ECONOMICS OF CARDAMOM CULTIVATION IN IDUKKI DISTRICT, KERALA STATE

By

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THESIS

Submitted in partial fulfilment of

the requirement for the degree of

Master of Science in Agriculture

Faculty of Agriculture

Kerala Agricultural University

Department of Agricultural Economics

COLLEGE OF HORTICULTURE

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1993

D E C L A R A T I O N

I, hereby declare that this thesis entitled 'Economics of Cardamom Cultivation in Idukki district, Kerala State' is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Vellanikkara,
25 February, 1993.

KOSHY JOHN

C E R T I F I C A T E

Certified that this thesis entitled "Economics of Cardamom Cultivation in Idukki district, Kerala State" is a record of research work done independently by Sri.Koshy John under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

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Chairman,
Advisory Committee,
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Vellanikkara,
25 February, 1993.

C E R T I F I C A T E

We, the undersigned members of the Advisory Committee of Sri.Koshy John, a candidate for the degree of Master of Sciences in Agriculture with major in Agricultural Economics, agree that the thesis entitled "Economics of Cardamom Cultivation in Idukki district, Kerala State" may be submitted by Sri.Koshy John in partial fulfilment of the requirement for the degree.

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Introduction

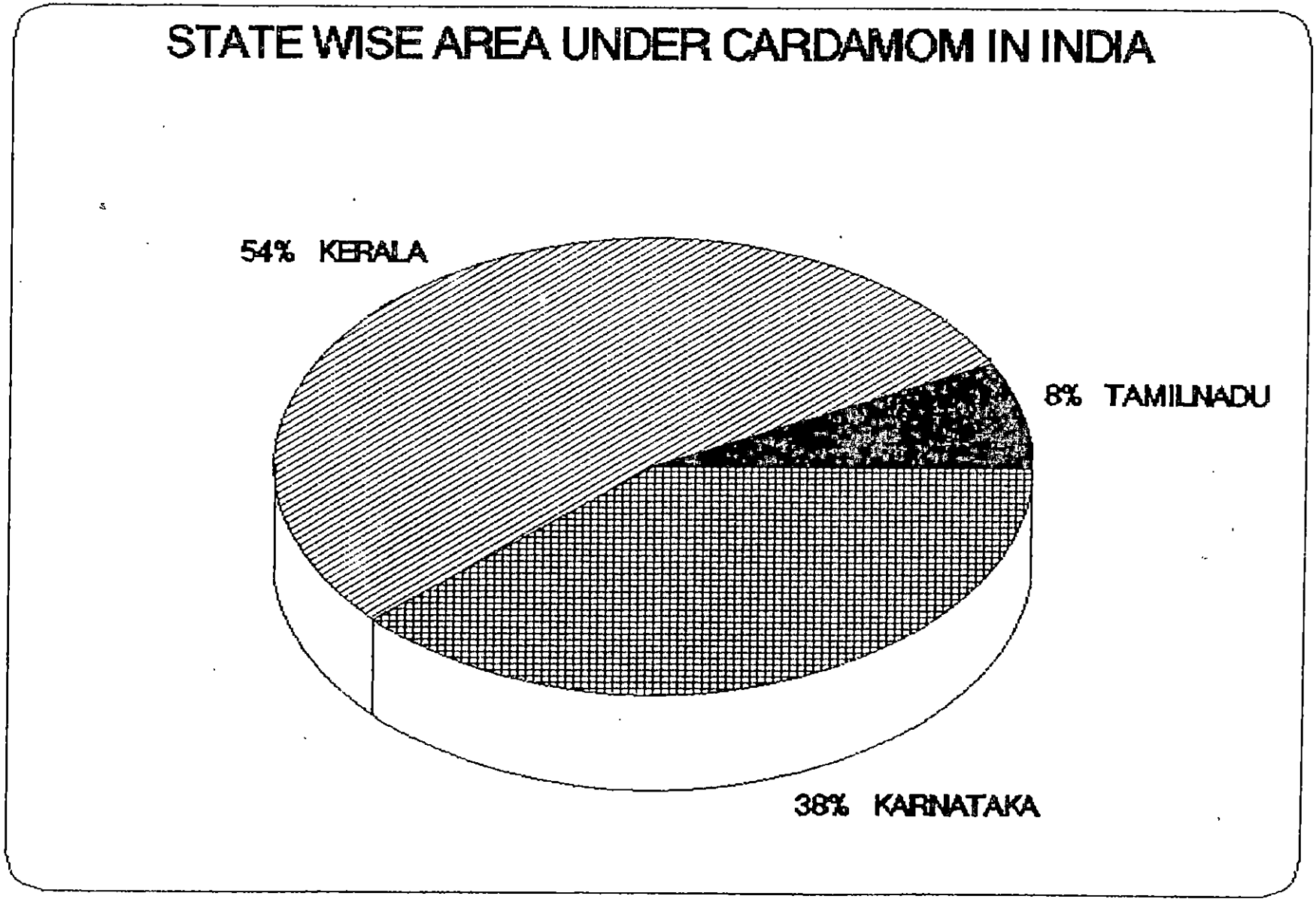
INTRODUCTION

India is one of the major producers of spices in the world. The crops such as pepper, cardamom, ginger have traditionally played an important role in the country's external relations in general and trade in particular. In spite of the fact that Indian exports have become more diversified, spices still have considerable importance in agricultural exports. The importance of cardamom as one among the spice crops is well acclaimed in domestic as well as in export fronts. Cardamom is one among the recognised plantation crops in Kerala and the queen among more than sixty spices identified in India and abroad.

Small cardamom of commerce is the dried fruit of Elettaria cardamomum Maton. It is indegenous to India and is one of the oldest spices known to man, with its commercial influence throughout the world. The natural habitat of cardamom is the evergreen forests of the Western Ghats in South India and in Sri Lanka. It occurs both in wild and in cultivated conditions. Indian cardamom cultivation is now confined to the three southern states of Kerala, Karnataka and Tamil Nadu. The area under cardamom in the three states is depicted in figure 1.

In India, Kerala is the major producer of cardamom, accounting for 54 percent of area and 69 percent of production

Fig. 1.1.

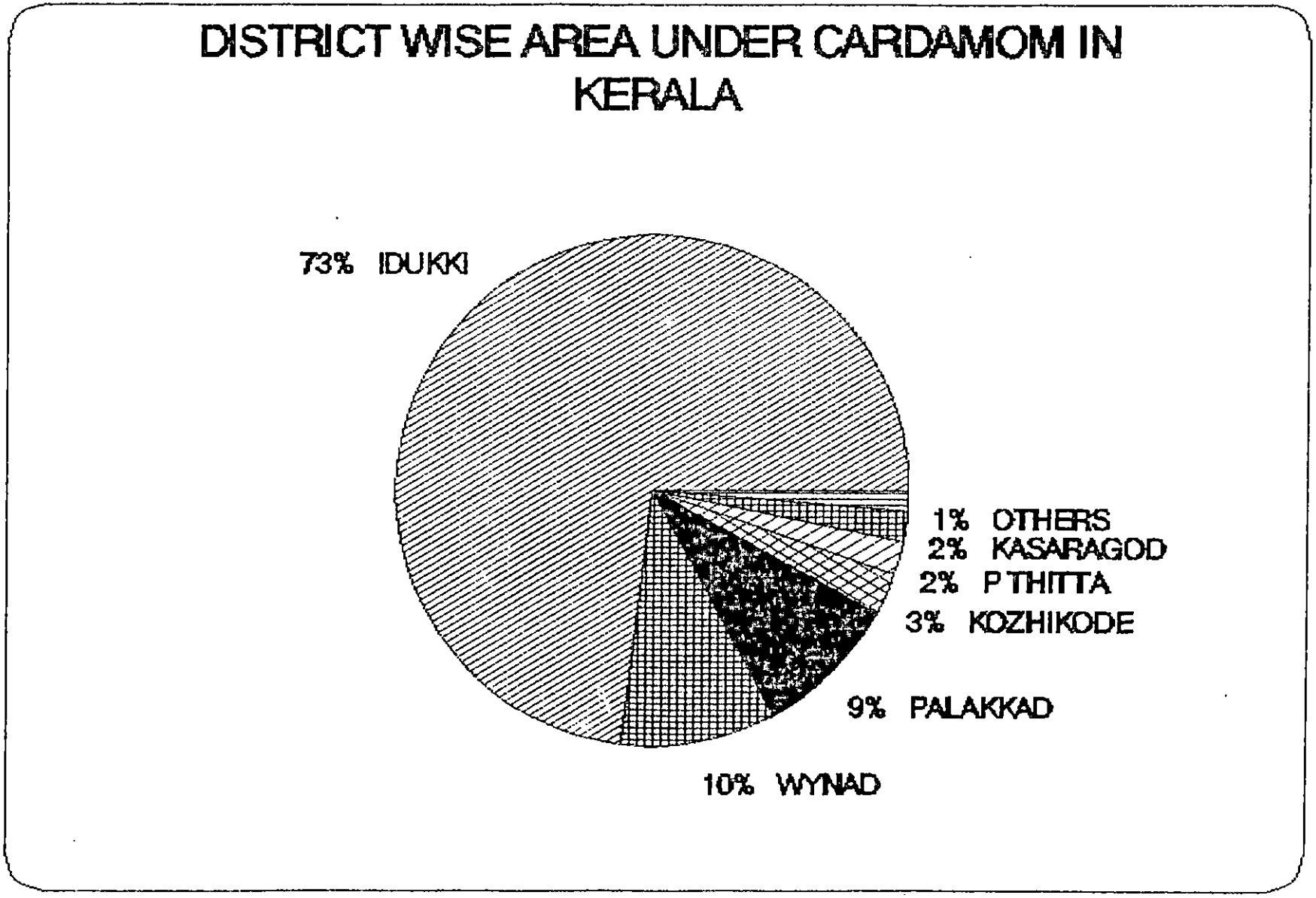

STATE WISE AREA UNDER CARDAMOM IN INDIA
54% KERALA
8% TAMILNADU
38% KARNATAKA

in the country. The main concentration of the crop in Kerala is in Idukki district. The district-wise distribution of cardamom in the state is depicted in figure 2. The crop has considerable economic importance potential to the State. Yet, there is hardly any authentic data on the economics of this crop. It was therefore felt that an indepth study on the economics of cardamom cultivation in Idukki district would be of great value, not only for growers and others directly connected with cardamom but also for planners and policy makers whose decisions and actions affect the fortunes of the growers of cardamom. Before dealing with the specific objectives of the study, it would be appropriate to briefly indicate the cultivation practices, uses etc. of the crop.

Cultivation practices

Cardamom is generally reared under the canopy of forest trees in hilly tracts with undulating and flat terrains. Cardamom plants grow luxuriously in well drained forest loamy soils, acidic in nature, with pH around 5.5. The crop thrives in an altitude between 600-1200 metres above MSL, a fairly well distributed rainfall between 1500-3500 mm and temperature in the range of 10-35°C. It is a shallow rooted plant and is highly susceptible to drought with sensitivity to severe winds. Ever since the economic potential of cardamom was realised from its natural existence

Fig. 1.2


DISTRICT WISE AREA UNDER CARDAMOM IN KERALA
73% IDUKKI
1% OTHERS
2% KASARAGOD
2% P THITTA
3% KOZHIKODE
9% PALAKKAD
10% WYNAD

as wild growths in the ever green forests, systematic cultivation practices started flourishing .

Cardamom prefers a medium shade with filtering light through the overhead trees providing canopy. Periodical skilful shade regulation of the overhead trees is an important cultural practice. Other cultural practices like weeding, mulching, trashing etc. are necessary for successful maintenance of the crop. Cardamom plants respond to irrigation during summer months. Fertilizer recommendation is NPK 75:75:150 Kgs per ha. in two split dozes. It is believed by cardamom growers through experience that application of organic manures and adoption of the minimum required cultivation in soil have beneficial effects on the crop towards longer economic life compared to intensive cultivation practices resulting into shorter economic life. The crop is susceptible to many pests and diseases leading to considerable economic loss. The pests 'thrips', 'root grubs' and 'stem borers' and the diseases 'katte' and 'azukal' are the comparatively important ones from the economic point of view.

Cardamom is propogated by vegetative method by using rhizomes and through seeds by raising seedlings. The aromatic seeds are embeded in the fruits. Flowers and fruits are borne on panicles emerging from base of numerous herbacious aerial shoots from the branches of subterranean rhizomes. It takes about hundred days for the fruits to mature after pollination

in flowers. Harvesting in cardamom plantations generally commence from August and ends by January under the climate prevailing in Idukki district. The two distinct varieties of small cardamom grown in Idukki are 'Mysore' with erect panicles and 'Malabar' with creeping panicles. There are also different agro-types of Mysore and Malabar cultivars. 'Vazukka' cultivars are essentially hybrids of different Mysore and Malabar cultivars. 'Kannielam' in Thodupuzha forest ranges of Kerala and 'Munjrabad' in Malanad areas of Karnataka are some of the Malabar cultivars. Mysore cultivars are believed to have been the introduced ones in Idukki district of Kerala.

Cardamom plants under normal cultivation practices are assessed to have an economic life of 12 - 15 years. Normally, the plants commence yielding from third year of planting. In harvesting, fruits just short of ripeness at an interval of 20-30 days in Kerala situations are hand-picked. Harvesting is a skilful operation done generally by female labourers. The cardamom capsules are dried in special curing chamber under controlled temperature for retaining green colour and flavour. The dried capsules in hotness are rubbed on coir mats or wire meshes for removing flower parts followed by winnowing. The cleaned, sieved and sorted cardamom is stored in polythene lined gunny bags. Marketing is effected directly through dealers or through auctions.

The dealers or exporters subsequently grade the produce according to size and colour to the preferences of domestic or export markets. Green coloured cured cardamoms are particularly priced high in the Middle East markets.

Exports

India, Guatemala, Tanzania and Sri Lanka are the major commercial producing countries in the world. Countries like Papua New Guinea, Costa Rica, EL Salvedor, Honduras etc. have also emerged as cardamom producing countries in recent years. Indian cardamom is exported to world over. India was the principal exporter of cardamom until 1986-87. Today Guatemala is the largest producer and exporter of cardamom. Global import of cardamom has increased substantially during the last decade. Until late 1970s India was the leader in world production and export of cardamom, accounting for more than 50 percent of world production and about 50 percent of the world trade. India's share both in world production and export markets declined in 1980s. The aggressive emergence of Guatemala both as a major producer and exporter from early 1980s is notable. In the export front Guatemala far out-weighed India in 1980s, accounting for nearly 60 percent of the world trade. The world production and exports of cardamom is given in table 1.1 while production and export of cardamom from India is shown in figure 1.3.

(in M.T.)

Table 1.1. World production and export of cardamom

Year	PRODUCTION				EXPORT			
	India	Guatemala	Tanzania & Sri Lanka.	Total	India	Guatemala	Tanzania & Sri Lanka.	Total
1970-71	3,170	1,000	540	4,710	1,705	979	417	3,101
1971-72	3,785	750	490	5,025	2,147	719	375	3,241
1972-73	2,670	700	475	3,845	1,384	658	357	2,393
1973-74	2,780	1,250	1,020	5,050	1,813	1,200	862	3,875
1974-75	2,900	1,520	1,045	5,465	1,626	1,472	892	3,990
1975-76	3,000	1,775	1,550	6,325	1,941	1,700	1,321	4,962
1976-77	2,400	1,975	870	5,245	893	1,904	732	3,529
1977-78	3,900	2,350	430	6,680	2,763	2,264	352	5,379
1978-79	4,000	2,200	690	6,890	2,876	2,107	561	5,544
1979-80	4,500	2,100	675	7,275	2,636	2,050	541	5,227
1980-81	4,400	3,400	850	8.650	2,345	3,360	705	6,410
1981-82	4,100	3,450	730	8,280	2,325	3,370	566	6,261
1982-83	2,900	3,600	770	7,270	1,032	3,500	609	5,141
1983-84	1,600	4,500	680	6,780	258	4,400	536	5,194

(Contd....)

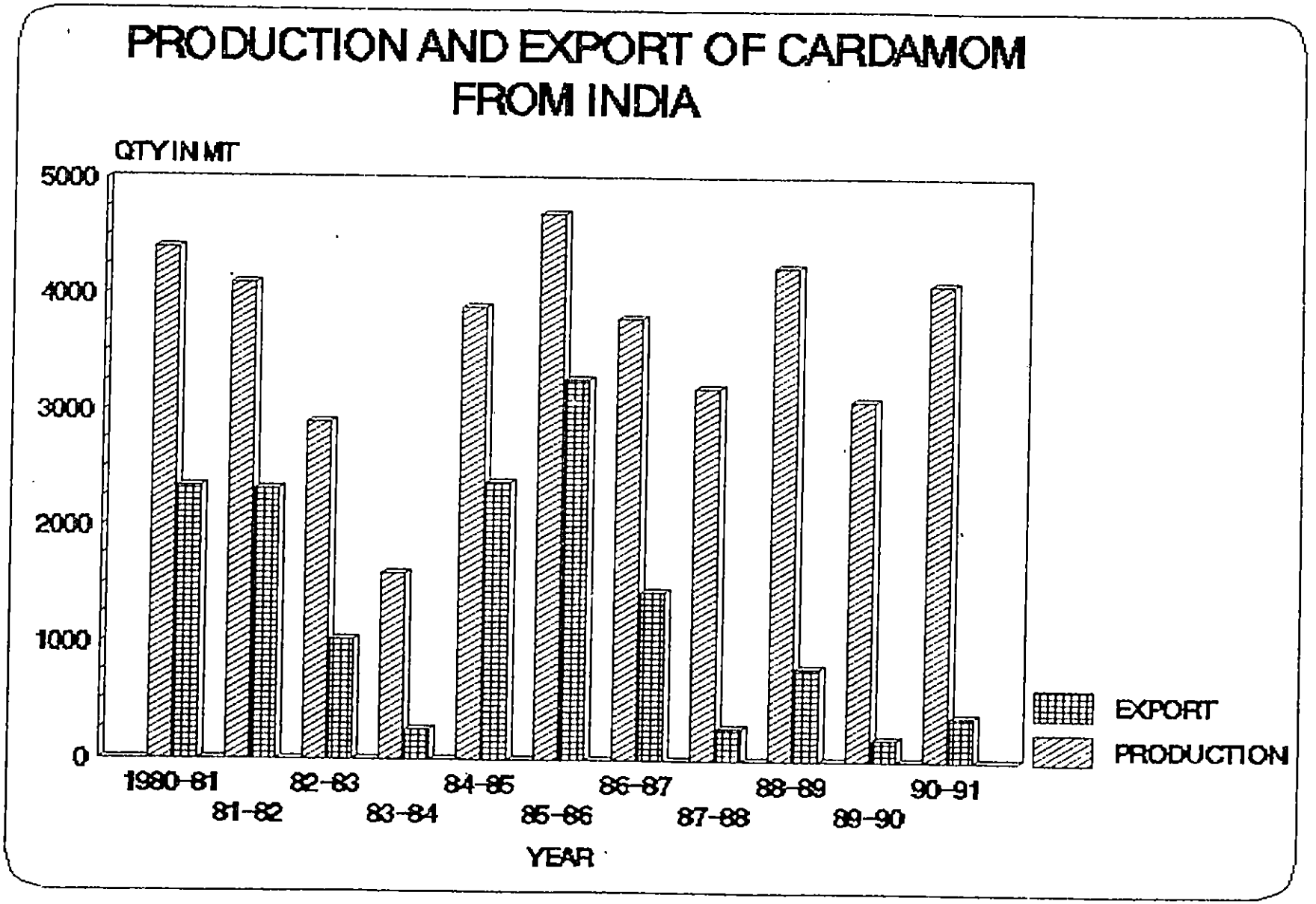
Table 1.1. (Contd.....)

Year	PRODUCTION				EXPORT			
	India	Guatemala	Tanzania & Sri Lanka.	Total	India	Guatemala	Tanzania & Sri Lanka.	Total
1984-85	3,900	5,000	650	9,550	2,383	4,900	517	7,800
1985-86	4,700	7,350	900	1,295	3,272	6,172	588	10,032
1986-87	3,800	8,100	900	12,800	1,447	8,340	597	10,384
1987-88	3,200	8,100	800	12,100	270	9,600	542	10,412
1988-89	4,250	9,000	850	14,100	787	9,027	539	10,353
1989-90	3,100	8,500	900	12,500	180	9,500	525	10,205
1990-91	4,750	9,500	850	15,100	400	9,900	550	10,850

Sources: (a) Published Statistics from 1970-71 to 1984-85, Spices Board, Kochi.

(b) Unpublished Estimates from 1985-86 to 1990-91, Spices Board, Kochi.

Fig.1.3


PRODUCTION AND EXPORT OF CARDAMOM FROM INDIA
QTY IN MT
5000
4000
3000
2000
1000
0
1980-81
81-82
82-83
83-84
84-85
85-86
86-87
87-88
88-89
89-90
90-91
YEAR
EXPORT
PRODUCTION

Uses

Out of the global production of cardamom, nearly 60 percent is consumed for the preparation of cardamom coffee (gahwa) in West Asia. In India and Sri Lanka about 15 percent is consumed through various food preparations and through betel quids. In western countries it is used in many sausages, pastries and processed meat products. Apart from its uses as a flavouring ingredient in food preparations, its uses in confectionery, beverages, perfumes, cosmetics, toiletries, liquor and betel quids are well acclaimed. It also finds medicinal use in allopathy and auyurveda systems. There is a special demand for Indian cardamom due to its characteristic flavour and aroma in the world market particularly amongst the principal cardamom consuming countries in the middle east.

Objectives of the study

The specific objectives of the study are the following:

a) To study cultural and management practices of cardamom followed by growers in Idukki district, Kerala.

b) To study costs and returns of cardamom in the Idukki district.

c) To examine resource use efficiency in cardamom cultivation.

d) To study comparative economics of major types of cardamom.

e) To evaluate the problems of the cardamom industry in the district.

Sources of data

The proposed study to fulfil the objectives needed data on different cultivation practices of cardamom, quantities and prices of various items of inputs, quantities and prices of output etc. Data collection was done by undertaking personal interview with a sample of cardamom planters in Devicolam, Udumbanchola and Peermade taluks in Idukki district, Kerala. The sampling and other details are explained in a subsequent chapter.

Limitations of the study

During the study, there could be a sample of only 120 holdings under the limitations of time available for the survey to the researcher and under the difficult communication facilities in the district. The required data on annual income and expenditure on cardamom cultivation/production were not easily forthcoming from the growers for their fear of tax

problems. The growers mostly with permanent settlement outside the district were not keeping proper and acceptable records in their cardamom holdings for obvious reasons. Taking advantage of the knowledge of the area as well as familiarity to the most of the sampled growers every effort was made to ensure that the data collected to be realistic for the purpose of the study.

Plan of study

The study is presented in six chapters including the present introductory chapter. A brief description of agro-economic features of Idukki district which is the area of study, constitute the second chapter. In the third chapter, a review of relevant literature studied is presented. The methods used for the study and important concepts are briefly discussed in the fourth chapter. The results of the study and the discussions thereon are dealt with in the fifth chapter with appropriate illustrations and explanations on the study. The summary of major findings is reported in the sixth chapter, together with appropriate policy recommendations.

Agro-Economic Features of the Study Area

AGRO-ECONOMIC FEATURES OF THE STUDY AREA

Idukki district is socio-economically backward district but is blessed with scenic beauty with numerous mountains and valleys. It finds a place in the tourist map of the country for its Thekkady wild life sanctuary and lake, abode of hydro-electric projects particularly the Idukki dam, the Periyar river, dense forests, stretched green grass lands, and extensive areas of plantation and spice crops like tea, coffee, cardamom and pepper in the high ranges and rubber in the middle land.

Periyar, Thodupuzhayar and Thalayar which are the important river systems in the district are with several feeders. The famous Pamba river after originating runs through a while through the district. Devicolam, Eravikolam and Elaveehapoonchira are the three fresh water lakes in the district. Of course Thekkady lake boarders with Pathanamthitta district as well.

There are no major irrigation projects in the district. The ground water resource are estimated to be poor but being at present tapped for cardamom cultivation. About three-fourths of Kerala electric power is generated from Idukki district. The national highway system and railway lines do not figure in the district map. The main road systems are Kottayam-Kumily, Kochi-Munnar, Kumily-Munnar, Thodupuzha-

Idukki, Kothanangalam-Idukki and Idukki-Kumily/Nedumkandom.

Idukki district is bound on the north by Trichur district (Kerala) and Coimbatore district (Tamil Nadu), on the east by Anna, Madurai, Ramanad and Tirunelveli districts (Tamil Nadu), on the south by Pathanamthitta district (Kerala) and on the west by Kottayam and Ernakulam districts (Kerala). The district lies between 9°-15° and 10°-21° of north latitude and 76°-37° and 77°-25° of east latitude. The index map of Idukki district is given in figure 2.1.

The headquarters of the district is Idukki which is the seat of the famous Idukki Arch Dam. There are four taluks in the district viz., Devicolam, Udumbanchola, Peermade and Thodupuzha. The former three taluks lie in the high land which is 250 ft. above MSL while the other taluk Thodupuzha lies partly in the high land and partly in the middle land which is between 25 ft. and 250 ft. above MSL. The majority of its geographical area of the district lies in the high land characterized by high rainfall and cold climate and the district does not have coastal belt in the low land which is below 25 ft. above MSL. The total geographical area of the district sprawls over an area of 5150 sq. km. which is 13 percent of the total area of the state and ranks first among the fourteen districts in the state. A good part of its area still reveals in sylvan splendour of thick rainfed forests from where as well cardamom emerged. Area in Idukki district is presented in Table 2.1.

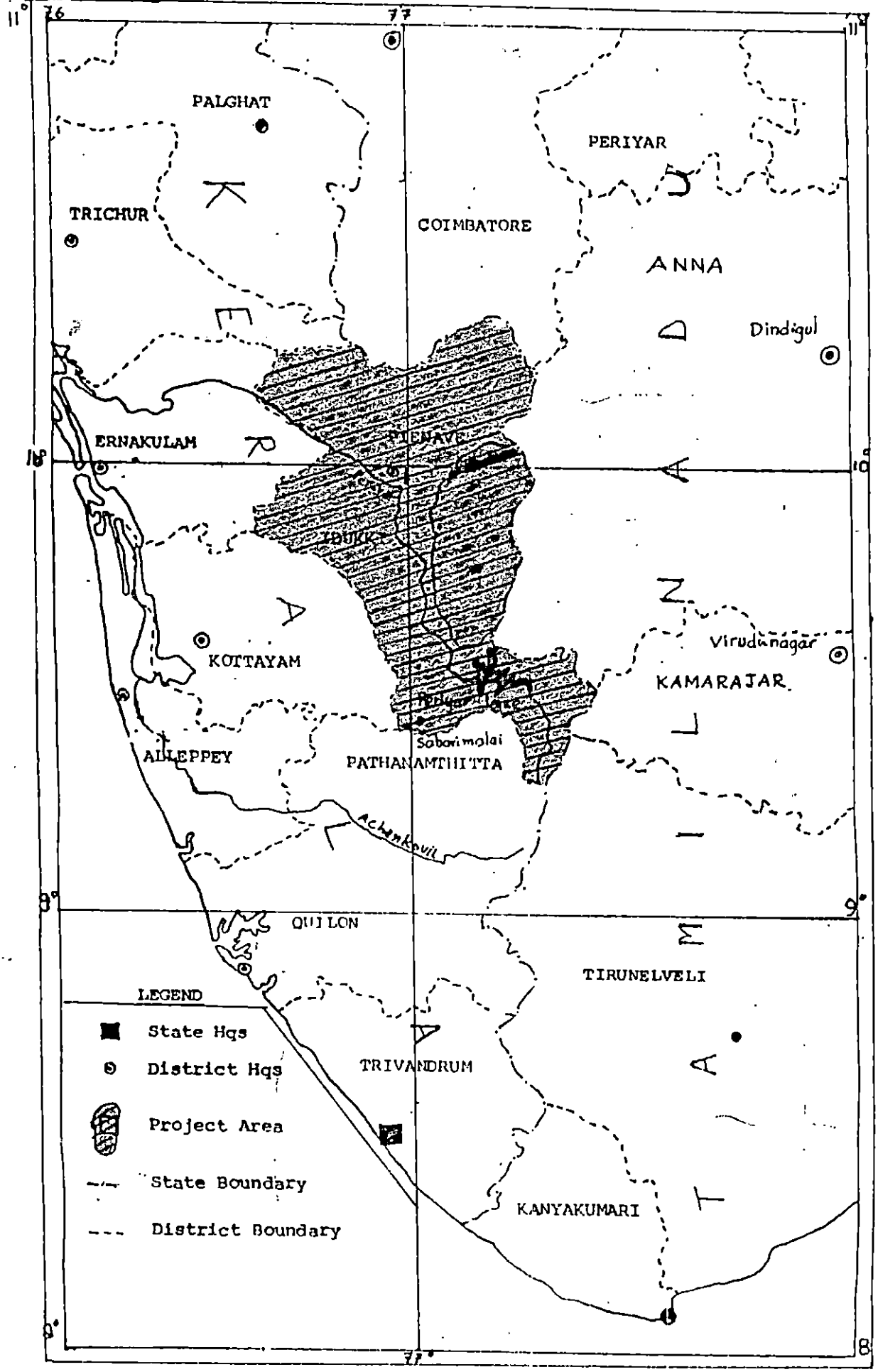

PALGHAT
TRICHUR
COIMBATORE
PERIYAR
ANNA
Dindigul
ERNAKULAM
IDUKKI
KOTTAYAM
Virudunagar
KAMARAJAR
Sabarimalai
ALLEPPEY
PATHANAMTHITTA
Achankovil
QUILON
TIRUNELVELI
TRIVANDRUM
KANYAKUMARI
LEGEND
State Hqs
District Hqs
Project Area
State Boundary
District Boundary

Table 2.1. Area of Idukki District (in Km^2)

Name of Taluk		Total area	Rural area	Urban area
Devicolam	T	1,774.1	1,768.2	5.9
	H	1,774.1	1,768.2	5.9
	M	-	-	-
Udumbanchola	T	1,071.4	1,071.4	-
	H	1,071.4	1,071.4	-
	M	-	-	-
Thodupuzha	T	973.7	951.8	21.9
	H	789.6	789.6	-
	M	184.1	162.2	21.9
Peermade	T	1,307.8	1,307.8	-
	H	1,307.8	1,307.8	-
	M	-	-	-
Total	T	5,087.0	5,059.2	27.8
	H	4,902.9	4,897.0	5.9
	M	184.1	162.2	21.9

Index: T. Total
H. High Land
M. Middle Land

Population

The population of the district as per 1981 census was 9.69 lakh and 10.77 lakh in 1991 census. Rural population was 9.24 lakh (95.4%) and urban population 0.45 lakh (4.6%) as per 1981 census. Male population was 4.93 lakh and 5.45 lakh and female population was 4.76 lakh and 5.82 lakh respectively in 1981 and 1991 census. Sex ratio of females per 1000 males respectively was 963 and 977 in 1981 and 1991 census with a literacy rate of male 72.2% and female 62.6% in 1981 census. The total main workers in the district as per 1981 census was 3.35 lakh with a work participation of 34.6%. The percentage distribution of main workers as per 1981 census showed cultivators 22.3%, agricultural labourers 25.9%, house hold industry workers 0.9% and other workers 50.9%. Marginal workers were 30,000 and non-workers were 6,04,000. The population details are shown in Table 2.2.

Soil and climate

Idukki is a high land district barring a bit of middle land region on the west banks of Thodupuzha taluk. The high ranges vary in altitude from 750 metres in Kulamavu to over 1500 metres in Munnar. The wide range in elevations speaks diversity in vegetation and soil. The soil is mainly laterite and forest loamy types. The district is blessed with a salubrious climate of tropical forests.

Table 2.2. Population - Idukki District

Sl. No.	Particulars	Unit	1981 Census	1991 Census
1.	Rural	'000	924.0	NA
2.	Urban	'000	45.0	NA
3.	Total	'000	969.0	1,077.0
4.	Male	'000	493.0	545.0
5.	Female	'000	476.0	532.0
6.	Scheduled Caste	'000	133.0	NA
7.	Scheduled Tribe	'000	38.0	NA
8.	House holds	'000	187.0	NA
9.	Density	Per sq.Km.	193.0	214.0
10.	Sex ratio	Females/ 1000 males	963.0	977.0
11.	Literacy rate	%	NA	NA
12.	Male	%	72.2	NA
13.	Female	%	62.6	NA
14.	Total	%	67.4	NA
15.	Total main workers	%	335.0	NA
16.	Work participation rate	%	34.6	NA
17.	Percentage distribution of main workers			
18.	Cultivators	%	22.3	NA
19.	Agricultural labourers	%	25.9	NA
20.	House hold industry workers	%	0.9	NA
21.	Other workers	%	30.0	NA
22.	Marginal workers	'000	30.0	NA
23.	Non-workers	'000	604.00	NA

Source: Basic Statistics 1991. Directorate of Economics and Statistics, Thiruvananthapuram.

Rainfall

The average yearly rainfall in Idukki district falls within a range of 2500 mm and 4250 mm but during some years it went up to even 7000 mm. The rain shadow areas of Marayur and Thalloor of eastern and north eastern parts in the district contrastingly get much lesser rainfall dropping down the average to 1500 mm annually. The monthly rainfall pattern in the Cardamom Research Station, Pampadumpara from 1981-1991 is given in Table 2.3 and the normal rainfall pattern for the district is shown in Table 2.4.

Land use pattern

The land use pattern of agriculture is given in Table 2.5. It showed net area sown 1.61 lakh ha., 1.66 lakh ha. and 1.81 lakh ha. respectively during the periods 1980-81, 1985-86 and 1989-90 while the total cropped area during the respective periods were 1.71 lakh ha., 19.7 lakh ha. and 2.29 lakh ha. The net area sown to total area was 31%, 32.2% and 35.2% and the total cropped area to net area sown was 106.1%, 118.4% and 126.4% respectively during the periods.

Cropping pattern

The cropping pattern of major crops in the district during 1980-81, 1985-86 and 1989-90 with their percentage to total is given in the Table 2.6. The perennial plantation

Table 2.3. Month-wise rainfall in Pampadumpara
(Rainfall in mm)

Months	YEAR											
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
January	4.30	-	-	28.50	134.50	18.50	6.00	-	-	114.70	43.00	3.00
February	-	-	-	28.00	-	21.20	3.00	5.40	-	5.20	35.00	-
March	6.50	3.40	-	103.50	7.50	36.20	19.00	34.20	31.80	126.40	54.00	-
April	25.40	127.10	21.40	90.75	46.50	42.70	13.10	117.80	140.50	33.00	194.00	161.60
May	81.60	153.80	129.80	57.00	94.75	19.00	80.80	43.90	60.50	227.60	38.00	123.40
June	573.70	265.00	211.40	775.15	671.50	214.10	230.60	181.00	353.20	310.20	496.10	321.40
July	315.80	206.30	345.50	338.00	299.25	234.50	68.60	135.80	623.70	257.10	462.40	402.70
August	386.30	214.00	423.50	212.00	232.50	375.70	371.00	325.60	215.20	256.90	295.80	255.70
September	312.80	71.90	289.00	421.75	266.00	144.50	128.00	241.40	188.60	29.20	101.20	262.50
October	380.00	142.20	183.30	286.50	173.00	197.70	345.60	171.50	373.40	263.20	218.60	197.40
November	89.50	201.30	203.50	124.75	92.00	117.10	242.00	114.40	94.50	299.20	34.30	373.60
December	37.00	23.70	79.00	62.75	35.00	35.50	263.80	16.10	18.20	77.80	10.30	33.40
Total	2212.90	1408.70	1886.40	2528.65	1982.50	1456.70	1771.50	1387.10	2099.60	2000.50	1982.70	2134.70

Source: Cardamom Research Station, Pampadumpara, Kerala Agricultural University.

Table 2.4. Normal monthly rainfall pattern in Idukki District

Month	Rainfall (mm)
January	31.1
February	24.1
March	44.6
April	111.7
May	200.9
June	556.7
July	655.1
August	432.9
September	262.7
October	304.4
November	195.8
December	68.8
Total	2898.9

Source: Directorate of Economics and Statistics Trivandrum.

Table 2.5. Classification of area under land utilisation - Idukki District

Sl. No.	Particulars	Area in hectares 1989-90	Percentage
1.	Geographical	5,14,962 (5150 sq.km)	100.00
2.	Forest	2,60,907	50.64
3.	Non-agricultural	15,958	3.09
4.	Barren and uncultivable	13,955	2.71
5.	Permanent pasture and other grazing	1,621	0.31
6.	Miscellaneous tree crops not included in net area	11,020	2.14
7.	Cultivable waste	27,513	5.35
8.	Fallow other than current fallow	984	0.19
9.	Current fallow	1,814	0.35
10.	Net area sown	1,81,190	35.19
11.	Area sown more than once	47,831	9.28
12.	Total cropped area	2,29,021	44.47
13.	Percentage of total cropped area to net area sown		126.39

Source: Basic Statistics 1991. Directorate of Economics and Statistics, Thiruvananthapuram.

crops like pepper, rubber, cardamom, tea, coconut and coffee dominate while other perennial crops like cashew and arecanut, and annual crops like rice, tapioca etc. are also marginally grown in the district. The net area irrigated in the district was negligible with 1700 ha., 3400 ha. and 3700 ha. respectively during 1980-81, 1985-86 and 1989-90 periods while gross area irrigated read respectively 2600 ha., 4400 ha. and 3500 ha. during the periods.

Income

Details on district income given in Table 2.7 revealed that net domestic product at 1980-81 prices was Rs.193 crores, 206 crores and 224 crores and at current prices at 193 crores, 325 crores and 477 crores during the period 1980-81, 1985-86 and 1988-89 respectively. Sector-wise distribution of net domestic product at current prices for primary sector was 56.3%, 57.2% and 52.6%, for secondary sector 17.4%, 18.1% and 18.8% during 1980-81, 1985-86 and 1988-89 periods respectively. Per capita income was Rs.1,929, 1,955 and 2,019 at 1980-81 prices, and Rs.1,929, 3,089 and 4,308 at current prices during periods 1980-81, 1985-86 and 1988-89 respectively.

Table 2.6. Cropping pattern of major crops under land utilization - Idukki District

Crops	(Area in 1000 ha.)					
	1980-81		1985-86		1989-90	
	Area	Percent	Area	Percent	Area	Percent
Paddy	9.3	5.44	8.3	4.22	4.9	2.14
Coconut	16.6	9.71	17.6	8.94	17.4	7.59
Tapioca	10.8	6.31	9.2	4.64	6.8	2.97
Rubber	17.4	10.18	31.1	15.78	37.8	16.51
Cashew	1.2	0.70	1.2	0.61	1.0	0.43
Coffee	5.0	2.93	5.8	2.94	10.8	4.72
Pepper	12.3	7.19	21.4	10.86	39.1	17.07
Arecanut	2.5	1.46	2.7	1.38	1.9	0.83
Tea	23.0	13.45	23.6	11.98	23.6	10.31
Cardamom	45.2	26.43	51.6	26.19	32.1	14.02
Other crops	27.7	16.19	24.5	12.43	53.6	23.41
Total cropped area	171.0	100.00	197.0	100.00	229.0	102.00

Source: Basic Statistics. Directorate of Economics and Statistics, Thiruvananthapuram.

Table 2.7. District income - Idukki District

Particulars	Unit	1980-81	1985-86	1988-89
NET DOMESTIC PRODUCT				
At current prices	Rs. Crores	193	325	477
At 1980-81 prices	Rs. Crores	193	206	224
Sector-wise distribution of net domestic product at current prices.				
Primary Sector	%	56.3	57.2	52.6
Secondary Sector	%	28.3	24.7	28.6
Tertiary Sector	%	17.4	18.1	18.8
PER CAPITA INCOME				
At current prices	Rs.	1929	3089	4308
At 1980-81 prices	Rs.	1929	1955	2019

Source: Basic Statistics 1990. Directorate of Economics and Statistics, Thiruvananthapuram.

Review of Literature

REVIEW OF LITERATURE

With a view to evaluating the objectives of the present study, it was required essentially to have an idea of some of the earlier observations, studies, approaches, and methods adopted. The review of literature having bearing on the main objectives and scope of the study provided the basis for structuring the present study with broad perspectives and multi-dimensions to make the exercise more comprehensive and penetrating. During the course of the review of literature, it was observed that, very little work on economics of cardamom cultivation/production were undertaken in this country and abroad. Nevertheless, a number of studies conducted within the country and outside in inquiring into cost of cultivation/ production and related economic aspects and measures of project evaluation are cited in this chapter on the following headings:

a) Cost of cultivation/cost of production studies on perennial crops.

b) Capital productivity analysis on perennial crops.

c) Appraisal of major problems of cardamom industry.

A. Cost of cultivation/production studies on perennial crops

Gopalan and Venkataraman (1951) worked out the cost of production of coconut under two stages ie., (a) cost up to

bearing age included cost on land, land tax, seedlings, digging of pits and planting, fencing, watering, cultivation, manuring, cleaning channel, levelling and bunding. The cost of maintenance consisted of the expenditure on manuring, cleaning of channels, harvesting, collection of nuts, land tax and other miscellaneous charges.

Agarwal (1952) studied the problems in evaluating the cost of cultivation of crops. He opined that allocation of overhead costs like depreciation, interest, maintenance charges on fixed capital and rental value of land should be made on the basis of the ratio between total prime expenditure on the holdings and on the individual crops. The rent usually should be allocated to various crops on the basis of their area and period for which the field remained occupied by them.

Cheyne (1952) made a revised estimate of expenditure on replanting of coconuts in Ceylon. The 1st to 7th year expenditures were found out respectively Rs.642, 158, 122, 72, 115, 115 and 107. The total estimated cost per acre for seven years equalled Rs.1,331.

Singh (1952) in a study on problems in calculating the cost of cultivation of crops concluded that the service-ability and value of an asset diminished as depreciation continued till it became exhaustive. It was pointed out that charges of depreciation, repairs, and interest should be apportioned based on their proportion of use on different crop enterprises.

Adams (1953) amortised cost of establishment of grapes over 30 years and 40 years in case of table and resin grapes respectively and this apportioned cost was taken as depreciation of vines. Balance sheet was arrived at by including 4 percent of interest on the fixed capital and apportioned cost of asset as depreciation over the life period of the grape enterprise.

Blocklock (1957) reported from a study on pepper in Sarawak that the first harvest of pepper was due only after 2½ to 3 years after planting. In giving the relationship between the age of plants and the yield, it was observed that during 4 to 7 years age group, yield increased with age and during 8 to 15 years age group, yield decreased with age.

Venugopalan (1961) estimated the cost of cultivation of pepper for the first six years to be Rs.244 per acre and during the tenth year when the yield stabilised to be Rs.491. The net income per acre by the first ten years when calculated to be Rs.2969.

Venkataram (1964) in a study on the economics of grape cultivation in Bangalore classified costs into establishment costs and maintenance costs. The expenditure in the first year of planting was the establishment cost and the costs incurred in the subsequent years were the maintenance costs. The establishment cost was apportioned over the productive life of the vine yard which was taken as 25 years.

Garg and Yadav (1965) in studying the cost of cultivation of mango, differentiated the growth and yield stages and worked out the costs for four periods, namely, establishment stage 1-6 years, growth stage 7-10 years, growth stage 11-20 years and declining stage from 21 year onwards.

Bhatnagar (1966) found the yield of 'made tea' to be 250 kg per acre in the 7th year after planting, which increased to 300 kg in the 12th year in Kangra district of Punjab. The gross revenue in the 7th year was Rs.688 which increased to Rs.825 in the 12th year. The recurrent expenditure worked out to be Rs.360 per acre leaving a net profit which varied from Rs.288 to Rs.468 per acre from 7th to 12th year.

Stankovle (1967) studied the time of replanting of various perennial crops. It was suggested that plantations should be replanted after the returns from their permanent crops were less than that could be obtained, at the same cost, by using land for an alternative purpose.

Muniraj (1968) in the case study of economic of production in cardamom plantation in Bodinayakanur area in Tamil Nadu evaluated the unit cost of production of cardamom and assessed the efficiency of resources. The average cost of production per acre was Rs.259.59, unit cost of production per kg Rs.6.83 and the profit Rs.405.18 per acre.

Madappa (1970) in an analysis of the cost of production of coffee in Chikmaglur district in Karnataka, observed that there was high percentage of labour and material costs in the total cost of cultivation in which labour cost accounted for 40 percent and material cost 20 percent. It was further observed that the size of the estate had no direct bearing on the cost of production of coffee except perhaps on the cost of spraying and pesticide application. The total cost of production of coffee was Rs.900 per acre, out of which cultivation cost was Rs.500 (55%), product preparing cost was Rs.100 (10%) and other costs were Rs.300 (35%). The difficulties encountered in the cost study identification mentioned were cost apportioning problems due to intercropping, mixing several varieties of crop, lack of proper records etc.

Mehta and Singh (1970) found the average cost of establishing one hectare of apple orchard up to bearing period in Kulu and Parabati valleys to be Rs.13,495 and Rs.10,714 respectively.

Venkateshwaralu and Suryanarayana (1971) divided the cost of cultivation of grapes under two main heads, namely, prebearing stage and bearing stage. While the first head was further divided into three sub-heads such as fixed assets, working assets and operating assets, the second head was divided into two sub-heads, namely, pre-harvest charges and post-harvest charges.

Mohan (1973) observed that the average cost of establishment of a pepper garden till the bearing stage was Rs.1,325 per acre.

Palanisamy and Kandasamy (1974) attempted estimating cost of grape production and resource use efficiency in grape gardens. They found that level of irrigation, manures and fertilizers had more influence on the production of grapes than other items.

RRIM (1975) reported that tapping and collection costs remained to be the biggest item in the cost of production of one kilogram of rubber production accounting for about 40 percent of total cost of mature area of rubber.

Jose (1976) discussed about need for enhanced cardamom production. The cost of one kg of cardamom arrived at was Rs.58. While the cost of maintenance was Rs.1,200/acre/year during 1975. The cost of establishment of one acre plantation was taken as Rs.2,765. This findings were arrived at after a study in certain pockets in Idukki, Wynad districts and Nelliampathy hills in Palghat district in Kerala.

Brandao et al. (1978) studied the economic viability of pepper production in Balia in Brazil and estimated the capital expenditure in analysing production costs, inputs, labour requirements and returns per hectare. The fixed, variable and average costs of production were studied. The cost per kg of dried pepper was also studied.

Achoth (1978) studied economics of Tea in Nilgiris in Tamil Nadu and worked out the establishment cost and the total costs incurred during five years in starting a tea estate. It included expenditure on clearing, lining, pitting, planting, replanting and other inputs like planting materials, plant protection chemicals, manures, land tax etc. Net establishment cost was computed by deducting value of crop from 3rd year onwards. The largest items of expenditure was on manuring and plant protection materials.

De'silva (1979) in a report on the coconut industry in Sri Lanka in the year 1978 reported that the cost of production of a coconut amounted to be Sri Lankan Re.0.25 during the year.

Singh et al. (1982) made a study on cost of production of plantation crops. The crops included were tea, coffee, rubber, coconut, arecanut, cashew, oil palm, cardamom, pepper, and tree spices. The methodological problems of estimating the cost of production of plantation crops as well were discussed in the paper to opine that a full proof and simple methodology for economic analysis of these crops was not available to researchers. They opined that it was extremely difficult to incorporate objectives of different nature and varying intensity into a yardstick with which to evaluate the plantation crops.

Das (1984) considering the average production cost and farmgate price of coconut at Rs.1.10 and Rs.1.50 per nut respectively under 1982-83 factor costs, the net return was worked out to be Rs.4,200/ha. Further, it was found that atleast 75 percent of labour required for various operations excluding harvesting, could be expected from the farmer's family itself. The returns to family labour and investment per hectare of cocconut garden came to Rs.5,760/annum.

Santhosh (1984) in a study on cost of cultivation and marketing of pepper in Cannanore district in Kerala found the per hectare aggregate cost for a period of seven years to be Rs.29,465. The annual expenditure for the seven year period was Rs.5,605, 2,475, 3,481, 3,514, 3,992, 4,715, 5,681 in that order. The maximum expenditure on cost of cultivation was during the 7th year followed by 1st year. The expenditure was the minimum during 2nd year and from 3rd year onwards, went on increasing till it reached the maximum in the 7th year. Labour input contributed the maximum with lesser family labour contribution.

Vinod (1984) in a study on cost of cultivation of pepper in Idukki district in Kerala found that annual cost of cultivation per hectare to be Rs.5,952, 3,958, 4,150, 4,583, 4,901, 5,412, 5,506 in that order for the first 7 years. The most conspicuous cost was on cultural operations with input human labour. Roughly one-fourth of the total cost was fixed

with the rental value of land predominant therein. The cost of cultivation viewed on a unit area basis was found to be decreased at the size of holding increased.

George and Rajasekharan (1985) estimated the average annual cost of maintaining a coconut garden in Kerala using budgeting techniques. It worked out to be Rs.3,888 per hectare. On adding interest on capital investment at 15 per-cent at the value of land to the annual maintenance cost, the total annual cost worked out to be Rs.18,888. On the basis of an average yield of 9000 nuts per hectare, average cost per 100 nuts worked out to be Rs.210, excluding the cost of management and own labour.

Randev et al. (1987) evaluated profitability of Almond cultivation in Kinnoar district of Himachal Pradesh by assuming a period of 30 years of life span with 10 years of commercial bearing. The establishment cost of almond orchard during 1984-85 was found to be Rs.12,003 per hectare including value of land, while operating cost was estimated between Rs.5,121 and Rs.11,024 per year per hectare.

Premaja (1987) in a study on the economics of coconut cultivation in Calicut district, Kerala estimated the total cost of cultivation for 16 years to be Rs.91,311. The average annual production of nuts was estimated to be Rs.10,049 per hectare and the cost of production to be Rs.1.12 per nut. The

estimated net returns on investment came to Rs.13,835 per year per hectare.

Bastin and Abdurazak (1988) made a size category-wise analysis of the cost of cultivation of bearing coconut plantations in North Kerala. The study revealed that the cost of maintenance of coconut per hectare was Rs.6,297.65, Rs.5,431.62, Rs.5,100.52 and Rs.4,183.73 respectively for the four size categories of farms in the district. The average cost was worked out to be Rs.4,442.05 per hectare. For application of manures and fertilizers, 65 percent of the total cost was incurred. Input-wise analysis showed that 45.19 percent of the total cost was incurred on manures and fertilizers and on labour 41.16 percent. The family labour utilisation showed wide variations ie., 34.73 percent in stratum I to 6.59 in stratum III. The average profit per hectare worked out to be Rs.10,360.43.

B. Capital productivity analysis

Prest and Turvey (1965) observed that cost-benefit analysis as a practical way of judging the desirability of long term projects. The cost benefit analysis implied the complete enumeration and evaluation of costs and benefits from the projects.

Peters (1970) opined that cost-benefit analysis is a practical way of assessing the desirability of projects.

The discount rate should be based on the rate of interest at which capital could be raised/borrowed. An afformative decision for the project could be possible if the internal rate of return exceeded the interest rate or if the present worth of the project was positive or if discounted benefit cost ratio exceeded unity.

George and Joseph (1973) estimated cost, revenues and margins of coconut, rubber, and oil palm in Kerala and reported that oil palm had the greatest return over cost with IRR 18 percent and BC ratio 2.71 at a discount rate of 9 percent. The corresponding figures for rubber was 10 percent and 1.2 and for coconut 9.5 percent and 1.07.

Jones (1973) discussed the economics of a coffee project of 75 acres in Rhodesia assuming the life over a period of 40 years. It was found that the return on total capital invested was @ 10 percent.

Lalgupta et al. (1973) opined that the benefit cost analysis provided a logical frame work for evaluating economic benefits of investments in resource development programme and was considered to be the most valuable technique for generation, evaluation and selection of projects.

Gupta and George (1974) worked out the profitability of Nagpur Santra oranges with the help of discounted cash flow techniques. The discount rate used was 12 percent. The results indicated that the optimum size of orange garden was

between 1 to 2 acres with payback period of 9 years. The IRR was estimated at 29.3 percent to 45.9 percent, BC ratio at 1.85 to 2.64 and NPW at Rs.4,260 to Rs.7,910. They concluded that cultivation of Nagpur Santra was desirable.

Menon (1979) computed a few measures of project appraisal involving cash flow discounting techniques for two varieties of grapes in Bangalore district. The techniques used were NPW, BC ratio and IRR. Cash in-flows and out-flows were discounted at 14 percent as it was the rate at which commercial banks advanced medium term loans. The cost of establishment during the first year and the annual costs from second year to the end of the economic life of vine yard were considered for the estimation. Land revenue and rental value of land were also taken into consideration in the computations.

Regupathy et al. (1979) found out the economic feasibility of investments made on coconut. The comparative economics of coconut production with no cultivation practices, and with manures/fertilizers application were worked out. The results of BC ratio, NPW and IRR revealed that all the projects were economically viable.

Joseph (1980) attempted to evaluate the economic efficiencies of coconut, cashew and rubber cultivated in Kerala. Economic efficiency was expressed in terms of net returns per hectare of crop activity. The results revealed

that descounted net returns from cashew were higher than that of rubber and coconut, the NPW being Rs.10,537, Rs.6,854 and Rs.4,758 respectively. Likewise BC ratio were 5.3, 1.6 and 2.0, and IRR 30, 16 and 17 percentages respectively. The analysis helped to understand the economic basis of the allocation of land to facilitate optimum crop mix at the farm level.

Bastin (1982) in a study of the economics of coconut cultivation in Irinjalakuda block in Kerala without taking into consideration the pre-bearing cost found out the BC ratio to be 2.19.

Elsamma and Mukundan (1984) evaluated the costs and returns of small holders of rubber in two zones in Kottayam district in Kerala. Using discounted cash flow technique at 10 percent interest, it was found that BC ratio was 2.04, and NPW Rs.25,597 for the district. The IRR was 24.20 percent.

Santhosh (1984) studied the capital productivity of pepper in Cannanore district and found that Payback period was around 9 years. At 10 percent discount rate BC ratio was 1.6, IRR 17.22 percent and NPW Rs.6,656.

Vinod (1984) in an analysis of capital productivity in Idukki district observed that Payback period of pepper was 10 year, BC ratio 1.09 and NPW Rs 4,180 at 10 percent interest rate. The IRR was found to be 13.48 percent.

C P C R I (1985) computed a few measures of project appraisal involving the cash flow discounting techniques for small holder plantation and spices crops including cardamom. They found that NPW was Rs.13,700 and BC ratio 1.42 at 14 percent discount rate for cardamom. The IRR was found to be 25 percent.

Nagaraja (1987) evaluated investments in coconut gardens in Tumkur district in Karnataka employing discounted cash flow technique. The economic life of coconut garden was assumed to be 60 years and the discount rate used was 15 percent. The results of the study showed the NPW to be Rs.19,112, Rs.20,663, Rs.30,021 and Rs.59,476 respectively for one hectare of medium, small, rainfed large and irrigated large gardens. The BC ratio was 1.17, 1.15, 1.30 and 1.22 respectively while IRR was 28.84, 24.02, 44.92 and 27.04 percentages, respectively.

Premaja (1987) studying the economics of coconut cultivation in Calicut district, Kerala reported that payback period of coconut was found to be 13-18 years, BC ratio 1.44, IRR 16.39 percent and NPW Rs.24,454 at 11 percent interest rate.

Randev et al. (1987) studied the capital productivity of Almond cultivation in Kinnour district of Himachal Pradesh and found that at 18 percent discount rate, NPW and BC ratio was Rs.68,593 and 2.67 respectively. The IRR was found to be 29.01 percent.

Mahabala et al. (1990) in a study on resource use efficiency and age-return relationship in cardamom plantations in Chickmaglur district in Karnataka recorded the peak returns in cardamom cultivation during the 7th year. The annuity value worked for the returns at 15 percent discount rate for pure and intercropped cardamom was the highest during the tenth year suggesting that it would be ideal to replace cardamom after 10 years of planting.

C. Appraisal of major problems of cardamom Industry

Mayne (1954) reported that cardamom occured throughout the forests of South India from South Travancore to North Mysore at elevations between about 750-1, 350 m. The area under the crop was one lakh acres, the greater part of which consisted of plantations and small holdings employing similar cultural methods. The plant was propagated by division or seed and was planted out in shallow pits. The main cultural operations consisted of shade management and weeding and more recently, pest and disease control. The most important pest was thrips and disease virus mosaic. Harvesting, yield, drying, classification and uses were also discussed.

Abraham (1955) described types of cardamom, pests and diseases, propagation, seed material, preparation of land for planting, spacing, pitting, planting, after-care,

manuring, harvesting and economics of cultivation.

Abraham and Tulasidas (1958) presented the details of the cardamom growing tracts of South India, ecological distribution and morphological differences of the existing varieties and types in their natural habitats, and their botanical and agricultural characteristics when grown together were reported.

Capoor (1967) probed into Katte disease of cardamom and recommended to eradicate systematically the affected clumps and thus remove the foci of infection altogether. Advised thereafter to transplant the required number of vigorously growing seedlings raised in isolated seed beds.

Nair (1967) made an appraisal of the existing position of the problems relating to the pests of cardamom and their control, and suggestions for future line of work given.

George (1976) assessed to report that there were various constraints to successful cardamom production like dependence on climatic conditions, problems of land tenure and deforestation in growing tracts, taxation policy, inadequacy of research and development and limitations of suitable area for cardamom cultivation.

Cherian (1977) reported that because of environmental imbalance, the productivity of cardamom in the country had gone down, as compared to twenty or thirty years back.

Due attention should be given to improve the environmental situations satisfying the requirements of the cardamom plants. The productivity could not likely to be improved with any amount of artificial tillage operations, irrigation, manuring, pesticides etc.

Abraham et al. (1979) reported that large scale denundation of forests in an around cardamom tracts in recent years was the greatest handicap in successful cultivation of cardamom. This practice caused upset to the ecological balance which was essentially required for the crop. For better plant performance, it was essential to maintain a suitable microclimate in cardamom plantations.

Krishna (1979) observed to report that the average recovery of cured cardamom from green cardamom was only 18-19 percent, and the same is 25-26 percent in well managed plantations. On account of improper harvesting alone, the possibility of crop loss was much to the total production. By improving the harvest technology to reduce the percentage of immature capsules, recovery on curing would go up by 28 percent.

Das (1982) in a review on the cardamom situation in India observed that the area under the crop went up by 62 percent between 1960-61 and 1979-80. Its production fluctuated violently over these years. The extreme susceptibility to climate influences and pests and disease accounted

for the mild variation in the yield. The unit value of cardamom per kg increased 1000 percent from Rs.18 in 1960-61 to Rs.199 in 1979-80. Mainly because of this unprecedental increase in price, the realised export earnings was pushed up to Rs.534.7 million in 1979-80 from merely Rs.36.7 million in 1960-61. Even then, India lost its near monopoly position in world production as well as export was replaced from some of the traditional markets through intensive competition from Guatemala.

Thomas et al. (1990) made a study on the production and export performance of Indian cardamom on the world market making use of the secondary data from 1970-71 to 1984-85. They found that India's export was highly and significantly correlated to production. The conclusion was that the low productivity and high cost of production vis-a-vis stiff competition in the international market rendered Indian cardamom less competitive and subsequently unremunerative for the planters.

In a general appraisal, as already noted, literature on economics of cardamom cultivation is scanty. Since methodologically study of economics of related spices and perennial crops like coconut, grapes, pepper, mango, tea, coffee, apple, rubber, arecanut, cashew, oilpalm, almond and orange is similar, an attempt has been made to review such literature. Review of literature on cost of cultivation/production as well as on capital productivity studies brings in ideas for strategy to be adopted in the methodology of the present study on economics of cardamom cultivation involving pre-bearing stage, initial bearing stage, steady bearing stage and declining stage during an economic life span of 12-15 years of the crop.

Materials and Methods

MATERIALS AND METHODS

This chapter deals with the nature and sources of data, and the various tools and techniques used in analysing and evaluating the data for the study on economics of cardamom cultivation in Idukki district. This chapter also contains definitions and explanations of some of the important terms and concepts used in the study.

The cardamom growing villages in the study area of the district were categorised into three zones based on productivity for the purpose of assessment of agricultural income tax, viz. Zone A, Zone B and Zone C. Zone A consisted of cardamom areas in Peermade taluk excluding Kokkayar and Peruvanthanam villages, Ayyappancoil, Chakkupallom and Vandanmettu villages of Udumbanchola taluk is rated as the most productive zone. Zone B falling in cardamom areas in Parathode, Pampadumpara, Udumbanchola, Chathurangappara, Santhanpara and Rajakkad villages in Udumbanchola taluk is considered to be less productive than Zone A. Zone C comprised of cardamom areas in Devicolam taluk and those villages in Udumbanchola and Peermade taluks not included in Zone A and Zone B is considered to be the least productive part in the district.

A three stage stratified random sampling procedure was followed in the study. The first stage sampling units

viz. cardamom growing villages were allocated to the different zones in proportion to the area under cardamom in the zones concerned to the total area under the crop in the district. The zones so formed constituted the second stage sampling units. On the basis of availability of time, it was decided to have a total sample size of 120. The sample was allocated to the different zones in proportion to area under the crop. There were 35 holdings in zone A, 34 holdings in zone B and 51 in zone C. The sample was post-stratified into small ($\leq$ 2 ha) and large ($>$ 2 ha) size classes on the basis of criteria adopted by the Spices Board. There were 78 small holdings and 42 large holdings in the sample. The selection of planters was based on the directory of the registered plantations published by the erstwhile Cardamom Board and out of the knowledge about the plantations in respect of different age groups to the Field Officers of the Board. The selected planters were personally interviewed and data recorded on the well detailed and structured interview schedule formulated for the purpose. A specimen of the schedule is provided in Appendix 1.

The reference period of the data collected related to the agricultural year from June 1983 to May 1984. Data collection was done during December 1983 to May 1984. All inputs and outputs were evaluated at 1983-84 prices.

The coverage of the study area was limited to three taluks out of four in the Idukki district which is the heartland of cardamom. The taluk omitted was Thodupuzha with insignificant cardamom cultivation in the district with its share of 3.90 percent under area and 4.38 percent under holdings of the total in the district. It also consisted of cultivations of a distinct cardamom cultivar 'Kannielam' which is different from mixed 'Mysore' and 'Malabar' cultivars dominated in the other taluks. Cardamom plantations in Thodupuzha taluk is otherwise included in zone C for agricultural taxation purposes.

The data were collected in respect of the actually existed cultivations of different ages in the year of the study from the sampled units. The data collected possessed information on different cultural and post harvest practices adopted in different stages of growth, hired and family labour engagement with cost thereof, cost of inputs like planting materials, organic manures, fertilizers, plant protection chemicals, marketing charges, market prices and such other data required for finding out cost of cultivation and production of cardamom.

Cardamom is basically a perennial plantation crop where there is a flow of income and expenditure over a long period. This crop has a time lag between the initial investment and first-pay off and needs replanting at a considerable

interval. Since this crop is different from seasonal and annual crops in respect of investment and returns, the economic as well as financial analysis of this crop deserve different treatment due to obvious reasons and therefore, economic evaluation of a perennial crop like cardamom is complex.

The technical coefficients, viz., inputs, outputs, revenue etc. were measured based on actuals followed and obtained from the holdings during the survey period. For computing the factor costs of inputs and labour wages, the actual operational input rates and wage rates during the period of study were adopted as obtained from the holdings surveyed. Time and motion approach was adopted in the study in getting age-wise data on costs and returns as prevailed during 1983-84 agricultural season.

Farm costs involve many kind of materials and services of heterogenous nature. A number of conceptual and measurement issues are involved in estimating the cost of cultivation and production of a perennial crop like cardamom. The issues mainly relate to treatment of hired human labour and family labour, labour amenities, cost on working capital and total fixed capital, rental value of land, managerial cost, transport and managerial charges, annuity of pre-bearing period, allocation of joint costs etc.

Costs of cultivation consist of cash and kind expenses actually incurred by the cardamom planters. They include (a) hired labour, (b) planting materials, (c) organic manures, (d) chemical fertilizers, (e) plant protection chemicals, (f) repair and maintenance of dead stock like agricultural implements and cardamom curing chambers, (g) transport and marketing charges, (h) overhead, contingencies and miscellaneous charges, (i) land tax and (j) interest on working capital.

Cost of human labour was one of the important constituents of the direct costs of cardamom cultivation. Labour consisted of both hired as well as family labour. Hired labour was evaluated on the basis of the actual wages paid during the period of study in the district. Family labour cost was evaluated at the market wage rate which prevailed over the district during the time of study. These consisted mainly of managerial functions performed by the family members and actual expenses incurred for visiting their plantations in the district.

Fixed capital excluding land was evaluated @ 11 percent per annum on the value of fixed assets during the time of study. Depreciation cost of fixed capital was worked out by the straight line method using the formula (original cost - salvage value) devided by the life of the assets. In case original values of fixed capital were not available,

depreciation was estimated on the basis of the present value and the remaining life of the assets.

Land tax was uniform throughout the district on the basis of actual amount paid to the government. Actual amounts incurred were taken into consideration in estimating overhead, contingencies and miscellaneous charges as well as on repair and maintenance of dead stock like agricultural implements, farm buildings and cardamom curing chambers. Actual expenses incurred for selling cardamom directly through dealers or through auction sales were charged towards marketing costs.

Interest on working capital was calculated @ 11 percent per annum for the pre-bearing period of two years for borrowed capital and interest on working capital for the subsequent period of 13 years of cropping period was calculated only for the half the crop year as borrowed capital could be paid back in the second half of every crop year on marketing cardamom in the later months of the crop season.

Rental value of own land was arrived at on the basis of market rent which prevailed during the period of study for lease-hold cardamom lands in the district. This approach was found meaningful as renting out of land in Kerala is a rare practice and land values are very high due to pressures external to agriculture.

Annuity value of pre-bearing establishment cost for two years was calculated @ 11 percent and allocated equally to the remaining 13 years of the life span of the crop. The annuity value included interest on establishment cost and amortised value of establishment cost for 13 years.

Cost of cultivation refers to total expenses incurred in cultivating one hectare of cardamom. This, together with costs on marketing were treated as cost of production of cardamom also. The economic life span of cardamom is taken to be 15 years. The plants get into yield normally by 3rd year of planting and the yield gets stabilised by 4th year. The economic yielding extends to 12th year under normal cultivation practices and thereafter yield decline is noticed. From 4th year onwards, items of cost remain almost same as that of the 3rd year. The expenditure during the pre-bearing stage ie., upto 2nd year constituted the investment on the crop. Data on flows of costs and returns were collected for a period of 0-4 years annually and thereafter for grouped plantations of 5-8 years, 9-12 years and beyond 12 years upto 15 years. Total cost of cultivation year-wise and item-wise for 15 years were calculated and the percentages of major individual items to costs were worked out for different zones, size category-wise holdings and district.

In the process of arriving cost of cultivation of cardamom, out of different concepts of cost of cultivation

in farm management the one thought to be the most appropriate and meaningful in this particular case of studying cost of cultivation of a perennial crop like cardamom has employed.

Cost of production was also worked out in terms of the cost involved in producing of one kg of cured cardamom. Cost of production have two major components, viz., establishment costs and maintenance costs. Thus, in determining the cost of production, in the first stage, the total investment for the pre-bearing establishment and the compound interest thereon were reduced to an annuity (capital recovery factor) bearing 11% interest, being the rate at which credit could be available during the period of study. The annuity was calculated using the formula (Das, 1985).

$$A = \frac{P}{\sum_{i=1}^{n} \frac{1}{(1+r)^n}}$$

where, A = annuity value;

P = total investment;

r = rate of interest; and

n = life of plantation.

The annuity value thus obtained was added to the annual maintenance cost to arrive at the total annual cost per unit area. Since no byproducts were involved, the net cost obtained was divided by the average annual production to arrive at the cost of production.

To examine resource use efficiency an exercise was attended to in respect of important factors, viz. hired labour, hired and family labour put together, organic manures, chemical fertilizers, organic manures and chemical fertilizers put together, and plant protection chemicals. It was done in respect of zone A, zone B, zone C, small size-group, large size-group and district. The influence of the said resources were evaluated on the basis of per rupee investment against the returns to know how much they gave in return. It was an attempt to appraise systematically of the different cardamom plantation management practices so as to determine their desirability by a comparison of their per rupee costs and benefits.

For testing economic viability, capital productivity analysis was employed which brings out efficiency of capital use in production. The indicators used to measure the capital productivity are the undiscounted measure of pay back period as well as the discounted measures of investment worth viz., Benefit Cost Ratio (BCR), Net Present Worth (NPW) and Internal Rate of Return (IRR).

(a) Pay Back Period

It is the length of time from the beginning of the project till the benefit pay up fully the cost of the capital investment. This measures the efficiency of cultivation by

indicating the period within which the returns offset the investment. Apart from the fact that this method ignores time value of money, it also ignores revenue accounting after the pay back period (Gittinger, 1976).

(b) Benefit Cost Ratio (BCR)

It indicates the return on a rupee of investment. It is the ratio between the present worth of benefits and that of costs. A project with benefit-cost ratio greater than unity is considered viable (Gittinger, 1976).

$$BCR = \frac{\sum_{i=1}^{n} \frac{Bn}{(1+i)^n}}{\sum_{i=1}^{n} \frac{Cn}{(1+i)^n}}$$

(c) Net Present Worth (NPW)

It is the present worth of the net cash flow stream which is the difference between the present worth of benefits and present worth of costs (Gittinger, 1976).

$$NPW = \sum_{i=1}^{n} \frac{Bn-Cn}{(1+i)^n}$$

(d) Internal Rate of Return (IRR)

This discounted cash flow measure is to find out of

the discount rate which just makes to NPW of the cash flow equal to zero. It represents the average earning power of the money over the project life and the project is worth to be accepted if the IRR is above the opportunity cost of capital (Gittinger, 1976).

$$IRR \quad \sum_{n=1}^{n} \frac{Bn - Cn}{(1 + i)^n} = 0$$

Where, Bn = Benefits in n th year;

Cn = Costs in n th year;

n = Number of years; and

i = Discount rate of interest

(The symbols are the same in all the three measures)

Sensitivity analysis was adopted to know how sensitive the returns from cardamom cultivation is to fall in prices (Gittinger, 1976). The recomputation was done with an imputed price which is 20 percent less than the one used earlier. This exercise was confined to IRR.

A perennial crop like cardamom has to be replaced at an appropriate time to maintain its productivity at an optimum and economic level. In understanding the age-return relationship in cardamom cultivation accumulated discounted returns over its productive life with standardised income thereof was calculated. The accumulated discounted income indicates the profitability in discounted rupees at that period in time.

The accumulated productive net discounted values are then standardised by multiplying it by the annuity obtainable using the formula

$$\text{Annuity} = \sum_{i=1}^{n} \frac{1}{(1 - (1+i)^{-n}}$$

where, i = Discount rate of interest

n = Number of years.

The optimum length of time to keep the plantation is determined by finding the year in which the stadardised income reaches the maximum. After the peak year is reached, the annuity or standardised income per year decreases during which time it is not economical to maintain the plantation (Perrin, 1972; Nagraj, 1987).

Results and Discussion

RESULTS AND DISCUSSION

The present study addressed itself to the task of examining the cost components and estimating cost of production of cardamom in terms of unit area and unit produce in Idukki district in Kerala. This was followed by different economic evaluations with a view to suggesting suitable policy recommendations in benefiting the cardamom industry in the country.

Unit cost of cardamom production is an important item of information necessary for evolving rational price policies and development strategies of cardamom production. The Agricultural Prices Commission of India in the first report itself expressed the desire to have reliable estimates of cost of production of important crops in India. In the case of cardamom, being an export oriented crop, such a realistic estimate on its cost of cultivation and production gain added significance. The economic survival of cardamom in the export markets would depend up on the success achieved in keeping its cost of production at competitive levels, at the same time ensuring remunerative prices to the farming community. Despite its importance, statistically valid estimates of the cost of production of cardamom was not available till the present study was undertaken. In the present study adequate attention to the concepts of scientific cost estimation on the principles of agricultural economics was attempted.

Cost of cultivation is the total expenses incurred in cultivating one hectare of cardamom and the cost of production is the total expenditure involved in producing one kilogram of cardamom.

In spite of several practical difficulties in obtaining correct information on income and expenditure in respect of every year of cardamom cultivation and production, every attempt was made to elicit correct information and present realistic estimates using the researcher's personal practical experiences on cardamom for several years. The information was collected for the particular year of cultivation itself during the reference period of the study. The inputs were valued at the rates that existed in the concerned zone during 1983-84 agriculture year. Interest on working capital for the particular year was also taken into consideration.

Initially the costs were estimated for every year of cardamom cultivation in respect of each sample holding. Simple average of every year of these sample level estimates were taken to generate estimates at the zonal level and at the size category farm level. The estimation for Idukki district was calculated as weighted averages of the zonal/size-category estimates in allowing weightages for the area in zones as well as in size groups.

An idea of various cultivation practices followed for cardamom cultivation and production in Idukki district

with costs and returns thereon for one hectare of new planting/ replanting is presented in this exercise.

Total cost - zonewise and sizewise

Total cost of cultivation over the life cycle of 15 years of cardamom is depicted in Table 5.1. It can be observed that for the district as a whole, this total was to the tune of Rs.1,93,340. There was no uniformity in cost among the three zones. The highest cost of Rs.2,14,387 per hectare was recorded for the zone A followed by Rs.1,93,765 in the zone B and Rs.1,76,745 in the zone C. Thus, in the zones C and B total cost was only 82.45 percent and 90.38 percent of the total cost in the zone A.

Costs incurred were different during the different phases of the crop such as planting period, pre-bearing period, period of initial bearing, period of steady bearing and period of decline. Of the pre-bearing period of the first two years, cost was much higher during the first year than the second for the obvious reason that activities related to planting had to be undertaken and the needed inputs particularly seedlings/rhizomes had to be procured during the year of planting. In the second year, mainly maintenance and gap filling costs are to be incurred. As the plants start bearing fruits during the third year, increase in cost takes place on account of greater intensity of input use

Table 5.1. Zone-wise cost of cultivation/production of cardamom (Rs/ha)

Year	Zone A	Zone B	Zone C	District
1.	11,186 (5.22)	10,420 (5.38)	9,305 (5.26)	10,126 (5.24)
2.	7,314 (3.41)	6,504 (3.36)	6,122 (3.46)	6,475 (3.35)
3	13,767 (6.42)	12,629 (6.52)	11,269 (6.38)	12,056 (6.24)
4	15,255 (7.12)	13,816 (7.13)	12,097 (6.84)	13,430 (6.95)
5-12	1,28,880 (60.12)	1,15,392 (59.35)	1,06,584 (60.30)	1,17,392 (60.72)
13-15	37,983 (17.72)	35,004 (18.07)	31,368 (17.75)	33,861 (17.51)
Total	2,14,387 (100)	1,93,765 (100)	1,76,745 (100)	1,93,340 (100)

(Figures in parenthesis represent percentages of total)

as well as of activities related to harvesting, processing and product preparation for the market. Further increase in input use and production in the fourth year raisescost still higher. As yield stabilizes during the fifth year and continues till the 12th year, cost has also stabilized during the period, at a level higher than that of the previous years. During the stage of declining yield, cost also has declined. Thus, percentage-wise 5.24 percent of total cost was incurred during the first year, 3.35 percent during the second year, 6.24 percent during the third year, 6.95 percent during the fourth year, 7.59 percent during fifth to 12th years and 5.84 percent during 13th to 15th years in the district.

Table 5.2 shows size class-wise cost. It can be observed that large holdings incurred lower total cost of Rs.1,92,235 per hectare as against Rs.1,94,391 per hectare in the case of small holdings. It may be of interest to note that contrary to the overall pattern, large holdings incurred higher cost during the initial years as well as during the period of decline.

Item-wise break-up of total cost

Item-wise break-up of the total cost of cultivation of cardamom is given in Table 5.3.

It could be seen therein that the largest share of the total cost in all the zones, size groups, and district was

Table 5.2. Size category-wise cost of cultivation/ production of cardamom (Rs/ha)

Year	Small holdings (< 2 ha.)	Large holdings (> 2 ha.)	District
1	9,248 (4.76)	10,432 (5.43)	10,126 (5.24)
2	6,427 (3.31)	6,561 (3.41)	6,475 (3.35)
3	12,101 (6.23)	12,016 (6.25)	12,056 (6.24)
4	13,495 (6.94)	13,396 (6.97)	13,430 (6.95)
5-12	1,20,600 (62.04)	1,15,840 (60.26)	1,17,392 (60.72)
13-15	32,520 (16.73)	33,990 (17.68)	33,861 (17.51)
Total	1,94,391 (100)	1,92,235 (100)	1,93,340 (100)

(Figures in parenthesis represent percentages of total)

Table 5.3. Item-wise break-up of total cost of cultivation/production for 15 years (Rs/ha)

Items	Zone A	Zone B	Zone C	District
1. Human labour				
(a) Wages of hired labour	68,752 (32.07)	59,684 (30.80)	54,980 (31.11)	60,695 (31.39)
(b) Imputed wages of family labour	6,594 (3.08)	5,673 (2.93)	4,863 (2.75)	5,839 (3.02)
(c) Amenities to hired labour	18,877 (8.81)	16,390 (8.46)	15,094 (8.54)	16,665 (8.62)
2. Planting materials	2,652 (1.24)	2,511 (1.30)	2,452 (1.39)	2,515 (1.30)
3 Organic manures	8,776 (4.09)	8,071 (4.17)	6,986 (3.95)	7,962 (4.12)
4 Chemical fertilizers	18,748 (8.74)	16,869 (8.71)	16,405 (9.28)	17,180 (8.89)
5. Plant protection chemicals	16,724 (7.80)	16,011 (8.26)	15,266 (8.64)	15,818 (8.18)
6 Marketing	7,454 (3.48)	7,721 (3.98)	5,588 (3.16)	6,973 (3.61)
7 Interest on working capital	8,993 (4.19)	8,061 (4.16)	7,396 (4.18)	8,085 (4.18)

(Contd.....)

Table 5.3 (Contd.....)

Items	Zone A	Zone B	Zone C	District
8. Maintenance of dead stock	2,707 (1.26)	2,361 (1.22)	2,187 (1.24)	2,396 (1.24)
9. Overhead, contingencies, miscellaneous	4,094 (1.95)	3,561 (1.84)	3,298 (1.87)	3,619 (1.87)
10. Depreciation of fixed capital	3,215 (1.50)	3,178 (1.64)	2,720 (1.54)	3,009 (1.56)
11. Interest on fixed capital	8,843 (4.12)	8,745 (4.51)	7,480 (4.23)	8,279 (4.28)
12. Rental value of land	2,250 (1.05)	2,250 (1.16)	2,250 (1.27)	2,250 (1.16)
13. Land tax	75 (0.03)	75 (0.04)	75 (0.04)	75 (0.04)
14. Annuity of pre-bearing pond	3,54,387 (16.62)	32,604 (16.83)	29,705 (16.81)	31,980 (16.54)
Total	2,14,387 (100)	1,93,765 (100)	1,76,745 (100)	1,93,340 (100)

(Figures in paranthesis represent percentage of total)

Table 5.4. Year-wise cost of Hired and Family Labour (In Rupees)

Year	Hired Labour	Family Labour
1	2,971 (4.90)	279 (4.78)
2	2,423 (3.99)	160 (2.74)
3	3,698 (6.09	295 (5.05)
4	4,246 (7.00)	358 (6.13)
5-12	37,640 (62.04)	3,904 (66.86)
13-15	9,717 (16.01)	843 (14.44)
Total	60,695 (100)	5,839 (100)

(Figures in parenthesis represent percentages of total)

towards human labour which for the district as a whole accounted for 43 percent of the total. Bulk of (93 percent) human labour cost was towards hired labour wages and other amenities. The absolute amount of labour cost was the highest in the zone A, followed by zones B and C. Labour cost was followed by expenditure towards chemical fertilizers and plant protection chemicals ranging from 8 to 9 percent in each case. Other major items were interest on fixed capital, interest on working capital, organic manures and marketing ranging from 3 to 4 percent in each case.

As the labour cost was the largest item of cost, an exercise was done to know utilisation of labour in different years of cultivation. Year-wise wage cost for various plantation operations is shown in Table 5.4. Out of the total cost of Rs.66,514/- per hectare for the district, 91.22 percent was towards hired labour cost, only the remaining 8.88 percent was for family labour. Family labour was utilized mainly for operations such as management of estate involving procurement and transportation of materials etc. Total annual wage cost was different during the different phases of the crop. It was at its highest level during the steady bearing period, followed by early bearing period.

In view of the predominance of hired labour cost in total labour costs, this item is examined further. The table 5.5 shows that hired labour is utilised for various

Table 5.5. Operation-wise Annual Hired Labour (In Mandays)

Sl. No.	Items	I year	II year	III year	IV year	V - XII year	XIII - XV year
1.	Clearing, fencing and pits formation	56 (24.03)	-	-	-	-	-
2.	Shade regulation/ shade planting	55 (23.69)	47 (24.74)	40 (13.79)	30 (9.07)	24 (6.50)	-
3.	Filling pits, cardamom planting and staking	27 (11.59)	7 (3.68)	-	-	-	-
4.	Weeding and mulching	49 (21.03)	49 (25.79)	75 (25.86)	87 (26.13)	99 (26.83)	70 (27.56)
5.	Soil works/conservational practices	18 (7.73)	45 (23.68)	36 (12.41)	36 (10.81)	30 (8.13)	30 (11.81)
6.	Trashing and mulching	-	8 (4.21)	14 (4.83)	25 (7.51)	28 (7.59)	20 (7.87)
7.	Manuring and mulching	15 (6.44)	16 (8.42)	18 (6.21)	21 (6.31)	24 (6.51)	22 (8.66)
8.	Plant protection	13 (5.58)	14 (7.37)	29 (10.00)	35 (10.51)	44 (11.92)	36 (14.17)
9.	Harvesting	-	-	47 (16.21)	57 (17.12)	69 (18.70)	46 (18.11)
10	Processing	-	-	31 (10.69)	42 (12.61)	51 (13.82)	30 (11.81)
Total		233 (100)	190 (100)	290 (100)	333 (100)	369 (100)	254 (100)

(Figures in paranthesis represent percentages of total)

plantation operations consisted mainly of (a) preparatory cultivation involving clearing, fencing and pits formation for planting, (b) attending to existing shade regulation or fresh shade planting for creating suitable eco-climate, (c) planting cardamom seedlings/rhizomes after filling up the opened pits followed by staking and mulching of planted materials, (d) weeding and mulching two or three occasions in an year, (e) resorting to various soil works and conservation practices, (f) trashing and mulching, (g) manuring and mulching (h) plant protection, (i) harvesting green cardamom at regular intervals, (j) and processing involving drying, cleaning, polishing and storing.

In terms of mandays, hired labour utilisation in the district for various cardamom cultivation practices came to 233, 190, 290 and 333 respectively during the first four years while the labour use in mandays during 5th to 12th year was 369 every year. Labour requirement became less during 13th to 15th year with 254 mandays per year. Labour requirement was the highest during the steady bearing period during 5th to 12th year with 369 mandays per year. That was due to higher labour utilisation for harvesting, processing and plant protection operations during the period compared to other years of cultivation. The cost of family labour was also the highest during the same period with 38 mandays per year.

During the first year of cardamom plantation, the largest item of labour utilisation was for clearing site, fencing and forming pits which consumed 24.03 percent hired labour followed by existing shade regulation/new shade planting. Weeding and mulching was the next important item. These operations put together utilized the bulk of hired labour requirement during the first year.

Weeding and mulching required 25.79 percent of hired labour during the second year of cardamom cultivation. This was followed by shade regulation and different soil works practices. In the early bearing period of 3rd and 4th year, the largest item of labour use was for weeding and mulching which required 25.86 and 26.13 percentages of total labour use in these years respectively. Other major items were harvesting, plant protection , shade regulation etc. during the year. As noticed earlier, it was during the steady bearing period from 5th to 12th year when labour use was at its peak and during this period more than 26 percent of labour use was for weeding and mulching followed by harvesting (18.70 percent) and processing (13.82 percent). Almost the same pattern was noticed during the subsequent phase also.

In a cardamom plantation various kinds of soil works and soil conservation practices called up on hired labour assistance which ranged from 7.73 to 11.81 percent of the

total labour every year during the entire life span of the crop. These practices were seen differed in certain holdings and much of them were found unnecessary operations.

Trashing followed by mulching were operations essentially carried out during the beginning of the cropping season in the bearing cardamom plantations. It could be seen that the hired labour requirement for the operations went up every year of progress of cardamom cultivation. It was at its highest level with 7.87 percent in the late bearing period of the crop.

Manuring followed by mulching were seen important operations carried out every year in cardamom plantations. The hired human employment ranged from 6.21 to 8.66 percentages over different years in the life span of the crop. Organic manuring was not seen dominant in many cardamom plantations compared to chemical fertilizing

Plant protection operations were seen dominant over manuring and fertilizing operations in almost all cardamom plantations. Many ways of plant protection operations were seen carried out for controlling various pests and diseases. These operations behaved important during bearing period of the crop rather than during the immature period of the crop. The hired labour employment was seen steadily increasing from 10 to 14.17 percent from 4 to 15th year of cultivation. The hired labour use for various plant protection operations

during pre-bearing period, however, was found less than the labour consumption for manuring and mulching operations during the same period of the crop cycle.

Harvesting of cardamom generally commenced from 3rd year of the crop life although there could be some negligible crop production during the second year itself. The hired labour requirement for harvesting steadily increased from 47 mandays to 69 mandays contributing 16.2 percent to 18.70 percent of annual labour use from 3rd to 12th year of production. Similar was the case of processing of cardamom as well during the period of which the labour used was from 10.69 to 13.82 percent. Labour use both for harvesting and processing was less during the late bearing period from 13th to 15th year of cultivation. That was obviously due to reduced crop obtainable from the aged cardamom plants for harvesting and processing.

In addition to hired and family labour inputs, various other material inputs were required for successful cardamom plantation operations. Year-wise cost of various cardamom plantation material inputs is shown in Table 5.6. During the first year of plantation operations, cost towards planting materials amounted to 56.42 percent of the material cost of of the year. The planting material cost towards gap filling in the second year was only 14.5 percent of the total cost of the year.

Table 5.6. Year-wise cost of various materials for Plantation Operations (in Rupees)

Sl. No.	Items	I year	II year	III year	IV year	V year	XIII year
1	Planting materials	2,282 (56.42)	233 (14.50)	000 (0.00)	000 (0.00)	000 (0.00)	000 (0.00)
2	Organic manures	858 (21.21)	217 (13.50)	757 (29.44)	690 (24.42)	680 (21.96)	000 (0.00)
3	Chemical fertilizers	559 (13.82)	705 (43.87)	1,005 (39.09)	1,127 (39.89)	1,237 (39.95)	1,296 (50.76)
4	Plant protection chemicals	346 (8.55)	452 (28.13)	809 (31.47)	1,008 (35.68)	1,179 (38.08)	1,257 (49.24)
Total		4,045 (100.00)	1,607 (100.00)	2,571 (100.00)	2,825 (100.00)	3,096 (100.00)	2,553 (100.00)

(Fitures in paranthesis represent percentages of total)

Different organic manures and chemical fertilizers were seen consumed in cardamom plantations from the pre-bearing stage onwards. In the first year cost towards organic manures was Rs.858/- (21.21 percent) of the total material cost while cost towards chemical fertilizers was Rs.559/- (13.82 percent) of the total cost of materials of the year. This was changed from 2nd year onwards as use of chemical fertilizers was seen considerably increased. Thus, cost of chemical fertilizers increased from Rs.559/- in the first year to Rs.1,237/- annually during the steady bearing period and further to Rs.1,296/- during the declining phase. There was generally no application of organic manures during the late bearing period of the crop.

Material cost towards various pesticides and fungicides consumed in cardamom plantations was seen lesser than the cost of organic manures and fertilizers consumed contrary to use of more hired labour for plant protection operations. The requirement of plant protection chemicals during first year of cardamom cultivation was less than during the subsequent years. Plant protection expenditure steadily increased from Rs.346/- during the first year (8.55 percent) to annually Rs.1,257/- (49.24 percent) of the annual total material cost during the declining phase of the crop.

Annual cost of cultivation during the steady bearing stage

Annual cost comprised of expenditure on major items

like hired labour, planting materials, organic manures, chemical fertilizers and plant protection chemicals. In addition to these items, cost on maintenance of dead stock involving agricultural implements and buildings, labour amenities, land tax, overhead, contingencies and other miscellaneous expenditure, interest on working capital, imputed value of family labour, depreciation and interest on fixed capital and rental value of land were also accounted. Along with these items, cost on marketing and allocated annuity value of the establishment cost were considered for determining the annual cost during bearing period of cardamom.

Tables 5.7 to 5.12 and figures 1 to 3 show the detailed cost of cultivation worked out for different years separately for the three zones as well as for the small holdings ($<$ 2 ha), the large holdings ($>$ 2 ha) and for the district. A comparison of the expenditure for different items of cost of cultivation and production as demonstrated in the Tables and figures revealed that major item of expenditure was towards labour cost with 29.33, 30.80, 34.34 and 31.38 percentages of the total cost respectively for the zone A, zone B, zone C and district. A further comparative study on each items in respect of the zones and size category holdings reitereated that expenditure on hired labour every year was the largest items of cost incurred among various cost factors involving cardamom

Table 5.7. Annual cost of cultivation/production : Zone A
(Rs/ha)

Sl. No.	Factors	I year	II year	III year	IV year	V to XII year	XIII to XV year
1.	Hired labour	3,404	2,678	4,271	4,922	5,317	3,647
2	Planting materials	2,400	252	-	-	-	-
3	Organic manures	960	230	861	773	744	-
4	Chemical fertilizers	590	940	1,102	1,169	1,328	1,441
5	Plant protection chemicals	364	473	991	1,155	1,190	1,407
6	Maintenance of dead stock	129	107	132	197	213	146
7	Marketing	-	-	466	647	658	359
8	Labour amenities to hired labour	935	735	1,173	1,351	1,460	1,001
9	Land tax	5	5	5	5	5	5
10	Overhead, contingencies, miscellaneous	209	161	220	295	319	219
11	Interest on working capital	990	614	507	579	618	453
12	Family labour	319	204	370	446	523	357
13	Rental value of land	150	150	150	150	150	150
14	Depreciation of fixed capital	195	204	208	220	225	196
15.	Interest on fixed capital	536	561	572	605	619	539
16	Annuity of pre-bearing period	-	-	2,741	2,741	2,741	2,741
Total		11,186	7,314	13,769	15,255	16,110	12,661

Table 5.8. Annual cost of cultivation/production : Zone B
(Rs/ha)

Sl. No.	Factors	I year	II year	III year	IV year	V to XII year	XIII to XV year
1.	Hired labour	3,060	2,410	3,863	4,284	4,501	3,353
2	Planting materials	2,278	233	-	-	-	-
3	Organic manures	940	222	748	705	682	-
4	Chemical fertilizers	565	660	1,002	1,115	1,206	1,293
5	Plant protection chemicals	357	466	892	1,099	1,178	1,263
6	Maintenance of dead stock	122	96	130	171	180	134
7	Marketing	-	-	482	633	684	378
8	Labour amenities to hired labour	840	662	1,061	1,176	1,236	921
9	Land tax	5	5	5	5	5	5
10	Overhead, contingencies, miscellaneous	184	145	212	257	270	201
11	Interest on working capital	919	539	462	520	547	415
12	Family labour	280	166	319	383	446	319
13	Rental value of land	150	150	150	150	150	150
14	Depreciation of fixed capital	192	200	212	216	222	194
15	Interest on fixed capital	528	550	583	594	611	534
16	Annuity of pre-bearing period	-	-	2,508	2,508	2,508	2,508
Total		10,420	6,504	12,629	13,816	14,424	11,668

Table 5.9. Annual cost of cultivation/production : Zone C
(Rs/ha)

Sl. No.	Factors	I year	II year	III year	IV year	V to XII year	XIII to XV year
1	Hired labour	2,678	2,321	3,468	3,736	4,233	2,971
2	Planting materials	2,227	225	-	-	-	-
3	Organic manures	727	208	717	630	588	-
4	Chemical fertilizers	538	641	966	1,104	1,187	1,220
5	Plant protection chemicals	325	433	722	881	1,171	1,179
6	Maintenance of dead stock	107	93	129	149	169	119
7	Marketing	-	-	355	463	492	278
8	Labour amenities to hired labour	735	637	952	1,026	1,162	816
9	Land tax	5	5	5	5	5	5
10	Overhead, contingencies, miscellaneous	161	139	208	224	254	178
11	Interest on working capital	825	517	414	452	509	372
12	Family labour	242	153	268	332	383	268
13	Rental value of land	150	150	150	150	150	150
14	Depreciation of fixed capital	156	160	168	176	196	164
15	Interest on fixed capital	429	440	462	484	539	451
16	Annuity of pre-bearing period	-	-	2,285	2,285	2,285	2,285
Total		9,305	6,122	11,269	12,097	13,323	10,456

Fig. 5.1

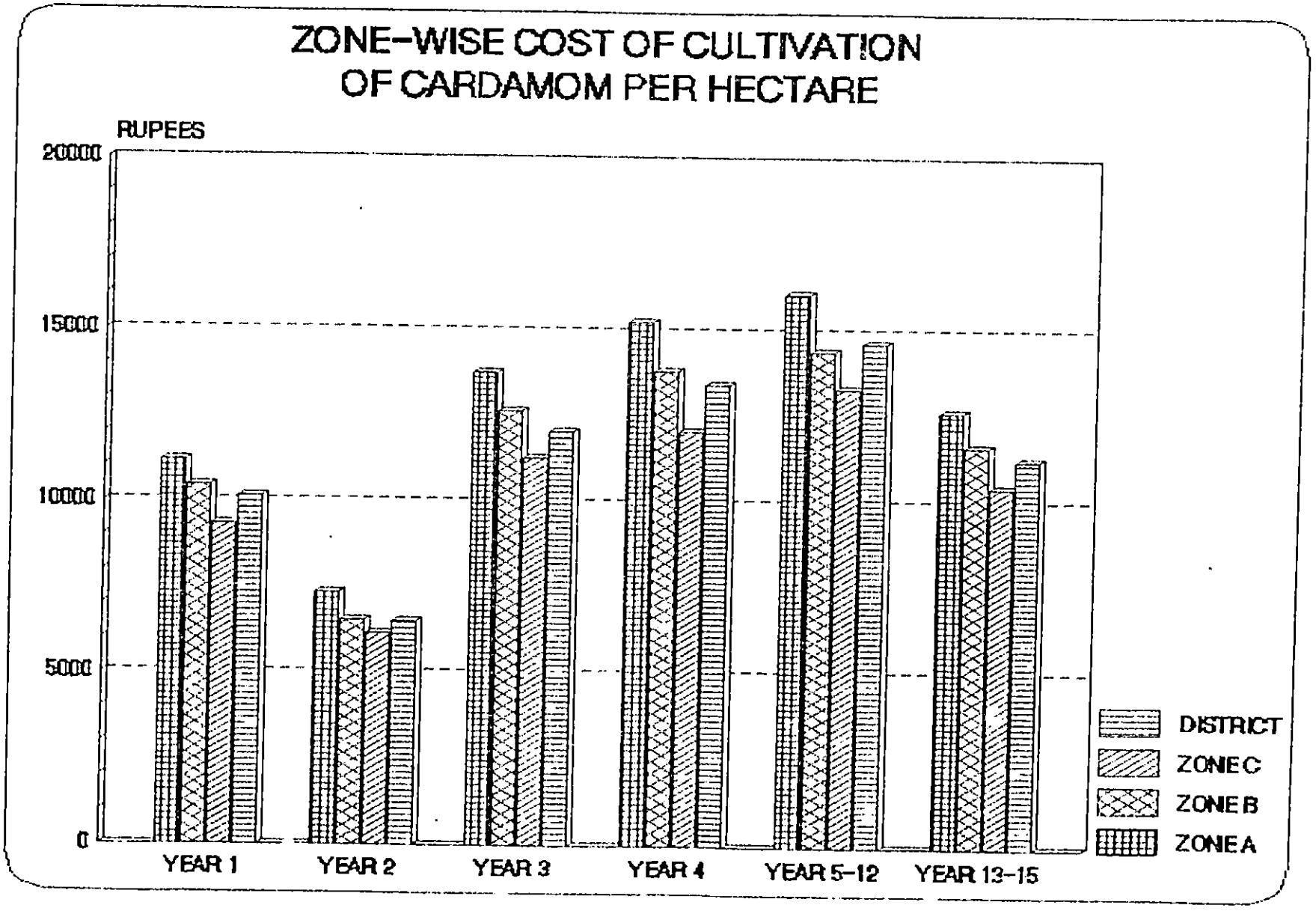

ZONE-WISE COST OF CULTIVATION
OF CARDAMOM PER HECTARE
RUPEES
20000
15000
10000
5000
0
YEAR 1
YEAR 2
YEAR 3
YEAR 4
YEAR 5-12
YEAR 13-15
DISTRICT
ZONE C
ZONE B
ZONE A

Table 5.10. Annual cost of cultivation/production : Small holdings (< 2 ha)
(Rs/ha)

Sl. No.	Factors	I year	II year	III year	IV year	V to XII year	XIII to XV year
1	Hired labour	2,831	2,435	3,851	4,208	5,164	3,137
2	Planting materials	2,037	235	-	-	-	-
3	Organic manures	705	207	751	814	736	-
4	Chemical fertilizers	485	728	1,009	1,238	1,232	1,247
5	Plant protection chemicals	292	446	906	1,143	1,210	1,229
6	Marketing	-	-	393	552	635	316
7	Labour amenities to hired labour	666	573	906	990	1,215	738
8.	Land tax	5	5	5	5	5	5
9	Maintaining dead stock	117	97	130	169	187	129
10	Overhead, contingencies, miscellaneous	180	145	1,211	253	281	194
11	Interest on working capital	805	536	449	516	587	385
12	Family labour	307	191	331	395	536	319
13	Rental value of land	150	150	150	150	150	150
14	Depreciation of fixed capital	178	181	183	197	217	178
15	Interest on fixed capital	490	498	503	542	597	490
16	Annuity of pre-bearing period	-	-	2,323	2,323	2,323	2,323
Total		9,248	6,427	12,101	13,495	15,075	10,840

Table 5.11. Annual cost of cultivation/production: Large holdings (> 2 ha)
(Rs/ha)

Sl. No.	Factors	I year	II year	III year	IV year	V to XII year	XIII to XV year
1	Hired labour	3,022	2,384	3,608	4,233	4,463	3,213
2	Planting materials	2,368	345	-	-	-	-
3	Organic manures	911	235	763	624	658	-
4	Chemical fertilizers	584	663	1,000	1,069	1,217	1,301
5	Plant protection chemicals	364	460	724	935	1,177	1,262
6	Marketing	-	-	393	552	635	237
7	Labour amenities to hired labour	948	748	1,132	1,328	1,400	1,008
8	Land tax	5	5	5	5	5	5
9	Maintaining dead stock	117	97	130	169	187	129
10	Overhead, contingencies, miscellaneous	180	145	211	253	281	194
11	Interest on working capital	935	559	438	504	552	404
12	Family labour	180	91	218	277	383	226
13	Rental value of land	150	150	150	150	150	150
14	Depreciation of fixed capital	178	181	183	197	217	178
15	Interest on fixed capital	490	498	503	542	597	490
16	Annuity of pre-bearing period	-	-	2,518	2,518	2,518	2,518
Total		10,432	6,561	12,016	13,396	14,480	11,330

Fig. 5.2

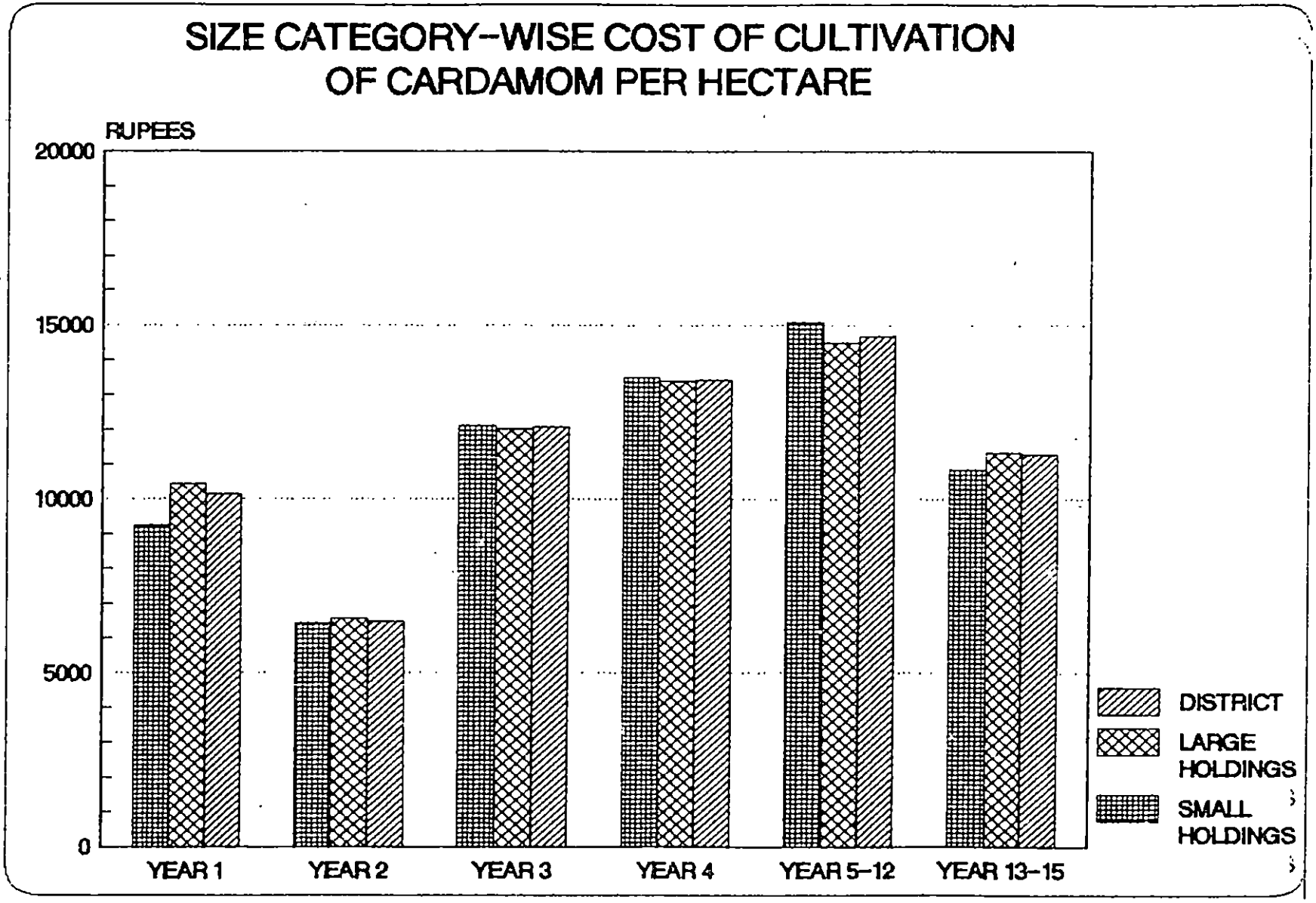
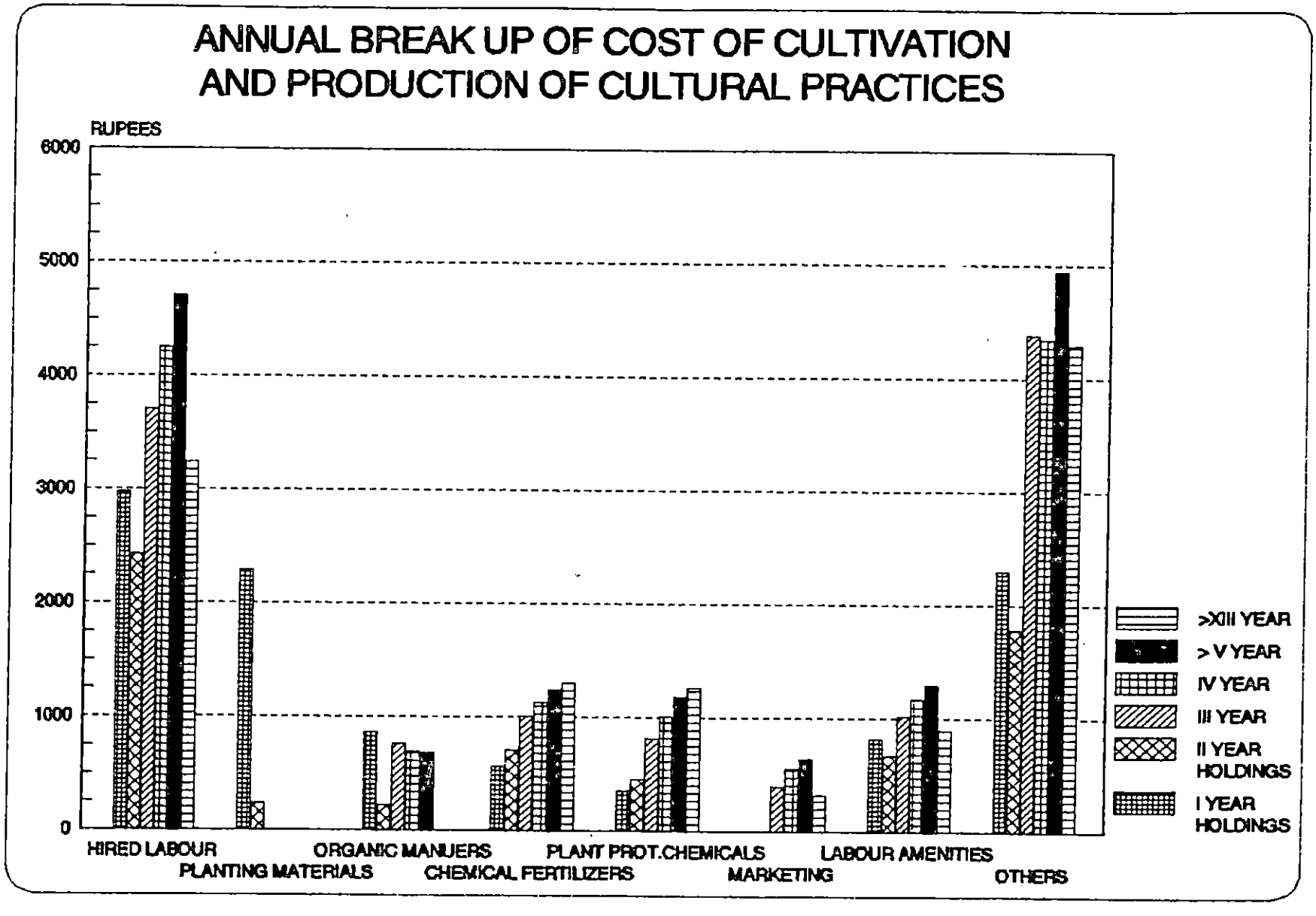

SIZE CATEGORY-WISE COST OF CULTIVATION
OF CARDAMOM PER HECTARE
RUPEES
20000
15000
10000
5000
0
YEAR 1
YEAR 2
YEAR 3
YEAR 4
YEAR 5-12
YEAR 13-15
DISTRICT
LARGE HOLDINGS
SMALL HOLDINGS

Table 5.12. Annual cost of cultivation/production : District
(Rs/ha)

Sl. No.	Factors	I year	II year	III year	IV year	V to XII year	XIII to XV year
1.	Hired labour	2,971	2,423	3,698	4,246	4,705	3,239
2	Planting materials	2,282	233	-	-	-	-
3	Organic manures	858	217	757	690	680	-
4	Chemical fertilizers	559	705	1,005	1,127	1,237	1,296
5	Plant protection chemicals	346	452	809	1,008	1,179	1,257
6	Marketing	-	-	393	552	635	316
7	Labour amenities	816	665	1,015	1,166	1,292	889
8	Land tax	5	5	5	5	5	5
9	Maintaining dead stock	117	97	130	169	187	129
10	Overhead, contingencies, miscellaneous	180	145	211	253	281	194
11	Interest on working capital	895	544	442	507	561	403
12	Family labour	279	160	295	358	488	281
13	Rental value of land	150	150	150	150	150	150
14	Depreciation of fixed capital	178	181	183	197	217	178
15	Interest on fixed capital	490	498	503	542	597	490
16	Annuity of pre-bearing period	-	-	2,460	2,460	2,460	2,460
Total		10,126	6,475	12,056	13,430	14,674	11,287

Fig. 5.3


ANNUAL BREAK UP OF COST OF CULTIVATION
AND PRODUCTION OF CULTURAL PRACTICES
RUPEES
6000
5000
4000
3000
2000
1000
0
HIRED LABOUR
PLANTING MATERIALS
ORGANIC MANUERS
CHEMICAL FERTILIZERS
PLANT PROT.CHEMICALS
MARKETING
LABOUR AMENITIES
OTHERS
>XIII YEAR
> V YEAR
IV YEAR
III YEAR
II YEAR HOLDINGS
I YEAR HOLDINGS

cultivation. Cost on plant protection chemicals among various inputs was less than the cost on chemical fertilizers. Marketing and processing costs were significant from 3rd year onwards but declined during the later bearing stage of the crop. These observations were found uniform and true in respect of all the zones, different sized holdings and district.

Small sized and large sized holdings however, behaved differently in incurring costs in different stages of plantation. Pre-bearing cost for the first two years in large holdings was higher than in small holdings. The early bearing period cost of 3rd and 4th year put together was more in large holdings. The steady bearing period cost from 5th to 12th year was higher in small holdings than in large holdings during the same period. During the later bearing stage from 13th to 15th year, large holdings behaved similarly as in the pre-bearing period incurring higher cost than in small holdings.

Expenditure on labour amenities was considerably more in large holdings than in small holdings. Obviously, family labour involvement was also more in the small holdings. Annuity value of establishment cost was Rs.2,323/- in small holdings and Rs.2,518/- in large holdings demonstrating clearly the higher cost of cultivation involved in large holdings during pre-bearing period of cardamom cultivation.

A comparative study of costs and returns

Considering the productive crop cycle to be 15 years for cardamom, the costs and returns per hectare in respect of different zones and district were worked out and presented in Table 5.13. As already seen, costs showed yearly increase from 3rd to 5th year and remained steady until 12th year before decreased from 13th year or 15th year. Returns started from 3rd year and showed increasing trend in 4th and 5th year. From 5th to 8th year returns remained stable but from 9th to 12th year and from 13th to 15th year, returns were seen declining during bearing life of the crop.

Annual cost of production

The cost of production of cardamom referred to the cost of maintaining one hectare of bearing cardamom from 3rd yea which is the economic commencement of the cropping period to the 15th year which is the economic end of the productive life of the crop, together with an annuity representing the establishment cost. It included variable costs involving costs on various cultural practices during the maintenance of the cardamom plantation and fixed costs constituting depreciation of fixed assets, interest on fixed assets, rental value of land and annuity value of establishment cost comprised of interest on establishment cost @ 11 percent and amortised establishment cost of 13 years. As already seen labour cost formed the major part of the variable cost in respect of

Table 5.13. Year-wise yield and cost of production
(Yield in kgs; Cost of production in Rs)

Zones/size-group/ district	III year		IV year		V - VIII year		IX - XII year		XIII-XV year	
	Yield	Cost of production.	Yield	Cost of production	Yield	Cost of production	Yield	Cost of production	Yield	Cost of production
A Zone	87	158	121	126	127	126	98	164	69	183
B Zone	85	148	118	117	123	117	96	150	68	171
C Zone	60	187	78	155	86	155	67	198	47	222
< 2 ha size	77	158	110	123	123	123	102	148	69	157
> 2 ha size	65	185	105	128	113	128	84	172	56	202
District	70	172	107	125	117	125	90	163	57	198

different zones, small and large sized forms, and district. Annuity value of the pre-bearing period constituted the major fixed cost in the zones as well as in small and large forms.

In determining the returns from cardamom plantations, average yearly yield in cardamom cultivated as well as average yearly price per kg were estimated during the study. There was no salvage (junk) value involved for cardamom plants after 15 years, and so, imputations for salvage value was not considered in determining cost of production.

Table 5.14 shows the yearwise costs and yields in determining the cost of production per kg of cardamom in different years in respect of different zones. Yield increase was from 87 kg to 127 kg per hectare in zone A, from 85 kg to 123 kg in zone B and from 60 kg to 86 kg in zone C, from 3rd to 5th years of production. Yield performance from 4th to 8th year was uniform in all zones followed by decline in yield from 9th year onwards in all the zones.

Cost of production was found to be lowest in the period 5th to 8th year in all the zones and the district. Among the zones, the cost of production was lowest in zone B and highest in zone C, in all the years. It was observed that cost of production was more during the later bearing period than the beginning of cardamom production. The lowest cost of production for the district was Rs.125/- per kg for cured cardamom during the 4th year as well as during the period 5th to 8th

Table 5.14. Costs and returns per hectare during a crop cycle (Rs/ha)

Year	Costs				Returns			
	Zone A	Zone B	Zone C	District	Zone A	Zone B	Zone C	District
1	11,186	10,420	9,305	10,126	-	-	-	-
2	7,314	6,504	6,122	6,475	-	-	-	-
3	13,769	12,629	11,269	12,056	21,837	21,335	15,060	17,570
4	15,255	13,816	12,097	13,430	30,371	29,618	19,578	26,857
5	16,110	14,424	13,323	14,674	31,887	30,873	21,586	29,367
6	16,110	14,424	13,323	14,674	31,887	30,873	21,586	29,367
7	16,110	14,424	13,323	14,674	31,887	30,873	21,586	29,367
8	16,110	14,424	13,323	14,674	31,887	30,873	21,586	29,367
9	16,110	14,424	13,323	14,674	24,598	24,096	16,817	22,590
10	16,110	14,424	13,323	14,674	24,598	24,096	16,817	22,590
11	16,110	14,424	13,323	14,674	24,598	24,096	16,817	22,590
12	16,110	14,424	13,323	14,674	24,598	24,096	16,817	22,590
13	12,661	11,668	10,456	11,287	17,319	17,068	11,797	14,307
14	12,661	11,668	10,456	11,287	17,319	17,068	11,797	14,307
15	12,661	11,668	10,456	11,287	17,319	17,068	11,797	14,307

years. It increased to Rs.163/- and Rs.198/- respectively during the 9th to 12th years and 13th to 15th years. From this, it could be concluded that the most productive phase of cardamom cultivation ended by 8th year of cultivation, and thereafter replanting could be thought of in appropriate time.

An yield of 77 kg and 65 kg respectively recorded during 3rd year, in small and large size group holdings rose to 123 kg and 113 kg during 4th and during 5th to 8th year period with corresponding cost of production of Rs.123/- and Rs.128/- per kg of cured cardamom in small and large sized holdings respectively. The cost of production increased to Rs.148/- and 157/- in small sized groups and to Rs.172/- and 202/- in large group holdings respectively during 9th to 12th year and during 13th to 15th years. The results of yield performance in size group holdings also emphasis on the unproductive phase of cardamom cultivation after 12 years.

It is an acknowledged fact that cardamom like any other perennial crops have to be replaced at an appropriate time. Stability of crop production was seen from 4th year to 8th year of cultivation. The attempt to know the age return relationship of cardamom from the results revealed that returns increased up to 8th year and started declining thereafter up to 12th year. From 13th year onwards, further decline in crop production was observed. Therefore, replanting could be done

around 12th year of cardamom cultivation.

Efficiency of resource use

In order to examine the efficiency of resource use an exercise was done in finding out returns per rupee of expenditure on major input factors, viz. (a) hired labour, (b) hired + family labour, (c) organic manures, (d) chemical fertilizers, (e) organic manures + chemical fertilizers, and (f) plant protection chemicals for different zones as well as for different size groups. This exercise was done for different phases of the crop and the periods chosen reflected the pattern of production. The results are given in Tables 5.15 and 5.16.

The results indicated that returns per rupee expenditure on hired labour was the highest in 4th year in zone A (Rs.5.45) and the lowest (Rs.4.11) was in zone C. In the same year, size wise, hired labour returns were higher in small holdings than in large holdings. When hired labour and family labour pooled together in the same year, returns were the highest (Rs.6.35) in zone B among the zones and in small holdings (Rs.4.94) among the size groups. Organic manure returns during 4th year was the highest in zone B with Rs.42.01 and with Rs.42.24 in large holdings. Similar was in the case of chemical fertilizers with Rs.26.56 and Rs.24.65 respectively. Organic and chemical fertilizers put together also behaved

Table 5.15 Zone-wise returns per rupee of investment in resources

Resources	A Zone			B Zone			C Zone			District		
	Years			Years			Years			Years		
	IV	V-VIII	IX - XII	IV	V-VIII	IX - XII	IV	V-VIII	IX - XII	IV	V-VIII	IX XI
Hired labour	5.45	5.34	4.12	5.42	5.38	4.20	4.11	4.00	3.12	4.96	4.90	3.4
Hired labour + family labour	5.66	5.46	4.21	6.35	6.24	4.87	4.81	4.68	3.64	4.65	4.53	3.4
Organic manures	30.29	42.86	33.06	42.01	45.27	35.33	31.08	36.71	28.60	38.92	43.19	33.2
Chemical fertilizers	25.98	24.01	18.52	26.56	25.60	19.98	17.33	18.19	14.17	23.83	23.74	18.2
Organic manures + chemical fertilizers	15.64	15.39	11.87	16.27	16.35	12.76	11.29	9.15	7.13	14.78	15.32	9.3
Plant protection chemicals	26.30	26.80	20.67	26.95	26.25	20.49	22.22	18.43	14.36	26.64	24.91	19.1

Table 5.16. Size group-wise returns per rupee of investment in resources

Sl. No.	Resources	Small holdings			Large holdings			District		
		Years			Years			Years		
		IV	V-VIII	IX - XII	IV	V-VIII	IX - XII	IV	V-VIII	IX - XII
1.	Hired labour	5.31	4.84	4.01	4.74	4.84	3.60	4.96	4.92	3.47
2.	Hired labour + family labour	4.94	4.46	3.70	4.50	5.54	3.38	4.65	4.53	3.48
3.	Organic manures	33.92	41.95	34.79	42.24	43.10	32.04	38.92	43.19	33.22
4.	Chemical fertilizer	22.30	25.06	20.78	24.65	23.31	17.32	23.83	23.74	18.26
5.	Organic manures + chemical fertilizers	13.46	15.69	13.01	16.08	15.13	11.24	14.78	15.32	9.35
6.	Plant protection chemicals	24.16	25.51	21.16	28.19	24.10	17.91	26.64	24.91	19.16

similarly. The returns on plant protection chemicals during the year also indicated similar results and the values were respectively with Rs.26.95 and Rs.28.19. It could be discerned that zone B and large size group behaved similarly in respect of returns on all these factors put together.

During 5th to 8th year, returns on hired labour was the highest in the zone B with Rs.5.38 while small and large holdings behaved similarly with Rs.4.84. Similar was the case for hired and family labour together in zone B as well as in large size groups.

The returns on organic manures during 5th to 8th years was the highest in zone B with Rs.45.27 and with Rs.43.10 in large size group. In the case of chemical fertilizer it was the highest with Rs.25.00 in zone B and in small size group with Rs.25.06. Organic manures and chemical fertilizers when pooled together also responded similarly respectively with Rs.16.35 and Rs.15.39 in zone B and small size group. The returns from zone A with Rs.26.80 and from small size group with Rs.25.51 were the highest in respect of plant protection chemicals.

In regard to 9th to 12th year age group, hired labour returns were the highest in zone B (Rs.4.20) and in small size group (Rs.4.01). The pooled together, hired and family labour as well behaved so with Rs.4.87 and Rs.3.70 respectively in zone B and small size group. During this period returns per rupee

of expenditure in organic manures was the highest in zone B (Rs.35.33) and in small size group (Rs.34.79). The returns on chemical fertilizers was also the highest in zone B and small size group respectively with Rs.19.98 and Rs.20.78. Organic and chemical fertilizers taken together also showed the similar results with Rs.12.76 and Rs.13.01 respectively in zone B and small size group. Return on rupee of expenditure on plant protection chemicals were the highest reported in zone B and small size group during the period.

The overall results indicated that both zone B and small size group did well in the use of scarce resources during 5th to 12th year in zone C the resources were totally under-utilised. Interestingly, the behaviour of large size group and zone A could be compared in certain respects in 4th year of cultivation in the efficient use of resources during the year contrary to behaviour later as were observed.

Comparative economics of major types of cardamom

It was earlier mentioned that 'Mysore' and 'Malabar' are the two distinct varieties of cardamom with its hybrid 'Vazhukka' available in the study area. As a result of continous cultivation, mixing of these varieties were reported from the sampled holdings although holdings in zone A and zone B were largely predominant with Mysore and Vazukka while holdings in C were with Malabar. It is characteristic of Mysore and Vazukka cultivars to behave well under more favourable agro-climatic

situations rather than Malabar in the same situations. At the same time, Malabar has got tolerance to some extent, to drought situations while Mysore and Vazukka could fail more under such adverse drought situations. The survey also revealed that the problem of thrips infestation was more in Mysore and Vazukka cultivars rather than in Malabar cultivars. This was established well with higher costs seen incurred towards plant protection operations mainly for thrips control in zone A and zone B compared to zone C in that order. It is the inherent character that Mysore and Vazukka have more potential in yielding than Malabar under favourable climatic conditions that the returns from cardamom in zone A and zone B predominantly from Mysore and Vazukka cultivars were more than from zone C which was predominantly with Malabar or Mysore/Vazukka remained comparatively under unfavourable climatic situations. These results further emphasised the reasonableness of categoring villages under zone A, zone B and zone C on the basis of productivity for agricultural income tax purposes by the Government of Kerala.

Capital productivity analysis

Capital productivity analysis was resorted to for bringing out efficiency in capital use in cardamom production. As cardamom has a long gestation period with considerable investments during pre-bearing period and bearing period and with returns remained spread over a long period, economics of investments and returns were attempted to evaluate through capital productivity analyses, viz. (a) Pay back period analysis, (b) Benefit-cost analysis, (c) Net present worth

analysis and (d) Internal rate of return analysis. The estimated cost of cultivation and returns obtained were used for these capital productivity computations.

Pay back period is the length of time required from the beginning of the project before the net benefits paid back the cost of the capital investment in the project. It is an undiscounted measure of worthiness of the project which measured the efficiency of the investments by indicating the period within which the returns offset the investments. Payback period analysis is shown in Appendices 2 to 5 and the results obtained are reproduced below:

Zone A - 3.75 years

Zone B - 3.52 years

Zone C - 4.50 years

District - 3.83 years

The indicated payback periods showed that zone B has a shorter payback period than the other zones but it could be meaningful to place payback period of cardamom as 4 years for practical purposes.

Benefit-cost (BC) ratio indicated the returns on a rupee of investment. It is the ratio of the present worth of benefits to that of present worth of costs. The project with BC ratio greater than unity is considered financially viable. Benefits and costs for every year were discounted

@ 11 percent of rate of interest at which rate long term agricultural credit could be obtained during the reference period of the study. BC ratio analysis can be seen done in Appendices 5 to 9. The results obtained are the following:

Zone A - 1.47

Zone B - 1.58

Zone C - 1.21

District - 1.46

As the BC ratios are greater than 1 in all the cases, the investments made out were economically justifiable. The economic viability was seen maximum in zone B compared to other zones. BC ratio came to around 1.5 in the district and is relevant to cardamom cultivation in the country as a whole for considering cardamom projects.

Net present worth (NPW) is the straight method of discounting cash flows in a project. It is otherwise the difference between the present worth of benefits and present worth of costs. Computation of NPW could be seen in Appendices 5 to 8 along with computation of BC ratio. The formal selection criterion for NPW is to accept a project with a positive net present worth when discounted at the opportunity cost of capital. The computed NPW are indicated:

Zone A - Rs.46,750/-

Zone B - Rs.52,525/-

Zone C - Rs.16,876/-

District - Rs.41,294/-

The NPW was positive in all cases. Zone B had the highest NPW indicating thereby that cardamom cultivation in the particular zone gave the most favourable returns.

Internal rate of return (IRR) is that discount rate which made the net present worth of cash flow zero. It represented the average earning power of the capital employed in the project. The formal selection criterion for IRR measure of worth is to accept a project having an IRR above the opportunity cost of capital. The IRR analysis done is shown in Appendices 10 to 13 and the results are given below:

Zone A - 51.00%

Zone B - 50.10%

Zone C - 32.60%

District - 49.50%

The results demonstrated that the IRR in all cases were well above the opportunity cost of capital of 11 percent. The investments on cardamom were very much profitable especially in zone A and zone B compared to zone C. It could be concluded that a cardamom project having around 50% IRR is a worthwhile while ... looking into financial viability of the project on cardamom.

The Appendix 14 made out sensitivity analysis which was done to know how sensitive the returns from cardamom cultivation would be, if there is an unexpected fall in prices. With a 20 percent fall in prices, the IRR was recomputed to read as 30.20% for the district. This indicated that cardamom cultivation is a very profitable enterprise to be worthwhile on its investments even under 20 percent price fall in some years.

The present study also attempted to understand the age-return relationship in cardamom cultivation. It could be discernible in the Appendix 15 the discounted net income and standardised income for the district. The annuity value or the standardised income at 11 percent was the highest in the 12th year and the value started declining thereafter. This indicates that taking up replantation of cardamom after 12 years of its cultivation is meaningful.

Problems of cardamom industry

The analysis of the primary data collected from the area of study in the cardamom growing zones in Idukki district and from the opinion of cardamom growers brought out certain salient features on the problems confronting the cardamom industry in the district.

Cardamom is predomiantly grown as a monocrop under the canopy of ever green forest trees in the district. A

major portion of such cardamom areas is accounted in the official records as marginal, small and medium sized holdings. For practical management purposes, a group of such holdings constitutes large individual family holdings in contrast to the position obtaining in the records mentioned above. This observation leads to the necessity for a more objective identification of actual small and marginal growers for regulating the flow of scarce public resources of technical and financial inputs to deserving category of growers.

No doubt, small and marginal planting community in large numbers face problems in production and marketing of cardamom. Cardamom cultivation continued to be a gamble on unexpected drought situations for want of sufficient irrigation facilities in a large number of holdings during the period of survey. This individual problem alone predominantly affects the economics of cardamom cultivation with low productivity in many a holdings. The survey showed that irrigated area was meagre, with only one percent of holdings in zone C, 2 percent in zone B and 4 percent in zone A being irrigated.

The tenancy system over cardamom lands posed problems. The holdings were either patta lands or leased in lands from the Government. In all the cases the right of grown-up trees providing shade to cardamom rested with the state Department of forests. There are two categories under leased

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in lands, viz. 'registry' and 'lease'. Tenancy under registry was sanctioned before 1942 and lease was granted under 1962 rules till 1972. No lease agreements were executed after 1972 on a policy decision from the government. Lease, either through public auctions, without auctions, renewable or concessional, enabled planters to hold temporary cardamom cultivating rights over the lands. In due course of time, the tenancy system led to unauthorised alienation or unauthorised and unscrupulous felling of shade providing forest trees. Although the political climate so far did not lead to eviction from such leased/encroached lands, lands should be assigned to the genuine cardamom cultivation under special registry in safeguarding cardamom reserve areas in the district in the long run. In providing such legalisation, the genuine cardamom planters should be made eligible for availing of institutional finance for furthering the cardamom industry.

In accordance with cardamom Act (1965), all cardamom lands must get registered from the revenue authority but cardamom registration is not that full proof leading to erroneous figures in the matter of number of holdings registered and area under registration with upto-date correct details thereof.

As cardamom is a delicate plant under the shade, many a pests and diseases ravage the crop both in uncared for

cultivations and intensively cultivated plantations. Scale of returns were seen reduced as revealed by the results of zones A and C. A cost-effective cultivation strategy has to be evolved for stable economic returns and the survival of the industry.

The study revealed that over-application of pesticides against thrips as well as over fertilization did not help increasing yields correspondingly as revealed by the results in zone A. Use of a variety of insecticides against thrips and root pests increased over the years as well as fungicide applications against rot: complex diseases. Despite the use of such inputs abundantly, the problems of pests and diseases continued to exist particularly in zone A. Above all, indiscriminate use of insecticides paved the way for pesticide residues in the product. The issue of pesticide residue could have been a major problem in cardamom marketing if the major International markets for Indian cardamom were USA and western countries instead of middle east countries where quality consciousness is not to the level of these developed countries. Further, the over applications of insecticides tell upon adversely the growth of honey bees which are the main pollinating agents of the crop reflecting the consequences thereon on the productivity of cardamom.

A virus disease called 'Katte' posed serious constraints over cardamom production over the years leading to uncertainty and risks over the stability of the industry. Katte disease

problem was better seen managed in zone A than zone B and zone C while the problem was more seriously observed in zone C. Katte infected cardamom plants continued to yield in initial infection period which tempted the planters in not going for immediate remedial measures. During the survey, 91% of the holdings reported incidence of Katte disease even though with 1 or 2 % of the total plants in a holding with Katte infection. In the study it further revealed that 100% of the planters were aware of the seriousness of this disease problem to themselves as well to the neighbouring planters.

Root rot complex diseases like clump-rot and Azukal caused sudden havocs to the bearing plants as against Katte disease. The incidence of these problems was seen more serious in zone A where intensive cultural practices with fertilization were in vogue. In zone A 19% of sampled holdings were seen infected while the corresponding figures for zone B and C were 9% and 7%.

Among the pests, thrips incidences were seen in 100% of the holdings surveyed irrespective of the zones. Insecticides procured were seen mainly used for containing thrips infestation to the produce, affecting product prices in the market. Another observation reported by the sampled farmers was that of severity of thrips infection on Mysore and Vazukka type cardamom plants as compared Malabar type plants. Thus thrips control measures cost more to plantations in zone A

rather than in zone B and zone C, because as stated earlier the types cultivated in zone A are Mysore and Vazuka.

Instability in prices of cardamom was pointed out to be a major problem facing cardamom industry. Indeed, it was the price which decided the growth of this plantation crop in 1970s and 1980s. It was also revealed during the study that real small and marginal growers were subjected to exploitation by middlemen in the market who deprived the farmers of the prevailing market prices at any point of time. There was an element of exploitation by about Rs.10/- per kg of cardamom marketed in zone A while it was reported to be about Rs.13/- and Rs.16/- respectively in zone B and C.

In order to avoid tax problems, majority of producers preferred to sell directly to the dealers rather than at the auctions but the dealings outside the auctions were based on the indication of prices of periodical auctions. This led to a conclusion that arrival of cardamom in auctions did not reveal the real production status of the crop in the district as sale of cardamom to dealers outside the auctions were substantial, and a realistic picture could not be available due to obvious reasons. The participants in the auctions even for partial sale of their produce were 71, 53 and 49 percentages respectively of sample growers in A, B and C zones.

The study also revealed that while 92% of the holdings studied possessed satisfactory information on internal prices, only 23% had the knowledge of international price situation of cardamom. The awareness of information about cardamom prices was more in zone A than in B and C zones.

Short term and long term credit is available from commercial as well as co-operative banks to the cardamom community. Long term institutional credit was mainly utilised by large farmers. On an only average 32% of sampled farmers availed of crop loans from financial institutions. Tenancy status was the main hindrance. It was found that 87% of small and marginal growers availed of subsidy facilities from the erstwhile Cardamom Board irrespective of zones.

Almost all groups of growers irrespective of zones pointed out difficulties confronted from tax and revenue authorities on agricultural income tax, sales tax, tenancy of land, cardamom registration etc. Seriousness of labour unrest was another problem which was expressed mainly by large planters. Along with this, absentee farming remained to be a problem facing the industry as there were many growers from outside the district in the state as well as from Tamil Nadu.

Availability of inputs like pesticides, fungicides, fertilizers, implements etc. did not pose much problems even though the supplies were entirely through private dealership

channels. Transportation and communication channels on these fronts existed between Kerala and Tamil Nadu states as a large section of cardamom community including labour force was from Tamil Nadu. Supply of cardamom planting materials, however, was from a chain of nurseries run by the erstwhile Cardamom Board spread over all the three zones in the district or from own nurseries raised by individual holdings encouraged technically and financially by the erstwhile Cardamom Board. Out of the sampled holdings 9% of the planters possessed their own nurseries with larger share going to holdings in zone A. Nevertheless, planting materials of high hielding clones suited to micro agro-climate of the different zones in the district were not available either in Board's nurseries or in private nurseries. There seemed a necessity of having a technique for rapid multiplication of high yielding identified clones and facilities for multiplication thereof.

Using agro-climatically suitable varieties in every zone remained as an important aspect in boosting cardamom production. No doubt, Mysore and Vazukka varieties possessed more potential in yields but did not perform very well normally under unirrigated conditions and on failure of adequate rainfall. It was noticed that holdings predominantly possed Mysore and Vazukka in zone C showed the lowest productivity even with higher cost of cultivation. The reasons for higher productivity of cardamom in zone A could

be due to favourable Vazukka type of cardamom predominantly in the zone. It seemed Malabar types were suited to drought situations.

In taking efforts to enable increasing productivity, the massive ecological degradation that has been taking place in cardamom growing areas required to be reversed to restore the earlier position during a few decades before when cardamom had only a status of a wild forest produce.

In the harvesting techniques, if unskilled labour attended, there are possibilities of getting more immature capsules during each harvest leading to loss of crop on curing. Harvesting at proper time by skilled labour is very crucial for obtaining quality product. It was found that unscientific way of harvesting resulted in avoidable loss of product. Efficient harvesting would result in recovery of 25 percent cured product. As against this, the sample growers could get only 17 to 19 percent.

The study further revealed that 74 percent of the sample holdings possessed their own cardamom curing facilities, others depending on neighbours possibly loosing a margin of profits in such cases. As a whole post-harvest and marketing efficiencies need to be enhanced towards further heights.

It was further pointed out during the study to reveal

that during 1960s and 1970s, there were cardamom plantations aged over 20-30 years, but during the study period seldom such plantations could be noticed for their satisfactory maintenance and returns, perhaps as a result of more intensive cultivation practices adopted. This led to frequent replantations without taking full economic advantage of the established plantations with high investments particularly in zone A.

Above all, certain areas once with cardamom cultivation in Idukki district particularly in Devicolam taluk and adjoining Udumbanchola taluk were seen wiped out in recent times due to deforestation and resultant ecological changes. These areas were seen largely replaced by pepper crop which is better suited to the changed agro-climatic situations. Naturally, cardamom crop became uneconomic in such areas especially when Mysore or undesirable Vazukka types continued to be tried under less shade and un-irrigated situations. Undoubtedly, cardamom is an essential crop required to be maintained in the district to keep up the cardamom production in the country.

Summary and Recommendations

SUMMARY AND RECOMMENDATIONS

Cardamom (small) famed as the queen of spices is an important foreign exchange earning crop in India. It is as well a low volume high value spice crop, and one among four recognised plantation crops.

The present study on the Economics of cardamom cultivation in Idukki district, Kerala state is based on a sample of 120 cardamom growers in the district. For the purpose of agricultural income tax, cardamom growing areas in the district are grouped into three different zones. The sample size of 120 growers were selected from zones A, B and C. The sample frame was further stratified into small (below 2 ha.) and large (above 2 ha.) size groups. The reference period of the study was the agricultural year 1983-84. The study was undertaken with the following objectives.

(a) To study cultural and management practices of cardamom followed by growers in Idukki district.

(b) To study costs and returns of cardamom in the district.

(c) To examine resource use efficiency in cardamom cultivation.

(d) To study comparative economics of major types of cardamom.

(e) To evaluate the problems of the cardamom industry in the district.

Cardamom is a perennial crop which starts bearing from

the third year and the economic yields continue upto fifteenth year. Input uses and costs were estimated for different phases with respect of the three zones, two size groups and the district.

In the district from the first to the fourth year, annual costs were Rs.10,126/-, Rs.6,476/-, Rs.12,056/- and Rs.13,430/- respectively per hectare. Cost per hectare per year during the period 5th to 12th year was Rs.14,674/- and it was Rs.11,287/- per year during the period 13th to 15th year.

In the zone A annual costs per hectare from first to fourth year were Rs.11,186/-, Rs.7,314/-, Rs.13,769/- and Rs.15,255 respectively. During the period 5th to 12th year, the annual costs per hectare was Rs.16,110/- and during the period 13th to 15th year, Rs.12,611/- per year.

In the zone B, the annual costs per hectare read as Rs.10,420/-, Rs.6,504/-, Rs.12,629/- and Rs.13,816/- during the first four years and Rs.14,424/- annually during the period 5th to 12th year, Rs.11,668/- annually during the 13th to 15th year.

In the zone C, the per hectare annual costs respectively were Rs.9,305/-, Rs.6,122/-, Rs.11,269/- and Rs.12,097/- during the first four years and Rs.13,323/- annually during the period from 5th to 12th year and Rs.10,456/- annually during the period from 13th to 15th year.

In the small size group (below 2 ha.), costs per hectare during the first four years respectively were annually

Rs.9,248/-, Rs.6,427/-, Rs.12,101/- and Rs.13,495/- while during the period 5th to 12th year, it was annually Rs.15,075/- and during 13th to 15th year, it was Rs.10,840/- annually.

In the large size group (above 2 ha.) from the first to 4th year annual costs per hectare respectively were Rs.10,432/-, Rs.6,561/-, Rs.12,016/- and Rs.13,396/-. It was Rs.14,480/- annually during the period from 5th to 12th year and Rs.11,330/- annually from 13th to 15th year.

The productivity of cardamom year-wise in kgs in respect of all the zones, size groups and district is indicated below:

	3rd year	4th year	5th to 8th year	9th to 12th year	13th to 15th year
District	70	107	117	90	57
Zone A	87	121	127	98	69
Zone B	85	118	123	96	68
Zone C	60	78	86	67	47
Small size group	77	110	123	102	69
Large size group	65	105	113	84	56

The cost of production per kg of cardamom year-wise in respect of all the zones, size groups and district is as follows:

	3rd year	4th year	5th year	9th to 12th year	13th to 15th year
District	172	125	125	163	198
Zone A	158	127	127	164	183
Zone B	148	117	117	150	171
Zone C	187	155	155	198	222
Small size group	158	123	123	148	157
Large size group	185	128	128	172	208

There was no difference in cost of production per kg of cardamom between the 4th and the 5th year. More than 30 percent of the total cost of cultivation/production per kg of cardamom was accounted for by hired labour during the bearing period in respect of all the zones, size groups and the district signifying the labour intensity involved in the cardamom production. It was further learnt that emphasis was not being attributed to application of organic manures during any of the growth periods particularly during the late bearing period. At the same time, over emphasis was seen bestowed in indiscriminate use of pesticides possibly causing health hazards to the work force, consumers and honey bees.

It was further discernible from the results and discussions that despite the higher productivity of cardamom

in zone A, production of cardamom in zone B was more rewarding than in zone A and zone B. The small sized holdings compared to large holdings also behaved to be more efficient in getting economic returns.

In order to examine the efficiency of resource use, an exercise was done in finding out returns per rupee of expenditure on major input factors. The over all results indicated that both zone B and small sized holdings performed well in the use of scarce resources during 5th to 12th year and in zone C resources were seen remained under-utilised.

The various measures of capital productivity analyses employed using the discount rate @ 11 percent showed payback period, NPW and BC ratio in different zones and district. Payback period in the district was 3.83 years, while it was 3.75 years, 3.52 years and 4.50 years respectively in zone A, zone B and zone C.

In the district, NPW was Rs.41,294/- while it was Rs.46,750/- Rs.52,525/- and Rs.16,876/- in zone A, zone B and zone C respectively.

BC ratio turned out to be 1.46, 1.47, 1.58 and 1.21 respectively in district, zone A, zone B and zone C.

IRR was also calculated in respect of three zones and district which were 49.50 percent, 51.00 percent, 50.10 percent

and 32.60 percent in district, zone A, zone B, and zone C respectively.

In addition to the above mentioned capital production analyses, the sensitivity analysis when employed with a 20 percent lower price per kg of cardamom, the IRR obtained was more than 30 percent which confirmed to the effect that the cardamom cultivation to be a very profitable enterprise in the plantation field. It was found that age-return relationship indicated towards the right time of replantation by 13th year under the existing system of cultivation and management.

The general problems faced by the cardamom growers were identified to on tenancy and registration leading to difficulties in enjoying the benefits of institutional credit easily. Along with this, taxation problems too worried the cardamom growers. In the cultivation front, 'Katte' disease as well as some rot-complex diseases posed problems coupled with infestation of thrips on cardamom capsules and incidences of a few root/stem pests. Many of the soil cultivation activities were indicated as unnecessary along with indiscriminate use of pesticides causing possibly health hazards to the work force, consumers and the honey bees which are the main pollinating agents of the crop. Application of organic manures was seen not adequate enough along with eco-preservation remained to be a felt serious problem of

the cardamom industry in the long run. Cardamom cultivars suited to micro-agro-climate in the different zones were seen not consciously cultivated telling upon poor productivity as against the potential from a agro-climatically suitable plant. These factors get reflected in the high cost of production of cardamom in the country. Above all, occurrence of occassional drought situations seemed to be a serious problem affecting the productivity of the crop.

Recommendations

The study on the Economics of Cardamom Cultivation in Idukki district, Kerala during the year 1983-84 led to the following recommendations for appropriate action plans and policy decisions in the interest of the Cardamom Industry in the district and the country as a whole:

1. A more objective classification of small growers of cardamom based on unit of actual management is necessary for facilitating meaningful flow of scarce inputs and finance for cardamom development.

2. Permanent rights to cultivate cardamom over the leased-in lands should be conferred so as to avoid uncertainities over the cardamom cultivation prevailing over many years on such lands.

3. Organic farming with eco-preservation is needed to be emphasised in the long run. Along with this,

unnecessary cultivation practices and indiscriminate use of insecticides have to be discouraged.

4. Under rainfed conditions suitable Malabar cultivars preferred to Mysore and Vazukka (hybrid) cultivars have to be popularised for longer economic returns. Under irrigated conditions suitable vazukka (hybrid) cultivars could be preferred as per the responses seen in different zones. No doubt, providing irrigation facilities would pave way for enhanced cardamom production avoiding risks over drought situations.

5. Contrary to earlier beliefs, it could be seen from the results of the study that the pre-bearing period was only two years, being the shortest among the plantation crops and the economic returns commenced from the third year cultivation itself. Therefore the steady and peak bearing period of the cardamom crop could be regarded as 4th to 8th year of cultivation. It would be appropriate to treat the average cost of cultivation/production of the said period as the maintenance cost in determining the cost of production of the crop for price fixation and other policy decisions.

6. The cultural practices of cardamom have to be so recommended as to get an economic yield for 10 years after the immature period before planning, replanting schedule by 13th year of crop cycle based on the age-return relationship studied.

7. As a step to increase yield and to reduce cost per kg of cardamom, action plans are required to have cost effective production with employing efficient post-harvest technologies.

8. Steps towards price stability and providing irrigation facilities would help avoid uncertainties and risks over cardamom cultivation, thus boosting production.

9. Elite demonstration plots could be designed and implemented by the Spices Board on the lines of organic farming, eco-preservation, cost-effective cultural and post-harvest practices and hygienic product development for meeting growing internal consumption as well as competitive international demands of cardamom.

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Appendices

Appendix - 1

ECONOMICS OF CARDAMOM CULTIVATION IN IDUKKI DISTRICT, KERALA STATE

(Research Programme - Schedule for Cardamom Planters)

01. Identification

1. Name of the Planter :

2. Address of the estate :

3. Permanent address of the planter :

4. Statehood of the planter : KERALA/TAMILNADU

5. Location of the estate :

Thavalam Village - Taluk

6. Type of ownership : Proprietory/Partnership/ Company.

7. Type of management : Professional/Non professional

8. Type of holding : Resident/Non-resident

9. Nature of land tenure : Patta land/lease land

10. Other Cultivation/business Interests of the planter :

11. Family details of planter:

Name	Sex	Relation-ship	Education	Occupa-tion	Income

12. Total extent of the holding

a) Area under Cardamom :

b) Area under other crops with details :

c) Land under buildings, road:

d) Land under waste :

13. Details of fragments of area under Cardamom

Reg. No. of fragment	Name of the holder	Partnership	Extent

14. Details of immature area under cardamom

Year of planting	Name of field	Age of plant	No. of plants	Spacing	Extent

15. Details of mature area under cardamom

Year of planting	Name of field	Age of	No. of plants	Spacing	Extent

02. Details of labour

1. Wage Labour	Permanent	Casual	Work hours perday	Wage rate
a) Men				
b) Women				
c) Children				
2. Family Labour				
a) Men				
b) Women				
c) Children				
3. Technical/Supervisory staff				
a) Manager				
b) Superintendent				
c) Clerk				
d) Watchmen				
e) Peon				
f) Others				

03. Details of source of income for plantation

a) Source of the cash for the year's expenditure:

b) Amount borrowing

c) Interest on borrowing

d) Subsidy amount

e) Others

04. Details on buildings/roads:

Nature	Year of construction	Construction cost	Present value

05. Details on implements/Machinery/Pumpset/Sprinkler/Vehicle etc.

Nature	No.	Year of purchase	Purchase value	Present value

06. Cost of cultivation:

New planting/Replanting

A. General

1. Area under planting

2. Year of planting

3. Type of plants. Mysore/Malabar/Vazukka

4. Type of seed material. Seedlings/rhizomes

5. Source of seed material: Own/Pvt/C.B.nursery

6. Spacing adopted

7. No. of seedlings/rhizomes used

8. Cost per seedling/rhizome

B. First Year

		Labour	Cost
1.	Shade planting/shade regulation		
2.	Clearing land, fencing, making drains, footpaths etc.		
3.	Lining/Pegmarking/terracing		
4.	Opening pits and filling		
5.	Cost of seedlings/rhizomes used		
6.	Transportation cost of seed material.		
7.	Planting		
8.	Staking and mulching		
9.	Irrigation		
10.	Weeding with frequency		
11.	Mulching with details		

12. Manuring/fertilising/liming

Material	Qty.	Rate	Value

13. Transportation charges under item No.12

14. Application charges under item No. 12

15. Plant protection/Weedicide materials

Material	Qty.	Rate	Value

16. Transporting charges under item No. 15

17. Application charges under item No. 15

18. Any other charges

C. Second Year

		Labour	Cost
1.	Shade planting/shade regulation with details.		
2.	Making drains, footpaths.		
3.	Terracing/platform formation/		
4.	No. of vacancies occured and filled		
5.	Type of seed material: Seedling/ rhizome		
6.	Source of seed material: Own/Pvt/C.B.		
7.	Cost of seedlings/rhizome used		
8.	Transportation cost of seed material		
9.	Reopening pits and filling		

	Labour	Cost
10. Planting		
11. Staking and mulching		
12. Irrigation		
13. Weeding with frequency		
14. Mulching with details		

15. Manuring/fertilizing/liming

Material	Qty.	Rate	Value

16. Transportation charges under item No.15

17. Application charges under Item No. 15

18. Plant protection/Weedicide materials

Material	Qty.	Rate	Value

19. Transportation charges under item No. 18

20. Application charges under item No. 18

21. Harvesting charges.

22. Curing charges under item No. 21

D. Third Year/Fourth Yea

		Labour	Cost
1.	Shade regulation		
2.	Making drains, footpaths etc.		
3.	Making terrace, platforms, basins		
4.	No. of vacancies occured and filled		
5.	Type of seed material: Seedling/rhizome		
6.	Source of seed material: Own/pvt./C.B. nursery		
7.	Cost of seedlings/rhizomes used		
8.	Transportation cost of seed material		
9.	Reopening pits and filling		
10.	Planting		
11.	Staking and mulching		
12.	Irrigation		
13.	Weeding with frequency		
14.	Mulching with details		
15.	Trashing		
16.	Manuring/fertilizing/liming		

Material	Qty.	Rate	Value

17. Transportation cost under item No. 15

18. Application charges under item No. 15

19. Plant protection/Weedicide materials

Materials	Qty.	Rate	Value

20. Transportation cost under item No. 18

21. Application charges under item No. 18

22. Harvesting

Period of harvest	Qty. green/curing	Labour	Cost

23. Curing charges	Labour	Cost
a) Outright curing		
b) Firewood		
c) Washing		
d) Caring		
e) Cleaning		
f) Grading		
g) Packing, storing		
24. Selling charges		
a) Transportation		
b) Commission		
c) Any other charges		
25. Net return		

E. 5th to 8th Year/
9th to 12th year/
13th to 15th year

	Labour	Cost
1. Shade regulation		
2. Drains, footpaths		
3. Trashing		
4. Weeding		
5. Mulching		
6. Irrigation		
7. Manuring/fertilizing/liming		

Material	Qty.	Rate	Value

8. Transportation cost under item No. 7

9. Application charges under item No. 7

10. Plant protection/weedicids materials

Materials	Qty.	Rate	Value

11. Transportation cost under item No. 10

12. Application charges under item No. 10

13. Harvesting

Period of harvest	Qty. Green/cured	Labour	Cost

14. Curing

	Labour	Cost
a) Outright curing		
b) Firewood		
c) Washing, spreading		
d) Caring		
e) Cleaning		
f) Grading		
g) Packing/storing		

15. Selling cost

a) Transportation
b) Commission
c) Any other charges

16. Net return

07. Details of output

A. Product	Qty.	Value
1. Green capsules		
2. Cured cardamom		
3. Seed		
4. Sale sample		
5. Gifts		

B. Market

1. Marketing channels
2. Market charges
3. Export functions
4. Other information

08. Details on taxes

1. Land revenue
2. Panchayat tax
3. Water tax
4. Income tax
5. Agrl. Income tax
6. Plantation tax
7. Lease amount
8. Sale tax

09. Labour Welfare	Permanent	Casual	Staff	Cost
1. National/festival holiday wages.				
2. Leave with wages				

	Permanent	Casual	Staff	Cost
3. Whether protectives/ clothing				
4. Provident fund				
5. Bonus				
6. Pension/gratuity				
7. Medical/Maternity aid				
8. Housing				
9. Entertainment/recreation				
10. Transportation				

10. Overhead charges

1. Salary of Manager/Supdt.
2. Salary of Clerks
3. Salary of other technical staff - Driver/Mechanic
4. Salary of Watchman/peon
5. Office stationery/postage/ Telephone
6. Rent
7. Electricity charges
8. Legal aid.
9. Donation/charities
10. Insurance charges
11. Repair and maintenance of assets
12. Transportation expenses

13. Bank and accounts charges

14. Commission of visiting agents

15. Any other expenses

11. Planters Production problems and suggestions

12. Planters marketing problems and suggestions

13. Workers problems and suggestions

14. Additional relevant information on Cardamom

15. Interviewer's remarks

Appendix - 2 (In Rs/ha.)

ZONE A

Payback period analysis

Year	Cost	Cost progressive total	Returns	Returns progressive total	Net returns on progressive total
1	11,186	11,186	-	-	- 11,186
2	7,314	18,500	-	-	- 18,500
3	13,769	32,269	21,837	21,837	- 10,432
4	15,255	47,524	30,371	52,208	4,684
5	16,110	63,634	31,887	84,095	20,461
6	16,110	79,744	31,887	1,15,982	36,238
7	16,110	95,854	31,887	1,47,869	52,015
8	16,110	1,11,964	31,887	1,79,756	67,792
9	16,110	1,28,074	24,598	2,04,354	76,280
10	16,110	1,44,184	24,598	2,28,952	84,768
11	16,110	1,60,294	24,598	2,53,550	93,256
12	16,110	1,76,404	24,598	2,78,148	1,01,744
13	12,661	1,89,065	17,319	2,95,467	1,06,402
14	12,661	2,01,726	17,319	3,12,786	1,11,060
15	12,661	2,14,387	17,319	3,30,105	1,15,718

$$\text{Payback period} = 3 + 1 \left(\frac{-10432}{-10432 - 4684}\right) = 3.75 \text{ years}$$

Appendix - 3 (In Rs/ha.)

ZONE B

Payback period analysis

Year	Cost	Cost progressive total	Returns	Returns progressive total	Net returns on progressive total
1	10,420	10,420	-	-	- 10,420
2	6,504	16,924	-	-	- 16,924
3	12,629	29,553	21,335	21,335	- 8,218
4	13,816	43,369	29,618	50,953	7,584
5	14,424	57,793	30,873	81,826	24,033
6	14,424	72,217	30,873	1,12,699	40,482
7	14,424	86,641	30,873	1,43,572	56,931
8	14,424	1,01,065	30,873	1,74,445	73,380
9	14,424	1,15,489	24,096	1,98,541	83,052
10	14,424	1,29,913	24,096	2,22,637	92,724
11	14,424	1,44,337	24,096	2,46,733	1,02,396
12	14,424	1,58,761	24,096	2,70,829	1,12,068
13	11,668	1,70,429	17,068	2,87,897	1,17,468
14	11,668	1,82,097	17,068	3,04,965	1,22,868
15	11,668	1,93,765	17,068	3,22,033	1,28,268

$$\text{Payback period} = 3 + 1 \left(\frac{-8218}{-8218 - 7584} \right) = 3.52 \text{ years}$$

Appendix - 4 (In Rs/ha.)

ZONE C

Payback period analysis

Year	Cost	Cost progressive total	Returns	Returns progressive total	Net returns on progressive total
1	9,305	9,305	-	-	- 9,305
2	6,122	15,427	-	-	- 15,427
3	11,269	26,696	15,060	15,060	- 11,636
4	12,097	38,793	19,578	34,638	- 4,155
5	13,323	52,116	21,586	56,224	4,108
6	13,323	65,439	21,586	77,810	12,371
7	13,323	78,762	21,586	99,396	20,634
8	13,323	92,085	21,586	1,20,982	28,897
9	13,323	1,05,408	16,817	1,37,799	32,391
10	13,323	1,18,731	16,817	1,54,616	35,885
11	13,323	1,32,054	16,817	1,71,433	39,379
12	13,323	1,45,377	16,817	1,88,250	42,873
13	10,456	1,55,833	11,797	2,00,047	44,214
14	10,456	1,66,289	11,797	2,11,844	45,555
15	10,456	1,76,745	11,797	2,23,641	46,896

Payback period = $4 + 1 \left(\frac{-4155}{-4155-4108} \right) = 4.50$ years

Appendix - 5 (In Rs/ha.)

DISTRICT

Payback period analysis

Year	Cost	Cost progressive total	Returns	Returns progressive total	Net returns on progressive total
1	10,126	10,126	-	-	- 10,126
2	6,475	16,601	-	-	- 16,601
3	12,056	28,657	17,570	17,570	- 11,087
4	13,430	42,087	26,857	44,427	2,340
5	14,674	56,761	29,367	73,794	17,033
6	14,674	71,435	29,367	1,03,161	31,726
7	14,674	86,109	29,367	1,32,528	46,419
8	14,674	1,00,783	29,367	1,61,895	11,112
9	14,674	1,15,457	22,590	1,84,425	69,082
10	14,674	1,30,131	22,590	2,07,075	76,944
11	14,674	1,44,805	22,590	2,29,665	84,860
12	14,674	1,59,479	22,590	2,52,255	92,776
13	11,287	1,70,766	14,307	2,66,562	95,796
14	11,287	1,82,053	14,307	2,80,869	98,816
15	11,287	1,93,340	14,307	2,95,176	1,01,836

$$\text{Payback period} = 3 + 1 \left(\frac{-11087}{-11087-2340} \right) = 3.87 \text{ years}$$

Appendix - 6

(In Rs/ha.)

ZONE A

Benefit-cost ratio analysis

Year	Cost (Rs.)	Return (Rs.)	Discount factor at 11%	Discounted cost (Rs.)	Discounted returns (Rs.)	Discounted incremental benefits (Rs.)
1	11,186	-	0.901	10,079	-	- 10,079
2	7,314	-	0.812	5,939	-	- 5,939
3	13,769	21,837	0.731	10,065	15,963	5,898
4	15,255	30,371	0.659	10,053	20,014	9,961
5	16,110	31,877	0.593	9,553	18,903	9,350
6	16,110	31,877	0.535	8,619	17,054	8,435
7	16,110	31,877	0.482	7,765	15,365	7,600
8	16,110	31,877	0.434	6,992	13,835	6,843
9	16,110	24,598	0.391	6,299	9,618	3,319
10	16,110	24,598	0.352	5,671	8,658	2,987
11	16,110	24,598	0.317	5,107	7,798	2,691
12	16,110	24,598	0.286	4,607	7,035	2,428
13	12,661	17,319	0.258	3,267	4,468	1,201
14	12,661	17,319	0.232	2,937	4,018	1,081
15	12,661	17,319	0.209	2,646	3,620	974
				99,599	1,46,349	46,750

$$B\ C\ R = \frac{1,46,349}{99,599} = 1.47$$

Appendix - 7 (In Rs/ha.)

ZONE B

Benefit-cost ratio analysis

Year	Cost (Rs./ha)	Return (Rs/ha)	Discount factor at 11%	Discounted cost (Rs.)	Discounted returns (Rs.)	Discounted incremental benefits (Rs.)
1	10,420	-	0.901	9,388	-	- 9,388
2	6,504	-	0.812	5,281	-	- 5,281
3	12,629	21,335	0.731	9,232	15,596	6,364
4	13,816	29,618	0.659	9,105	19,518	10,413
5	14,424	30,873	0.593	8,553	18,308	9,755
6	14,424	30,873	0.535	7,717	16,517	8,800
7	14,424	30,873	0.482	6,952	14,881	7,929
8	14,424	30,873	0.434	6,260	13,399	7,139
9	14,424	24,096	0.391	5,640	9,422	3,782
10	14,424	24,096	0.352	5,077	8,482	3,405
11	14,424	24,096	0.317	4,572	7,638	3,066
12	14,424	24,096	0.286	4,125	6,891	2,766
13	11,668	17,068	0.258	3,010	4,404	1,394
14	11,668	17,068	0.232	2,707	3,960	1,253
15	11,668	17,068	0.209	2,439	3,567	1,128
				90,058	1,42,583	52,525

$$B\ C\ R = \frac{1,42,583}{90,058} = 1.58$$

Appendix - 9 (In Rs/ha.)

DISTRICT

Benefit-cost ratio analysis

Year	Cost (Rs/ha)	Return (Rs/ha)	Discount factor @ 11%	Discounted cost (Rs.)	Discounted returns (Rs.)	Discounted incremental benefits (Rs.)
1	10,126	-	0.901	9,124	-	- 9,124
2	6,475	-	0.812	5,258	-	- 5,258
3	12,056	17,570	0.731	8,813	12,844	4,031
4	13,430	24,849	0.659	8,850	17,699	8,849
5	14,674	29,367	0.593	8,702	17,415	8,713
6	14,674	29,367	0.535	7,851	15,711	7,860
7	14,674	29,367	0.482	7,073	14,155	7,082
8	14,674	29,367	0.434	6,369	12,745	6,376
9	14,674	22,590	0.391	5,738	8,833	3,095
10	14,674	22,590	0.352	5,165	7,952	2,787
11	14,674	22,590	0.317	4,652	7,161	2,509
12	14,674	22,590	0.286	4,197	6,461	2,264
13	11,287	14,307	0.258	2,912	3,691	779
14	11,287	14,307	0.232	2,619	3,319	700
15	11,287	14,307	0.209	2,359	2,990	631
				89,682	1,30,976	41,294

$$B\ C\ R = \frac{1,30,976}{89,682} = 1.46$$

Appendix - 10

(In Rs/ha)

ZONE A

Internal rate of return analysis

Year	Cost (Rs/ha)	Return (Rs/ha)	Incremental benefits (Rs/ha)	Discount factor @ 40%	Discount factor @ 50%	Discounted incremental benefits (Rs.) @ 40%	Discounted incremental benefits (Rs.) @ 50%
1	11,186	-	11,186	0.714	0.667	- 7,987	- 7,461
2	7,314	-	7,314	0.510	0.444	- 3,730	- 3,247
3	13,769	21,837	8,060	0,364	0.296	2,934	2,386
4	15,255	30,371	15,116	0.260	0.198	3,930	2,993
5	16,110	31,877	15,767	0.186	0.138	2,933	2,176
6	16,110	31,877	15,767	0.133	0.088	2,097	1,387
7	16,110	31,877	15,767	0.095	0.059	1,498	930
8	16,110	31,877	15,767	0.068	0.039	1,072	615
9	16,110	24,598	8,488	0.048	0.025	407	212
10	16,110	24,598	8,488	0.035	0.017	297	144
11	16,110	24,598	8,488	0.025	0.012	212	102
12	16,110	24,598	8,488	0.018	0.008	153	68
13	12,661	17,319	4,658	0.013	0.005	61	23
14	12,661	17,319	4,658	0.009	0.003	42	14
15	12,661	17,319	4,658	0.006	0.002	28	9
						3,947	351

$$IRR = 40 + 10 \left(\frac{3947}{3947 - 351} \right) = 51\%$$

Appendix - 12.

(In Rs/ha)

ZONE C

Internal rate of return analysis

Year	Cost (Rs/ha)	Return (Rs/ha)	Incremental benefit (Rs/ha)	Discount factor @ 30%	Discount factor @ 35%	Discounted incremental benefit @ 30% (Rs.)	Discounted incremental benefit @ 35% (Rs.)
1	9,305	-	- 9,305	0.769	0.741	- 7,156	- 6,895
2	6,122	-	- 6,122	0.592	0.549	- 3,624	- 3,361
3	11,269	15,060	3,791	0.455	0.401	1,725	1,539
4	12,097	19,578	7,481	0.350	0.301	2,618	2,252
5	13,323	21,586	8,263	0.269	0.223	2,223	1,843
6	13,323	21,586	8,263	0.207	0.165	1,710	1,363
7	13,323	21,586	8,263	0.159	0.122	1,314	1,008
8.	13,323	21,586	8,263	0.123	0.091	1,016	752
9	13,323	16,817	3,494	0.094	0.067	228	234
10	13,323	16,817	3,494	0.073	0.050	255	175
11	13,323	16,817	3,494	0.056	0.037	196	129
12	13,323	16,817	3,494	0.043	0.027	150	94
13	10,456	11,797	1,341	0.033	0.020	44	27
14	10,456	11,797	1,341	0.025	0.015	34	20
15	10,456	11,797	1,341	0.020	0.011	27	15
						860	- 805

$$IRR = 30 + 5 \left(\frac{860}{860 - (-805)} \right) = 32.60\%$$

Appendix - 13 (In Rs/ha)

DISTRICT

Internal rate of return analysis

Year	Cost (Rs/ha)	Return (Rs/ha)	Incremental benefits (Rs/ha)	Discount factor @ 45%	Discount factor @ 50%	Discounted incremental benefits @ 45%	Discounted incremental benefits @ 50%
1	10,126	-	- 10,126	0.690	0.667	- 6,987	- 6,754
2	6,475	-	- 6,475	0.476	0.444	- 3,082	- 2,875
3	12,056	17,570	5,514	0.328	0.296	1,809	1,632
4	13,430	24,849	11,419	0.226	0.198	3,035	2,659
5	14,674	29,367	14,693	0.156	0.132	2,292	1,939
6	14,674	29,367	14,693	0.108	0.088	1,587	1,293
7	14,674	29,367	14,693	0.074	0.059	1,087	867
8	14,674	29,367	14,693	0.051	0.039	749	573
9	14,674	22,590	7,916	0.035	0.026	277	206
10	14,674	22,590	7,916	0.024	0.017	190	135
11	14,674	22,590	7,916	0.017	0.012	135	95
12	14,674	22,590	7,916	0.012	0.008	95	63
13	11,287	14,307	3,020	0.008	0.005	24	15
14	11,287	14,307	3,020	0.006	0.003	18	9
15	11,287	14,307	3,020	0.004	0.002	12	6
						1,241	- 137

$$IRR = 45 + 5 \left(\frac{1,241}{1,241 - (-137)} \right) = 49.50\%$$

Appendix - 14

DISTRICT

(In Rs/ha)

SENSITIVITY ANALYSIS

Internal rate of return

Year	Cost (Rs/ha)	Return (Rs/ha)	Incremental benefit (Rs/ha)	Discount factor @ 25%	Discount factor @ 35%	Discounted incremental benefit @ 25%	Discounted incremental benefit @ 35%
1	10,126	-	- 10,126	0.800	0.741	- 8,101	- 7,503
2	6,475	-	- 6,475	0.840	0.549	- 4,144	- 3,555
3	12,056	14,070	2,014	0.512	0.406	1,031	818
4	13,430	21,507	8,077	0.410	0.301	3,312	2,431
5	14,674	23,517	8,843	0.328	0.223	2,901	1,972
6	14,674	23,517	8,843	0.262	0.165	2,317	1,459
7	14,674	23,517	8,843	0.270	0.122	1,817	1,079
8	14,674	23,517	8,843	0.168	0.091	1,486	805
9	14,674	18,090	3,416	0.134	0.067	458	229
10	14,674	18,090	3,416	0.107	0.050	366	171
11	14,674	18,090	3,416	0.086	0.037	294	126
12	14,674	18,090	3,416	0.069	0.027	236	92
13	11,287	11,457	170	0.055	0.020	9	3
14	11,287	11,457	170	0.044	0.015	7	3
15	11,287	11,457	170	0.035	0.011	6	2
						1,995	- 1,868

$$IRR = 25 + 10 \left(\frac{1,995}{1,995 - (-1,868)} \right) = 30.20\%$$

Appendix - 15

(In Rs/ha)

AGE-RETURN RELATIONSHIP ANALYSIS

Discounted net income and standardised income: District

Age (Year)	Net income (Rs.)	Discount factor @ 11%	Annuity factor @ 11%	Discounted net income (Rs.)	Accumulated discounted net income (Rs.)	Standardised income (Rs.)
1	- 10,126	0.901	1.110	- 9,124	- 9,124	- 10,128
2	- 6,475	0.812	0.584	- 5,258	- 14,382	- 8,399
3	5,514	0.731	0.409	4,031	- 10,351	- 4,234
4	11,419	0.659	0.322	8,849	- 1,502	484
5	14,693	0.593	0.271	8,713	7,211	1,954
6	14,693	0.535	0.236	7,860	15,071	3,557
7	14,693	0.482	0.212	7,082	22,153	4,696
8	14,693	0.434	0.194	6,376	28,529	5,535
9	7,916	0.391	0.181	3,095	31,624	5,724
10	7,916	0.352	0.170	2,787	34,411	5,850
11	7,916	0.317	0.161	2,509	36,920	5,944
12	7,916	0.286	0.154	2,264	39,184	6,034
13	3,020	0.258	0.148	779	39,963	5,915
14	3,020	0.232	0.143	700	40,663	5,815
15	3,020	0.209	0.139	631	41,294	5,740

Abstract

ECONOMICS OF CARDAMOM CULTIVATION IN IDUKKI DISTRICT, KERALA STATE

By

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ABSTRACT OF THE THESIS

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ABSTRACT

A study on the Economics of Cardamom Cultivation in Idukki district, Kerala state was done in the year 1983-84. Various analyses were done in respect of the three cultivating zones and two size groups to evaluate the cost and returns, capital productivity measures and efficiency in resource uses. The problems facing the cardamom industry in the district were also studied.

The cost of cultivation of cardamom in the district during the establishment period of two years was Rs.16,601/- while the cost of maintenance during 3rd to 12th year ranged from Rs.12,056/- to Rs.14,674/- and read as at Rs.11,287/- during 13th to 15th year of cultivation.

Cost of production of one kilogram of cardamom varied from Rs.172/- per kg during the third year (the first economic yielding year) to Rs.125/- during the period fourth to 8th year. Labour intensity in the cardamom production was very higher. More than 30 percent of the yearly total expenditure of the cultivation was on labour.

Capital productivity analyses indicated towards payback period being 4 years, BC ratio 1.46, IRR 49.50 percent and NPW Rs.41,294/- when discounted at 11 percent interest rate signifying the shorter payback period among

the plantation crops and the attractive profitability in venturing in the cardamom industry. The standardised income at 11 percent discount rate was the highest during the 12th year suggesting the ideal time of replantation of cardamom to be after 12 years of economic returns.

The serious problem facing cardamom industry was the necessity for eco-preservation with giving emphasis on organic farming for producing environment friendly cardamom preferred in the international markets. Along with this, cultivation of cultivars suited to micro-agro-climate with providing irrigation support needed encouragement in getting the potential cost-effective returns in the long run.

The study on the economics of cardamom cultivation in Idukki district, Kerala State revealed that cardamom being one of the important plantation as well as spice crops is a profitable enterprise in the district irrespective of the size of the holdings provided agro-climatically suitable cultivars are made use of for cultivation.