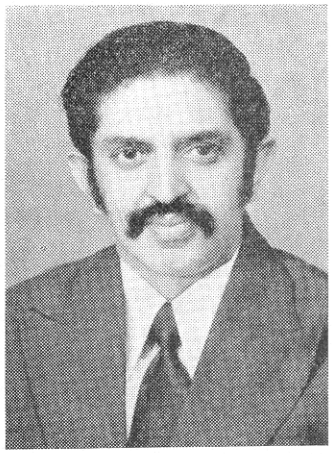
FINANCE COMMITTEE

Chairman : Nelliat EV
Vice-chairman : Kandankoran KB
Convener : Ramadas A
Members : George MV
Gopalasundaram P
Jacob Mathew
Krishnan Kutty
Somasekharan Nair S

VICE-CHAIRMAN

CONVENER

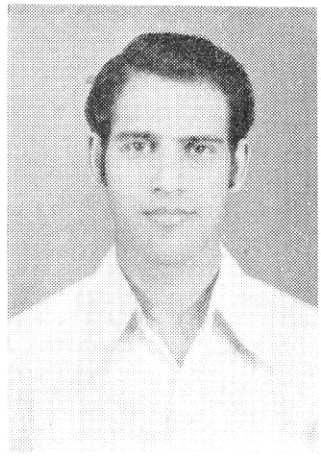
EXHIBITION AND ENTERTAINMENT COMMITTEE



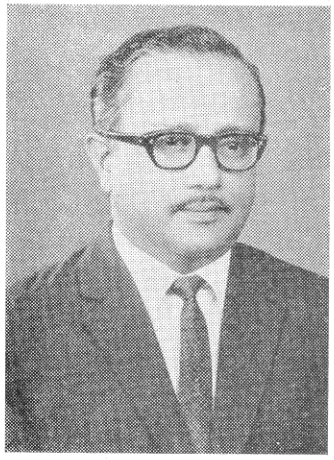
CHAIRMAN

Chairman : Jayasankar NP
Convener : Thomas Joseph
Co-convener : Subramaniam S
Members : Govinda Pillai N
Hali R
Kaimal PVR
Kumaran PM
Mohan KS
Narayanan MC
Pillai RSN
Pillai RV
Reghunathan A
Rajah KK
Robert Cecil
Sethumadhava Menon K
Vijayakumar G
Vijay Singh

CONVENER



CO-CONVENER



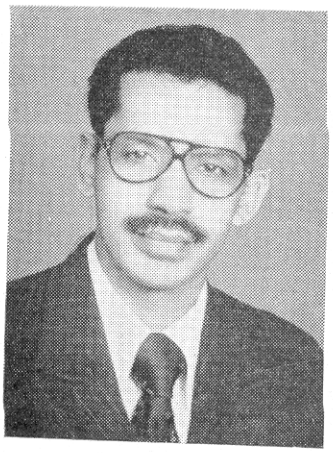
CHAIRMAN

TRAVEL AND ACCOMMODATION COMMITTEE

Chairman : Silas EG
Vice-chairman : Pillai NG
Members : Ayyappan Pillai S
Joseph KV
Mathew George
Nair PVR
Prabhakaran NT
Reghunathan A
Ramachandran PN

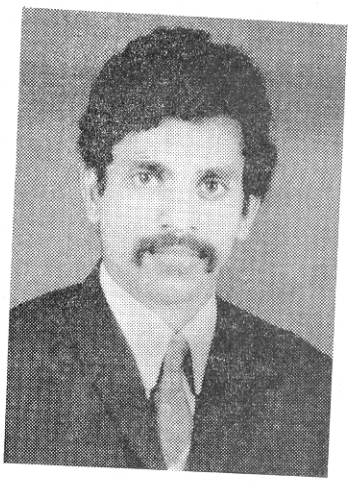
VICE–CHAIRMAN

HOSPITALITY COMMITTEE

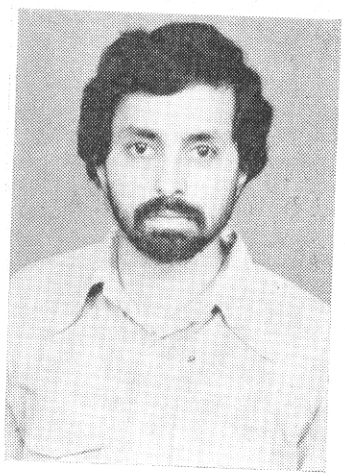


CHAIRMAN

Chairman : Koshy PK
Convener : Thomas Varghese PK
Co–convener : John KC
Members : Bahuleyan
James Abraham
Menon MA
Pillai NG
Prasanna Jait
Sosamma Varghese
Sundara Raju
Thomas NT
Varghese Paul

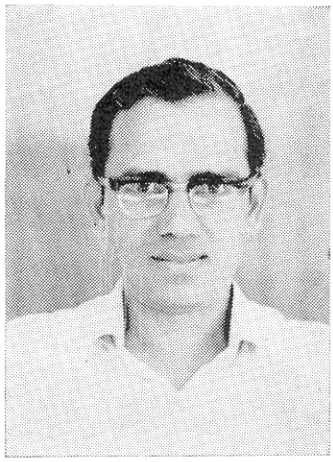


CONVENER



CO–CONVENER

SYMPOSIUM TOUR COMMITTEE



CHAIRMAN

Chairman : Iyer RD
Convener : Govindan Kutty MP
Members : Abraham KJ
Arul Raju
Dhander DC
Divakaran Pillai
Khan HH
Nair NS
Rawther TSS
Varde NPS

CONVENER

BHASKARA RAO EVV

SECRETARIAT

Bhaskara Rao EVV
John Sylvester VF
Khan HH

Asoka Betelnut Company Pvt. Ltd.
11/234 Dr. Nanjappa Road
PB No. 3702
Coimbatore

AV Thomas and Co. Ltd.
Willingdon Island
Cochin

Bharat Pulverising Mills Pvt. Ltd.
"Shriniketan" 14 Queens Road
Bombay 400 020

Brooke Bond India Ltd.
Area Sales Office
Water Works Road
Trivandrum 695 010

Cashew Export Promotion Council
Ernakulam 682 016

Central Scientific Supplies Co. Ltd.
Masjid Buildings
PB No. 124
Trivandrum 695 001

Coffee Board
1 Vidhana Veedhi
Bangalore 560 001

Kalarickal Agencies
HO Kalarickal Bazaar
PB No 70
Kottayam 686 001

Kerala Agricultural University
Vellanikkara
Trichur 680 651

Kerala Agro-Industries Corporation Ltd.
Trivandrum 695 023

Kerala Co-operative Central Land Mortgage Bank Ltd.
PB No 56 Trivandrum 695 001

Kerala State Warehousing Corporation
PB No 1727
Ernakulam
Cochin 682 016

Magnum Glass works
Chemical Industrial Estate
Aroor 688 534

Pest Control India Ltd.
Ernakulam

Plantation Corporation of Kerala Ltd.
Kottayam 686 004

Premier Pesticides Pvt. Ltd.
ERG Road
PB No 1246, Ernakulam
Cochin 682 011

Scientific Equipment and Co.
Ernakulam

Sreeram Aluminium Industries
39/199 Chittoor Road
Cochin 682 011

State Farming Corporation of Kerala Ltd.
Karumbu Bhavan
Nellippally P. O.
Punalur 691 313

Sujirkar's Trading Co.
PB No 203
Jew Town
Cochin 682 002

Travancore Chemical and Manufacturing Co.
PB No 19 Kalamassery
Alwaye 683 104

Union Carbide (India) Ltd.
Agricultural Products Division
37/1, Richmound Road
Bangalore 560 025

University of Cochin
Cochin 632 001

Voltas Ltd.
Bangalore

OUR ADVERTISERS

FULL PAGE

Admiral Tour and Travel Bureau
Cochin

Asiatic Export Enterprises
Quilon

Cardamom Board
Cochin

Cashew Corporation of India Ltd.
New Delhi

Cashew Export Promotion Council
Cochin

Cynamid India Ltd.
Bombay

Excel Industries Ltd.
Bombay

Export Council of India
Calcutta

Farm Information Bureau
Trivandrum

Fertilisers and Chemicals Travancore Ltd.
Udyogamandal

Indian Explosives Ltd.
New Delhi

Indian Society for Plantation Crops
Kasaragod

Jindal Aluminium Ltd.
Bangalore

Kerala State Cashew Development Corporation Ltd. Quilon

Kerala State Co-operative Marketing Federation Ltd. Ernakulam

Madras Fertilisers Ltd.
Madras

Richard Franco Agency Inc.
New york

M Shamsudhin & Co.
PB No. 52 Quilon

HALF PAGE

AV Thomas & Co. Ltd.
Alleppey

Blue Star Ltd.
Madras

Concord Instruments Pvt. Ltd.
Ernakulam

Food Corporation of India
Cochin

IDL Chemicals Ltd.
Hyderabad

Indian Council of Agricultural Research
New Delhi

Indian Farmers Fertiliser Co–op. Ltd.
New Delhi

Indian Nut Products
Quilon

Indian Potash
Cochin

Kabir Cashews
Karunagappally

Karnataka Agro Industries Corporation Ltd.
Bangalore

Kerala Co-operative Central Land Mortgage Bank Ltd. Trivandrum

Kerala Financial Corporation
Trivandrum

Kerala Nut Food Co.
Quilon

KS Subraya Anantha Kammath & Sons
Kasaragod

Malayala Manorama
Kottayam

Mathrubhumi
Calicut

Peirce Leslie India Ltd.
Cochin

Plantation Corporation of Kerala Ltd.
Kottayam

Premier Irrigation Equipment Private Ltd.
Bangalore

Quality Traders
Cochin

Rallis India Ltd.
Cochin

Rubber Board
Kottayam

Supreme Motors
Mangalore

Syndicate Bank
Manipal

Techno Chemical Industries Ltd.
Calicut

Toshniwal Brothers Private Ltd.
Madras

Travancore Titanium Products Ltd.
Trivandrum

Trivandrum Rubber Works Ltd.
Trivandrum

Vijayalaxmi Cashew Co.
Quilon

Zuari Agro-Chemicals Ltd.
Goa

QUARTER PAGE

Crop Care
Cochin

KM Radhakrishna Chetty & Bros.
Calicut

Nurserymen Co-operative Society Ltd.
Bangalore

Pharm-o'-Sales
Ernakulam

Public Relations Department
Trivandrum

SV Rangaswamy and Co. Ltd.
Bangalore