ECONOMICS OF PRODUCTION AND MARKETING OF COCONUT IN CENTRAL REGION OF KERALA

By

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THESIS

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DECLARATION

I hereby declare that this thesis entitled **"Economics of production and marketing of coconut in central region of Kerala"** 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, fellowship or other similar title, of any other University or Society.

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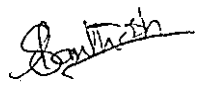

Santhosh Narayanan

Dedicated

To

MY PARENTS

and

Sister

LIST OF TABLES

Table No.	Title	Page No.
Table 1.1	Statewise area, production and productivity of coconut (1997-98)	2
Table 1.2	District wise area and production of coconut in central region (1997-98)	3
Table 3.1	Summary table showing geographic location and demographic details of sample areas	17
Table 3.2	Average monthly rainfall during 1998 (in mm.)	19
Table 3.3	Average monthly mean temperature (^{0}C)	20
Table 3.4	Average relative humidity in the study area (per cent)	21
Table 3.5	Cropping pattern in Ernakulam district for the year, 1997-98	23
Table 3.6	Cropping pattern in Thrissur district for the year, 1997-98	24
Table 3.7	Cropping pattern in Palakkad district for the year, 1997-98	25
Table 3.8	Area, production and productivity of coconut in Ernakulam, Thrissur and Palakkad districts	26
Table 4.1	Study area selected	28
Table 4.2	Distribution of sample coconut farmers	29
Table 5.1	Distribution of sample farmers' family based on age and sex	38
Table 5.2	Distribution of respondents based on occupation of head of household	39
Table 5.3	Educational status of the respondents	40
Table 5.4	Topography of coconut garden	41

Table 5.5	Cropping pattern of the sample households (ha)	41
Table 5.6	Distribution of sample palms in each category(number)	42
Table 5.7	Distribution of source of planting material(number)	43
Table 5.8	Distribution of farmers according to spacing adopted(number)	44
Table 5.9	Distribution of farmers applying organic manure(number)	46
Table 5.10	Distribution of farmers applying fertilizers(number)	46
Table 5.11	Quantity of nutrients applied by sample farmers (g\palm)	49
Table 5.12	Distribution of farmers adopting mulching(number)	50
Table 5.13	Source of Irrigation water	51
Table 5.14	Irrigation practices adopted by sample farmers	51
Table 5.15	Details of pumpsets used by sample farmers for irrigation	52
Table 5.16	Frequency of Irrigation adopted by sample farmers	53
Table 5.17	Cost of establishment per hectare of one-year-old palms	55
Table 5.18	Cost of maintenance per hectare of non-bearing palms	56
Table 5.19	Cost of maintenance per hectare of increasing yields stage	58
Table 5.20	Cost of maintenance per hectare of stabilised yield stage	59
Table 5.21	Cost of maintenance per hectare of declining yields stage	60
Table 5.22	Cost of maintenance per hectare of yielding palms (mean)	61

Table 5.23	Category wise distribution of total labour utilization of the sample farmers in mandays per hectare	63
Table 5.24	Production details of sample farmers (ha)	64
Table 5.25	Cost of production of Coconut	65
Table 5.26	Financial viability of coconut garden (ha)	66
Table 5.27	Distribution of farmers according to the form of products they sell	68
Table 5.28	Distribution of respondents according to of buyers of products	70
Table 5.29	Marketing margins and costs of various intermediaries	71
Table 5.30	Reasons for the incomplete/nonadoption of selected coconut cultivation practices	72
Table 5.31	Constraints in coconut cultivation	76

LIST OF FIGURES

No.		Page No.
1.	Map of Kerala showing Ernakulam, Thrissur and Palakkad Districts	17
2.	Quantity of nutrients applied (g/palm/year)	80
3.	Cost of establishment and maintenance cost of nonbearing palms (Rs/ha)	88
4.	Cost of maintenance of yielding palms(Rs/ha)	88
5.	Aggregate cost of maintenance for yielding categories	89
6.	Total labour utilisation (ha)	89

CONTENTS

Chapter	Title	Page No.
1	INTRODUCTION	1
2	REVIEW OF LITERATURE	5
3	AREA OF STUDY	16
4	METHODOLOGY	27
5	RESULTS	38
6	DISCUSSION	78
7	SUMMARY	102
	REFERENCES	106
	ABSTRACT	

1. INTRODUCTION

Coconut is the most useful tree crop ever grown in the world. Perhaps no other crop plant in the tropics has so much to offer to mankind as the coconut palm. It has varied uses as a source of food, drink and shelter and as a raw material for various industrial uses. That is why, coconut is termed a horticultural crop, plantation crop, food crop and even as an oilseed. The major food product derived from coconut are edible copra, coconut milk in its natural state as well as processed form, desiccated coconut, toddy and toddy products, coconut water based products etc. For direct food use in households as well as for social and religious ceremonies, fresh coconut is in demand in many of the states of the country. The coconut palm is also an important source of raw materials for the traditional processing sector.

World production of coconut is 54 billion nuts from an area of 11.6 million hectares. Four major players namely, India, Indonesia, Philippines and Sri Lanka contribute more than 75 per cent of this. The growth rate recorded in area under coconut during the last decade was very low (1.1%), while that registered in production was better (2.5%). Thailand and India have recorded high growth rates in production (7%) followed by Indonesia (3.6%) (Markose, 2000).

The crop assumes considerable significance in the national economy in view of the scope for rural employment and income generation. In recent years, India has attained the top position in the production of coconut, overtaking Indonesia and Philippines. The major share of coconut production in the country is contributed by million of small and marginal farmers who form the backbone of coconut culture. It is a fact that wherever coconut is grown, the economy of the region is closely inter-linked with the prospects of the crop. With an area of 1.89 million ha and a production of 13,088 million nuts, coconut contributes more than Rs. 7000 crores annually to the GDP. The raw material for coir industry is derived from coconut husk and the country earns a valuable foreign exchange to the tune of

Rs.300 crores by way of export of coir and coir products. Copra, the dried kernel of coconut is the richest source of edible oil and its contribution to the total edible oil pool in India is around six per cent. The by-products obtained, such as its husk, shell timber and leaves are utilised for making value added products. About 10 million peoples are engaged in coconut cultivation, processing, industry and trade related activities. With the development of value added products such as coconut cream, coconut honey, coconut skimmed milk, tender coconut water in pouches, activated carbon and nata-de-coco, coconut offers ample investment opportunities.

Table 1.1. State-wise area, production and productivity of coconut (1997-98)

State	Area ('000 ha)	Production (million nuts)	Productivity (nuts/ha)
Andhra Pradesh	94.9	780	8216
Karnataka	286.9	1493	5204
Kerala	1020.4	5911	5793
Orissa	53.1	272	5123
Tamil Nadu	319.8	3716	11620
West Bengal	24.3	306	12601
Others	98.0	610	6225
All India	1897.4	13088	6898

Source: Markose, 2000

Kerala traditionally has contributed for the largest share in coconut production in India. But, its share has been on decline. State-wise area, production and productivity is given in Table 1.1. Kerala's productivity is lower than the All India productivity of coconut. Tamil Nadu, Karnataka and Andhra Pradesh are taking to coconut cultivation in a big way. Kerala, Karnataka and Tamil Nadu account for nearly 85 per cent of production in India. Although Kerala accounts for around 53 per cent of the area under coconut in the country, it contributes only 45 per cent of the output. On the other hand, Tamil Nadu with 16.85 per cent of share

in area accounts for 28.39 per cent of the production and Karnataka with 15.12 per cent of area accounts for 11.07 per cent of the production.

In Kerala, coconut is mainly small holders' crop. Over 90 per cent of holdings are less than one hectare in area. The crop is grown in homestead gardens and smallholdings. Coconut is grown in all the districts of Kerala. Most of the crop is grown under rainfed conditions.

Table 1.2. District wise area and production of coconut in central region (1997-98)

District	Area (ha)	Production (million nuts)
Ernakulam	64816	357
Thrissur	76656	491
Palakkad	48929	237

Source: Govt. of Kerala (GOK), 2000

The district-wise area and production of coconut in the central region of Kerala for the year 1997-98 is given in Table 1.2. The area and production is high in Thrissur district while production is lowest in Ernakulam district of Kerala.

The importance of coconut in the agricultural economy of Kerala needs no emphasis. Kerala's economy is closely woven with the fortunes in coconut trade since coconut and its subsidiary coir industry is the main stay of the economy as it generates considerable employment. Coconut being an essential and is a part of daily life of persons in Kerala, a study of cost of production of coconut and the marketing aspects of the farmers will be very useful. Recent trend of very low price for coconut is found affecting the marketing of coconut. Co-operatives have started procuring copra all over Kerala in the recent period and even this is found a futile exercise as far as an increase in price of nut is concerned. Mean while cost of inputs is increasing day by day, thus a situation where returns diminishes and cost increases, exist. The central region of Kerala consisting of Ernakulam, Thrissur

and Palakkad districts contributes 20.83 per cent of Kerala's production of coconuts with 21.53 per cent of Kerala's total coconut cultivated area. Moreover, coconut occupies a prominent position in the total cropped area, being either first or second in these districts. But there is large-scale incidence of pest and disease in this area. Moreover, these districts are nearer to the Kerala Agricultural University and hopefully get the maximum benefits from the University. Hence it would be useful to study the details regarding coconut production and marketing in understanding the problems faced by the coconut cultivators in every front of coconut cultivation in this area. The study was conducted with the following objectives.

1. To study the economics of production and marketing of coconut in central part of Kerala
2. To identify the constraints and problems encountered by the coconut growers

Limitations of the study

The study is based on farm level data generated through sample survey. The main limitation of the study is that farmers do not maintain any basic farm records, as a result of which reliance has to be made on their memory, which might have resulted in recall bias. In spite of this, every effort has been made to generate as reliable information as possible.

Plan of work

The thesis consists of seven chapters including the present one. A review of the relevant literature is given in chapter two. Chapter three deals with a brief description of area of study. Methodology of study is given in chapter four. The results of the study are given in chapter five while results are discussed in chapter six. The summary of major findings of the study is given in the final chapter.

Review of Literature

2. REVIEW OF LITERATURE

This chapter presents a review of various past works relevant to the present study. The review attempts to throw light on the present status, strengths and weakness of the existing studies on the topic, from the point of view of methodology as well as substance. The review of literature is presented in this chapter under two sections:

(1) Economics of coconut cultivation
(2) Marketing of coconut

2.1 Economics of coconut cultivation

George and Joseph (1973) estimated the relative costs and returns from three tree crops namely, coconut, rubber and oil palm. The establishment cost was taken as 7 years and the project life period was considered as 40 years. At a discount rate of 9 per cent the net present worth of a hectare of coconut garden was calculated as Rs.870. The internal rate of return was obtained as 9.5 per cent, benefit-cost ratio was 1.07 and pay back period was worked out to 16 years.

Singh *et al.* (1976) in a study of the economics of Arecanut cultivation at CPCRI, Vittal found out the various economic parameters like Pay back period, Benefit cost ratio, Net present worth and Internal rate of return. He obtained a pay back period of 7 years, net present worth of Rs.29771 per hectare at 12 per cent discount rate. The internal rate of return was found to be 29.32 per cent and the benefit cost ratio at 12 per cent discount rate was 1.90:1.

An annual yield increase of 31 nuts per palm due to supplementary basin irrigation given during the summer to coconuts grown in red sandy loam soil was reported by Bhaskaran and Leela (1978) based on a study at the Central Plantation Crops Research Institute, Kasaragod. About 50 per cent of the yield

increase was achieved during the transit period of production, comprising the first 3 years. The cost-benefit ratio of irrigation was estimated at 1:30.

Joseph (1980) conducted an economic evaluation of three major plantation crops namely cashew, rubber and coconut in Kerala reported that the net present value for coconut was equal to Rs.4758. The internal rate of returns was worked out to be 17 per cent and the benefit-cost ratio equal to 2:1.

The cost of establishing a one-hectare West Coast Tall (WCT) coconut plantation under rainfed condition in Kerala, into stabilised bearing excluding cost of land was furnished by Nelliat (1981). He reported that during the first year the expenses would be high amounting to Rs.10,630 at the 1980 price level. The annual recurring expenses would increase gradually because of the increasing dose of fertiliser in the early years and later due to increasing harvest charges. From twelfth year, a steady average yield of 50 nuts per palm was expected giving a gross return of Rs.10,500. The annual expenditure worked out to be Rs.3,560, thus net profit per hectare came to Rs.6,940 per year. The gross cost of establishing a one hectare coconut plantation upto the end of ninth year under rainfed condition was Rs.33,180. The gross investment for establishing one hectare of irrigated coconut plantation upto the end of sixth year was be Rs.40,510. Stabilised yield was expected from tenth year of planting and the annual net profit was Rs.13,165.

A study of the economics of coconut cultivation in Irinjalakuda block in the command area of Peechi irrigation project in Kerala, without taking into account costs incurred during the pre-bearing stage was made by Bastine (1982). The average cost of maintenance per hectare worked out to Rs.6330.79. Average main product value obtained per hectare was Rs.12,107.23. On an average the net income at cost C worked out to Rs.7,560.98 and benefit cost ratio at cost C was 2.1:1. Analysis of resources use showed that family labour decreased with the size of holding, both for male and female labour, the average being 40.56 hours and 3.06 hours respectively. Quantity or N, P and K applied per hectare on an average

were 5.20 kg, 6.49 kg and 17.34 kg which was only 7.65 per cent, 19 per cent and 12.75 per cent of the recommended quantities.

Reporting on the development of small coconut holdings in Sri Lanka, Liyanage (1982) observed that amongst the many constraints that the farmers faced, the unremunerative prices, sometimes deliberately kept down in the interests of the consumer did not leave any surplus for re-investment.

Mandal and Mehta (1982) in a case study of the performance of coconut cultivar (Bananlim) in Goa, reported that the net income per hectare during pre-irrigation period of three years, post-irrigation period of five years and integrated use of manuring, irrigation and other cultural care of five years was estimated at Rs.774, Rs.5800 and Rs.14120 respectively. The study revealed that irrigation alone increased the yield per hectare by 12.9 per cent and irrigation cum manuring by 29.5 per cent over no manuring and no irrigation. Further, irrigation-cum-manuring could increase yield per hectare by 50.5 per cent over irrigation alone. Thus, coconut cultivation adopting proper management practices would be a very profitable proposition in Goa region, using the local cultivar Benanlim.

Rao (1982) studied the economics of coconut cultivation in Ollukkara block in the command area of Peechi irrigation project in Kerala, without taking into account costs incurred during the pre-bearing stage. The average total cost (cost C) was Rs.5184.86 per hectare. The average gross returns per hectare was Rs.10953.15. Benefit-cost ratio was 4.84:1 at cost A and 2.43:1 at cost B.

Bhalarao and Singh (1983) in a sample study on profitability of arecanut cultivation in Jalpaigura area of West Bengal found that pay back period ranges between 8.7 years to 9.5 years between the sample farmers (small, medium and large). Net present worth at 10 per cent discount rate ranged from Rs.47874 for medium to Rs.54420 for large farmers. At 12 per cent discount rate, net present worth ranged from Rs.32507 for medium farmers to Rs.35502 for large farmers.

The value of internal rate of return remained 24.4 per cent for medium to 24.8 per cent to large farmers. The benefit-cost ratio obtained were 2.3:1 for medium farmers while it was 2.5:1 for large farmers.

Das (1984) estimated the cost of production of coconuts in Kerala at Rs.1.10 per nut under 1982-83 factor costs, without taking the value of land into consideration. In view of the fact that the rate of appreciation of land was significantly higher than that of bank interest rates and the land market was out of normal economic ambit, there was no justification to include land value in the investment in present Kerala situation. When a moderate price of Rs.50,000 per hectare of land was added to the investment on coconuts, the production cost came to Rs.1.94 per nut. Considering the average production cost and farm gate price of coconut as Rs.1.10 and Rs.1.50 per nut respectively, the net returns worked out to be Rs.4,200 per hectare. The cost of bringing one hectare of coconut garden to bearing or the total establishment cost per hectare upto seventh year came to Rs.35,300. The annual maintenance cost came to Rs.5,500. Since coconut was a small holder plantation crop, at least 75 per cent of labour required for various operations, excluding harvesting could be expected from the farmer's family itself. Therefore, the returns to family labour and investment per hectare of coconut garden worked out to be Rs.5,760 per annum. The study thus revealed that coconut cultivation under good management was a profitable proposition in Kerala.

George and Rajasekharan (1985) estimated the average annual cost of maintaining a coconut garden in Kerala using the budgeting technique. The cost of maintenance worked out to Rs.3,888 per hectare. On adding the interest on capital investment for the value of land at the rate of 15 per cent to the annual maintenance cost, the total annual cost worked out to Rs.18,888. On the basis of an average yield of 9000 nuts per hectare, the average cost per 100 nuts worked out to Rs.210, excluding the cost of management and own labour. Internal rate of returns in coconut cultivation was calculated to be 15 per cent at the price of Rs.226 per 100 nuts.

Premaja (1987) studied the economics of coconut cultivation in Calicut district during 1985-86. She opined that the total cost of bringing one hectare of coconut plantation up to bearing stage (initial 7 years) was Rs.38,773 and the maintenance cost per hectare per year was Rs.5883 at the 1986 prices. The average annual production of nuts per ha during the stabilised period was estimated as 10049 nuts. Cost of production per nut was calculated as Rs.1.2. The estimated net return on investment per hectare per year came to Rs.13,835.

In a case study undertaken from a 12 ha irrigated coconut farm near Bangalore, Nagaraj *et al.* (1987) examined the profitability and economic feasibility of investment in the enterprise by computing a few measures of project appraisal. The net present worth for the entire project was found to be Rs.77,167, the discounted benefit cost ratio 1.69 at 12 per cent, the internal rate of return 21.40 per cent and the pay back period 10 years. The sensitivity analysis done by assuming 15 per cent escalation in cost as well as a simultaneous 15 per cent decline in returns showed that the IRR for the above situation was 17.04 indicating the project was still worthwhile.

Narayana and Nair (1989) observed that area changes and production changes showed a clear distinction between the northern districts of the state and the southern. They, further, opined that as all the available land area has been cultivated in Kerala and that the scope for bringing more area under coconut is rather limited, productivity is the key to increasing the production in the state. He also infers that irrigation delays the age at which the decline in yield sets in, which under rainfed conditions sets in around the age of 45 years or 50 years, thereby effectively lengthening the peak bearing period.

Patil *et al.* (1989) in their study in the Konkan region of Maharashtra, assessed economic viability of coconut cultivation. The study revealed that an overall level benefit cost ratio, net present value and profitability index at 10 per cent discount rate were 2.27, Rs.81 and 4.32 respectively whereas pay back period

and internal rate of return were 11 years and 22.06 per cent respectively. The study concluded that based on these economic parameters, coconut plantation in Konkan region was an economically viable proposition.

The economic considerations mostly in the low lands in the riverbanks were analysed using the data collected from the sample growers in Ernakulam district of Kerala by Ipe and Varghese (1990). Being a perennial crop with a gestation period of 6 to 7 years and an economic life of about 60 years, estimates of costs and returns for the entire period was developed and discounted at 14 per cent rate to arrive at the measures of project worth. The pay back period, net present worth, benefit-cost ratio and internal rate of return were 11 years, Rs.122018, 1.89 and 24.62 per cent respectively.

Jaganathan (1992) carried out an economic analysis of coconut farming in Annamalai block of Coimbatore district of Tamil Nadu and found that in the case of gardens without intercropping, the farmers were able to recover the initial investment on development within 11.86 years whereas the payback period was 1.79 years for gardens with intercropping. The Benefit cost ratio and the Net present value for gardens without intercropping were 1.42 and Rs.23750 respectively while it was 2.18 and Rs.66717 respectively for gardens with intercrops. The internal rate of return from garden with intercrops was estimated as 25.68 per cent.

Job *et al.* (1993) showed that labour, manure and land area have significant influence on productivity. They state that by identifying the optimum mix of crops and planting them scientifically, the income from coconut based cropping system can be increased substantially.

Sairam *et al.* (1997) estimated cost of cultivation of coconut based on 1995-96 prices. It ranged from Rs.28,600 per ha during the first year of planting to Rs.23,450 per ha during the stabilized bearing period under optimum management

conditions of North Kerala. The cost of production was estimated as Rs.3.30 per nut and Rs.2.60 per nut under rainfed and irrigated condition respectively.

The annual expenditure incurred per hectare of rainfed coconut was estimated to Rs.46,370 and the annual income derived was Rs.47,290, reported at Aralam Farm by Remold (2000). Benefit cost ratio at 13 per cent cost of capital was estimated as 1.02. Cost of production was estimated to be Rs.4.41 per nut. The financial norms were based on the year 1996-97.

2.2 Marketing of coconut

Venkataraman (1958) conducted a study of marketing of coconut products in India. It was estimated that producers' share in the price paid by consumer was about 60 per cent. He pointed out that the price that the cultivators received for fresh nuts depended on proximity of market and copra content of coconut. He suggested regulated markets, multi-purpose co-operatives, marketing societies, warehousing facilities and quality improvement of copra.

Venkataraman (1961) identified that uncertain markets and lack of incentive were the drawbacks in marketing. He suggested the need for providing short, medium and long-term loans, starting of marketing co-operative societies with godown facilities and copra processing units, effective linking up of these marketing societies with service societies on the one hand and apex marketing societies on the other for the orderly marketing of nuts collected from growers and a better return to growers for their labour.

Lakshmanachar (1960) studied the fluctuations of coconut prices and explained that the size and quality of nuts, availability, imports of copra and oil, middlemen and speculators all contributed to the instability of coconut prices. The main reasons for variations in wholesale prices were differences in quantity and quality of nuts produced during different periods of the year and difference in price

itself varied in relation to seasonal demand for it by coir industry. Regulation of imports and licensed warehouses were the suggested measures for stabilisation.

Lavaniya *et al.* (1966) in their study on marketing of agricultural produce in selected villages in UP highlighted the existence of high price spread due to multiplicity of charges and market functions, distress sale of agricultural produce and malpractice. He also showed that some of the developments beneficial to producers such as confirmation of ownership of tenants, provision of cheaper institutional finance and storage facilities to the cultivators adversely affected the flow of marketable surplus.

Kuttappan (1969) examined the working of coconut processing and marketing co-operatives in Kerala. The study revealed that inadequate working capital, lack of co-ordination among different types of societies, poor organisation, wide fluctuations in the price of copra and oil and spread of small producers over a wide area were the bottlenecks affecting marketing efficiency.

Khan (1972) undertook a study in marketing of coconut in Tiptur taluk of Tumkur district in Mysore state. It was found that the marketable surplus was more in large farms when compared to small farms, i.e. 93.04 per cent and 78.00 per cent respectively. Producer's share in consumer's rupee was 71.66 per cent. Marketing costs accounted for 21.1 per cent of consumers' price, which rose to 28.34 per cent when middle men operated in the marketing channel.

Suryaprakash *et al.* (1979) in a comparative study of price spread of agricultural commodities in Karnataka reported that the price spread of coconut varied from 5.23 to 21.73 per cent and for copra it was 5.86 per cent of traders sale price in Tiptur and Arsikere markets in Karnataka. The four marketing channels identified for coconut were (1) Producer – Commission agent – Trader, (2) Village merchant – Commission agent – Trader, (3) Producer – Village merchant – Trader, (4) Producer – Trader. They concluded that profit margin as well as profit as a

percentage of purchase price of intermediaries was maximum for the village merchants.

Arshad (1983) evaluated efficiency of coconut marketing system by small holders in Malayasia and observed that it suffered various deficiencies in the form of imperfection that exists in the market structure, practices and performances. Farm level constraints and lack of marketing facilities have resulted in low quality produce, which merely induced the middle men to indulge in unethical trading practices.

Venkitachalam (1983) observed that of the total production of desiccated coconut industry in Karnataka, 25 per cent directly went to biscuit manufacturers and 65 per cent was sold through wholesale agents in upcountry markets and the balance disposed off through retailers. Taxation was a factor which hindered the growth of the industry.

Raveendran (1984) studied the marketing of coconuts in Lakshadweep Islands and reported that 20 per cent was consumed locally and remaining processed into copra. Copra was usually transported to main land before onset of monsoon in country as well as mechanized boats owned by Lakshadweep Marketing Federation. The entire copra produced (500-1800 tons) was marketed. Calicut and Mangalore were the important marketing centers for island copra, which always fetched a premium price.

Jos (1987) observed that the level of coconut oil price has not been stable, even though the fluctuations were mild in some years, the prices moved up and down frequently and violently. Sharp fluctuations in prices of coconut oil had become a global phenomenon and these fluctuations in price could not be attributed to any shrinkage in production of coconut.

Narasimhappa (1987) reported that in the recent years, demand for coconut oil has declined both in edible and inedible sectors. The continued high price margin, erratic price behaviour and short supplies coupled with certain policy matters of Government have been instrumental for this erosion of demand of coconut oil. As a consequence of this, other oils in both edible and inedible sectors are slowly replacing coconut oil.

Babu and Sebastian (1996) studied the seasonal price behaviour in coconut and coconut products in Kerala using monthly data from 1971 to 1990, covering a time span of 20 years. The seasonal indices were estimated by the ratio -to-moving average method, and it was found that seasonal peak in coconut production was coupled with seasonal trough in coconut prices, and vice versa, thereby indicating the prevalence of a distorted market in the state to the disadvantage of coconut growers.

Haridoss and Chandran (1996) studied the coconut marketing systems in Tamil Nadu and found that the major marketing channel was wholesaler/ mandiholder to local markets and oil miller. The producers' share in consumer price was as high as 80.93 per cent, with a low price spread of 19.07 per cent. The low margin to intermediaries, in turn, resulted in high marketing efficiency as is evidenced by the high shepherd's index of 4.24.

Yasodha and Padmanaban (1996) in their study on selling behaviour of coconut growers in Tamil Nadu reported that the majority of coconut sales was taking place through local traders. The wholesalers were purchasing only meagre quantities from the farmers. The reason for sales to local traders was the need for immediate sales and high cost of transport.

Bhat (1999) observed that while all other edible oils are ruling 30-40 per cent lower than the previous year's (1998) price, coconut oil prices were 25 per cent higher than during the period last year (1998) at the cochin market. One of the

factors for this high price of coconut oil even during easy availability of low priced palmolein in the state, is the decline in the production of coconuts by about 10-15 per cent in Kerala. Moreover, Kerala's share in the total production of copra in the country has declined to 55 per cent from 90 per cent a few years ago. Another factor is the increased demand for refined coconut oil from the industrial sector.

George and Pillai (1999) analysed the annual wholesale average price of copra in Kerala for the years 1975-1997. The analysis of the trend and seasonal pattern of price behaviour of coconut indicates that changes in supply (production) have significant influence in determining the price levels. The demand for coconut is consisting of two types, first is the demand for consumption as raw nuts and the second is for industrial purposes. Mainly, Mumbai based oilgopolies control the market and they make the market nearly an oligopsony. The extent of influence of demand on the price of coconut is said to be difficult to be ascertained. They, further comment that with the implementation of economic reforms and globalisation of trade, the coconut economy of India is facing serious challenges as it is experiencing intense competition in international trade and instability in domestic prices. Further, secular fall in demand due to competition from cheaper substitutes has also contributed to price instability.

Area of Study

3. AREA OF STUDY

Ernakulam, Palakkad and Thrissur districts are the three major districts covering 21.53 per cent of the total coconut cultivated area in the state. Moreover, it contributes 20.83 per cent of total coconut production in the state. Very few studies on coconut is done in the central region. Hence Ernakulam, Palakkad and Thrissur districts are selected as study areas.

3.1 Location, Area and Population

3.1.1 Kerala state

The State of Kerala (area: 38,863 km^2) lies in the south-west corner of the Indian peninsula, between 8^0 18' and 12^0 48' north latitude and 74^0 52' and 77^0 22' east longitude, as a long narrow strip of land (32 to 130 km wide) hedged between the lofty heights of Western Ghats and the Arabian sea, with a 590 km long coastal belt. The state is so rich in flora and fauna that the biological scientists consider Kerala as a genetic paradise. The state is divided into 14 districts, which occupies 1.18 per cent of the total area of India supporting a population of about 3.5 per cent (1991 Census). Population density is, thus, higher (747 km^{-2}) than the average for the country (257 km^{-2}). The State has highest sex ratio (1040 females per 1000 males) as well as highest literacy rate (90%) in the country.

3.1.2 Ernakulam

Ernakulam district is located between the latitude 9° 42' 38" to 10° 18' north and longitude 76° 12' to 76° 46' east. The district is bounded by a 30 km coastal belt of Arabian sea on the west, Kottayam and Alappuzha district in the south, Idukki district on the east and Thrissur on the north. The area of the district is 2408 km^2 which accounts for 6.2 per cent of the total area of the state. This district accommodates 9.7 per cent of the state's population and has a population

density of 1168 people km^{-2}. It has almost equal number of males and females (sex ratio: 1002).

Table 3.1. Summary table showing geographic location and demographic details of sample areas

	State	Ernakulam	Thrissur	Palakkad
Location:				
North Latitude	$8^0 18'$ to $12^0 48'$	$9^0 42' 38''$ to $10^0 18'$	10^0 to $10^0 4'$	$10^0 20'$ to $11^0 14'$
East Longitude	$74^0 52'$ to $77^0 22'$	$76^0 12'$ to $76^0 46'$	$75^0 57'$ to $76^0 54'$	$76^0 02'$ to $76^0 54'$
Geographical area of the district/State (km^2)	38,863	2408	3032	4480
Area as percentage of the State	100	6.2	7.8	11.3
Population (Millions)	29.03	2.81	2.74	2.38
Sex ratio (No.of female/1000 male)	1040	1002	1088	1060
Population as percentage of the state	100	9.7	9.4	8.2
Population density (person/sq. km)	747	1168	902	532

Source: Census, Government of Kerala (GOK), 1991

3.1.4 Thrissur

Thrissur district is located at the centre of the state of Kerala between north latitude 10^0 and $10^0 4'$ and east longitude $75^0 57'$ and $76^0 54'$. The district is bounded on the north by Palakkad and Malappuram districts. Palakkad district forms the eastern boundary of Thrissur district. Ernakulam and Idukki districts

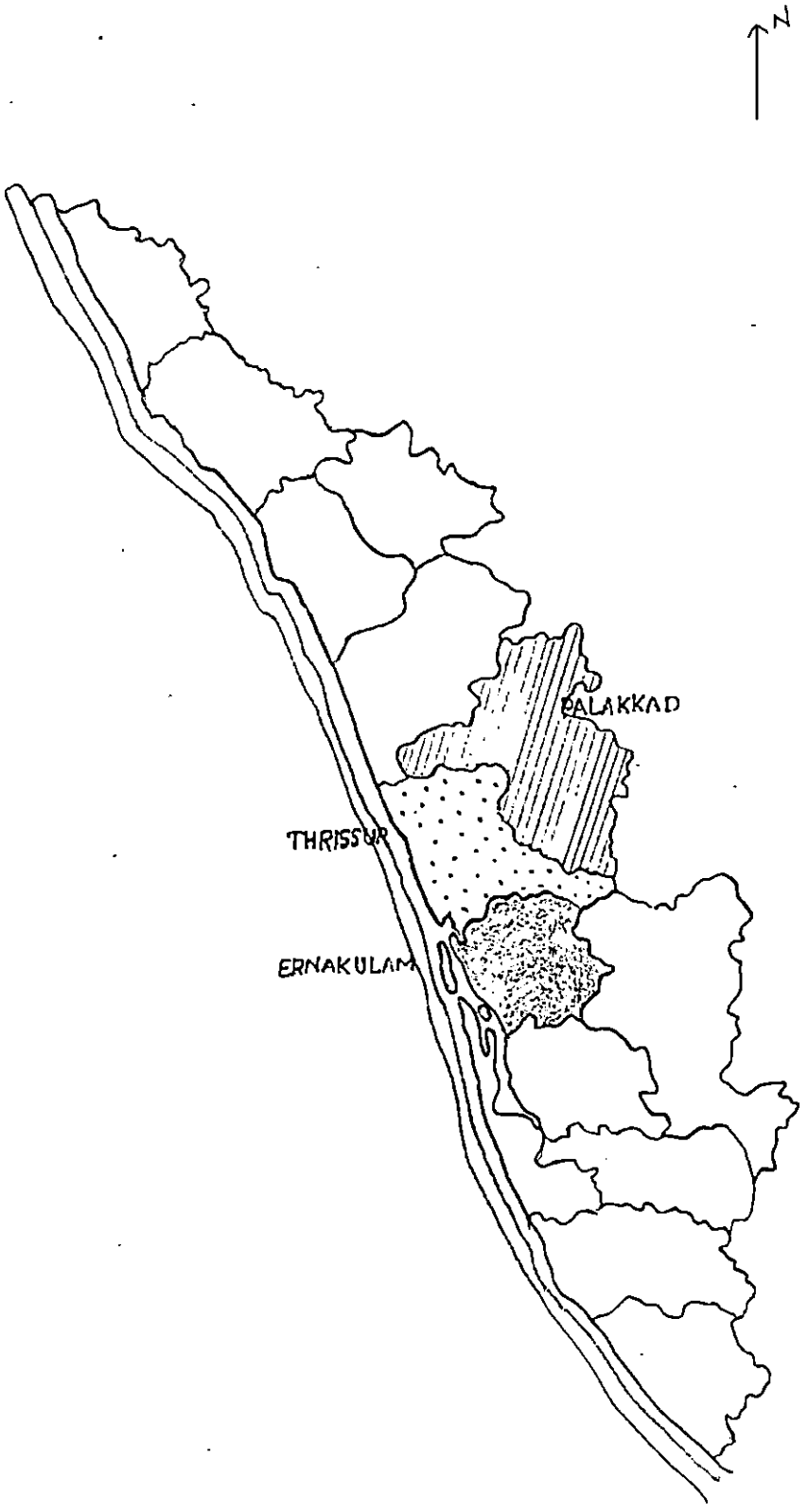

Fig 1 Map of Kerala showing the selected Districts

form the southern boundary and Arabian sea the western. The total geographical area of Thrissur district is 3032 km^2 that forms 7.8 per cent of the total area of the state. The district accommodates about 9.4 per cent of state's population and has a population density of 902 people km^{-2}.

3.1.5 Palakkad

Palakkad district, located in Central Kerala, lies between 10° 20' and 11° 14' north latitude and 76° 02' and 76° 54' east longitude. The district is flanked by the districts of Coimbatore on the east and Malappuram on the west.. On the south of it lies the district of Thrissur and on the North the Nilgiris. The total geographic area of the district is 4480 km^2, which accounts for 11.30 per cent of total area of the state. This district supports about 8.2 per cent of the total population of the State and has a density of 532 people km^{-2}. Sex ratio of this district is 1060.

3.2 Soil

3.2.1 Ernakulam

The main type of soils in Ernakulam district is laterite soil and sandy soil. Sandy soil is seen in the coastal belt of the district.

3.2.2 Thrissur

Soil is mainly laterite origin even though sandy, alluvial and forest soils are also seen in certain belts. Sandy soil deficient in almost all major plant nutrients is seen in coastal taluks of Chavakkad and Kodungallur. Forest soil is confined to parts of Thalappilly, Thrissur and Mukundapuram taluks. Alluvial soils rich in organic matter are generally seen in the low-lying areas of Thrissur and Mukundapuram taluks.

3.2.3 Palakkad

Almost the entire district falls under the midland region except Attappady block in Mannarkkad taluk, which lies in high land. There are three main types of soil in the district namely lateritic soil, virgin forest soil and black soil. Laterite soil is the major group and is found in the major parts of Ottappalam, Alathur, Palakkad and Chittur taluks. Virgin forest soil is found mainly in Mannarkad taluk and in the northern region of Ottappalam taluk. Black soil, which is an extension of black soils of Deccan plateau, is found in Chittur taluk.

3.3 Climate

A brief introduction of climatic conditions of the area is presented here. Monthly mean data on three weather parameters, viz., rainfall, temperature and relative humidity, which are most relevant to the crop under study are presented in Tables 3.2 to 3.4.

Table 3.2. Average monthly rainfall (mm) during 1998

Months	Ernakulam	Thrissur	Palakkad
January	0	0	0.2
February	1.6	1.6	0.1
March	4.8	1.0	9.0
April	62.9	17.7	46.4
May	191.3	175.7	118.5
June	690.9	815.7	541.3
July	604.9	649.0	543.4
August	367.2	413.2	317.5
September	712	662.3	341.3
October	522.5	505.9	280.6
November	98.9	57.8	130.4
December	50.2	57.8	87.4
Annual	**3307.2**	**3358.7**	**2416.1**

Source: Government of Kerala (GOK), 2000

Table 3.3. Average monthly mean temperature (^{0}C)

Months	Ernakulam		Thrissur		Palakkad	
	Max	Min	Max	Min	Max	Min
Jan.	31.9	22.8	32.8	22.1	33.0	21.8
Feb.	32.3	24.3	34.8	22.5	35.7	22.5
March	32.7	25.4	36.2	23.8	37.5	23.9
April	33.0	26.0	35.6	25.0	37.1	25.0
May	32.5	25.9	34.0	24.8	34.7	24.7
June	30.4	24.2	30.1	23.4	30.0	23.0
July	29.5	23.7	29.0	23.0	28.7	22.6
Aug.	29.5	23.9	29.4	23.2	29.0	22.7
Sept.	30.2	24.2	30.5	23.3.	30.3	23.1
Oct.	30.8	24.2	31.4	23.1	31.6	23.1
Nov.	31.4	24.0	31.7	22.9	31.7	23.0
Dec.	32.0	23.2	31.9	22.6	31.8	22.2

Source: India Meteorological Department, Thiruvananthapuram

3.3.1 Ernakulam

A tropical humid climate with almost uniform temperature throughout the year is experienced in the district. The maximum day temperature varies form 29.5 ^{0}C to 33 ^{0}C and minimum temperature from 22.8 ^{0}C to 26 ^{0}C. The total annual rainfall per year is about 3500 mm, the major part of which is received in the month of June, July and August. Heavy rains occurring continuously for 10-15 days result in flooding, which is usual during June, July and August. Humidity is often very high, recording more than 90 per cent.

3.3.2 Thrissur

The climate of Thrissur district is tropical and humid with an oppressive hot season. Average daily maximum temperature is 31 ^{0}C - 32 ^{0}C in the coastal regions and 29 ^{0}C to 36.2 ^{0}C in interior. The rainfall is seasonal and fairly assured. The annual rainfall received in this district during 1997 was 3106.3 mm, concentrated in the months from June to September, the southwest monsoon season. Relative humidity fluctuates highly in this district, ranging from 72 per cent to 95 per cent of maximum mean and 38 per cent to 80 per cent of minimum mean. Higher RH is during June to September. Fluctuation in RH is much higher in this district.

Table 3.4. Average relative humidity (per cent) in the study area

	Ernakulam		Thrissur		Palakkad	
Months	Max	Min	Max	Min	Max	Min
Jan.	74	61	72	41	72	48
Feb.	79	66	77	38	71	41
March	77	68	82	42	72	40
April	77	70	84	53	76	52
May	81	73	86	60	79	61
June	90	83	93	78	89	80
July	91	83	95	80	91	83
Aug.	90	82	94	77	91	82
Sept.	87	79	92	70	87	75
Oct.	84	77	87	69	85	73
Nov.	82	72	83	62	80	67
Dec.	75	64	75	49	75	59

Source: India Meteorological Department, Thiruvananthapuram

3.3.3 Palakkad

The climate of Palakkad is tropical except in Attappady hill ranges where it is temperate. The district experiences tropical hot summer from mid February to May end, South-West monsoon from June to August., North-East monsoon in November and cool climate from December to February. June, July, August are the high rainfall season.. December, January and February are lean periods. The annual rainfall during the year 1998 was 2416.1 mm. The average monthly distribution of rainfall for the district during 1998 is presented in Table 3.2.

3.4 Cropping Pattern

3.4.1 Ernakulam

The major crops grown in the district are coconut, rubber, paddy, pulses, cereals and other millets. The cropping pattern in the district is given in the Table 3.4. Coconut occupies an area of 65631 ha which comes to 20.63 per cent of the gross cropped area. Rubber is the second important crop areawise covering 56025 ha of the total cropped area in the district (17.61%). Pulses cover an area of 48452 ha (15.26%) whereas paddy covers 14.51 per cent of the total cropped area.

3.4.2 Thrissur

Major crops grown in the district are paddy, coconut, arecanut, vegetables, rubber, banana and other plantains. Rice is cultivated in 40977 hectares of land, which is 15.7 per cent of the total cropped area. Coconut is grown in 76656 hectares of land, which is 29.37 per cent of the total cropped area, and is the main crop in the sandy coastal belts, which stretches over a length of 51.5 km from Kodungallur to Chavakkad.

Seasonal crops like tapioca, banana and vegetables are grown in midland regions where laterite soil is present. Plantation crops like tea, coffee and rubber are grown in highland regions. The cropping pattern for the district is given in Table 3.5.

Table 3.5. Cropping pattern in Ernakulam district for the year, 1997-98

Crop	Area (ha)	Percentage to total cropped area
Paddy	46152	14.51
Other cereals and millets	46152	14.51
Pulses	48542	15.26
Sugar crops	310	0.10
Spices and condiments	14436	4.54
Fruits	24080	7.57
Vegetables	9481	2.98
Coconut	65631	20.63
Other oil seeds	815	0.26
Fibre, drugs and narcotics	35	0.01
Tea	2	0.00
Coffee	-	0.00
Rubber	56025	17.61
Cocoa	1368	0.43
Fodder grass	123	0.04
Green manure crops	274	0.09
Other non food crops	4654	1.46
Total cropped area	318080	100.00

Source: Government of Kerala (GOK), 2000

Table 3.6. Cropping pattern in Thrissur district for the year, 1997-98

Crop	Area (ha)	Percentage to total cropped area
Paddy	40977	15.70
Other cereals and millets	-	-
Pulses	626	0.24
Sugar crops	298	0.15
Spices and Condiments	13370	5.13
Fruits	21006	8.05
Vegetables	86101	32.95
Coconut	76656	29.38
Other oil seeds	447	0.17
Fibre, drugs and narcotics	72	0.03
Tea	529	0.20
Coffee	-	-
Rubber	13105	5.02
Cocoa	164	0.06
Fodder grass	17	0.007
Green manure crops	905	0.35
Other non food crops	6678	2.56
Total cropped area	260951	100.00

Source: Government of Kerala (GOK), 2000

Table 3.7 Cropping pattern in Palakkad district for the year, 1997-98

Crop	Area (ha)	Percentage to total cropped area
Paddy	120809	35.60
Other cereals and millets	7611	2.24
Pulses	4660	1.37
Sugar crops	6434	1.90
Spices and condiments	19073	5.62
Fruits	30202	8.90
Vegetables	24256	7.15
Coconut	48929	14.42
Ground nut	10031	2.96
Other oil seeds	1161	0.34
Fibre, drugs and narcotics	14561	4.29
Tea	829	0.24
Coffee	4650	1.37
Rubber	28125	8.29
Cocoa	21	0.01
Fodder grass	210	0.06
Green manure crops	1964	0.58
Other non food crops	15802	4.66
Total cropped area	339328	100.00

Source: Government of Kerala (GOK), 2000

3.4.3 Palakkad

The major crops grown in the district are paddy, coconut, rubber, spices and condiments, fruit tress and vegetables. The cropping pattern is shown n

Table 3.6. Paddy is cultivated in an area of 120809 ha which is 35.60 per cent of the total cropped area. Coconut is grown in 48929 ha of land (14.42%).

3.5 Area, Production and Productivity of coconut

Table 3.8. Area, production and productivity of coconut in Ernakullam, Thrissur and Palakkad districts

	Ernakulam	Thrissur	Palakkad	State
Area(ha)	64816 (7.33)	76656 (8.67)	48929 (5.53)	884344 (100)
Production (million nuts)	357 (6.85)	491 (9.43)	237 (4.55)	5209 (100)
Productivity (nuts per ha)	5508 (93.51)	6405 (108.74)	4844 (82.24)	5890 (100)

Source: Government of Kerala (GOK), 2000

Figures in parantheses indicate percentage to state total

The area, production and productivity of coconut in the three central districts Ernakulam, Thrissur and Palakkad is compared with state figures in Table 3.7. These three districts occupy nearly 21.53 per cent of the total coconut cultivated area and 20.83 per cent of total nuts produced in the state. Among the three districts Thrissur is having highest area under coconut cultivation and also it contributes highest percentage of production. Productivity in Thrissur district is greater than that of State average whereas in Ernakulam and Thrissur districts it is lower than the state average.

Methodology

4. METHODOLOGY

The study of cost of cultivation of perennial crops faces with many practical as well as conceptual problems. This is due to the long run nature of the investment and the long gestation period before they start yielding returns.

In the case of perennial crops like coconut, with long gestation period and continuos yield for a number of years, computation of cost should include both the cost of establishing the crop as well as its annual maintenance. Most of the studies of production costs of perennial crops consider the maintenance cost only. The present study aims at collecting the data on the establishment costs of the gardens also by selecting sample holdings, which possess young coconut palms. The establishment costs will be annualised and will be added to the maintenance costs to arrive at the cost of production, which will be useful for the policy makers as well as those who are concerned with the economic aspects of coconut cultivation.

The study on "Economics of coconut production and marketing in central region of Kerala" was conducted in Ernakulam, Thrissur and Palakkad districts as these are the main three districts of the central region of Kerala.

4.1 SAMPLING FRAMEWORK

4.1.1 Selection of study area

Coconut occupies the prime position in the cropping pattern covering 20.63 per cent of the gross cropped area in Ernakulam district while in Thrissur district it covers 29.38 per cent of the total cultivated area and was second to area under vegetables. In Palakkad district also coconut occupies the second position area wise covering 14.42 per cent of total cultivated area (GOK, 2000). So, these are the important districts as far as coconut cultivation is concerned in the study region and hence these districts were selected for this study.

4.1.2 Sampling design

Three stage random sampling procedure was adopted for the study with block as the primary unit, panchayat as the secondary unit and farmer as the ultimate unit. Two blocks were selected randomly from each district and from each block two panchayats were selected randomly. The list of selected blocks and panchayats is given as Table 4.1.

Table 4.1. Study area selected

District	Block	Panchayat
Ernakulam	Paarakadavu	Paarakadavu
		Kunnukara
	Angamaly	Manchapra
		Thuravoor
Thrissur	Puzhakkal	Avanoor
		Kaipparambu
	Ollukkara	Puthur
		Ollukkara
Palakkad	Mannarakad	Thachanattukara
		Thachampaara
	Nenmara	Nenmara
		Elavanchery

List of good coconut farmers were collected from the Krishi Bhavans of the respective panchayats. From each Panchayat, a total of 18 farmers were selected thus making a total sample of 216 (18*2*2*3) farmers. The 18 farmers selected from a panchayat was based on the age of their coconut garden. The groups based on age were, farmers having one year old, 2 to 3 year old, 4 to 7 year old, 8 to 14 year old, 15 to 40 years old and greater than 40 years old coconut gardens. Two farmers each from the first four categories and five farmers each

from the last four categories were selected for the study. The first four age groups represent establishment and pre-bearing periods whereas the last two groups represent stabilization and declining periods. Classification of farmers based on the age group of their coconut garden is given in Table 4.2.

Table 4.2. Distribution of sample coconut farmers

Class	Age group (years)	Number of farmers	
		Panchayat	Total
C-I	1	2	24
C-II	2 to 3	2	24
C-III	4 to 7	2	24
C-IV	8 to 14	2	24
C-V	15 to 40	5	60
C-VI	greater than 40	5	60

4.1.3 Collection of Data

Only primary data were used for this study. The data were collected through personal interview method using well-structured and pre-tested schedule.

Data on marketing aspects were collected from a sample of 24 village traders/copra makers, 8 oil millers, 12 wholesalers and 12 retailers. A separate schedule was developed for collecting data on marketing aspects such as marketing costs, marketing margins etc.

4.2 Period of study

The data were collected for reference period June 1998 to May 1999.

The main items of observation made were

a. Agewise distribution of palms

b. Hired human labour

c. Animal labour machine labour, seedlings
d. Organic manure
e. Plant protection
f. Land tax
g. Irrigation charges
h. Interest on working capital and building and depreciation charges
i. Imputed value of family labour
j. Harvesting charges
k. Yield of palms
l. By-products
m. Processing
n. Mode of marketing
o. Marketing channels, marketing margins
p. Problems in marketing

4.3 Method of Analysis

Percentage analysis was used for interpretation of data. To estimate cost of production annuity value method was used. Capital productivity analysis was done to assess the financial feasibility of the investments. The details are described below.

4.3.1 Annuity value method

Regarding the cost of production, due to the characteristic features of the crop as listed earlier, the estimation of costs and returns in coconut needs special treatment which differ in many respects from that of seasonal and annual crops. There are limited studies covering these aspects. Some studies have worked out the cost of production using primary data without taking into account the establishment costs (Sumith, 1990). The present study aims to fulfil this lacuna by

computing cost of production from primary data taking into account the establishment costs also.

The methodology and norms suggested by Nelson *et al* (1973) have been adopted in this study with necessary modifications. The same methodology and norms was used by Das (1984) for estimating the cost and return for coconut in Kerala. For estimating the cost of production per nut, the establishment cost was amortised into an annuity value @ 14 per cent. An interest @ 12.5 per cent was added to the annual maintenance cost for half year as the opportunity cost for investment in coconut. For working out the costs and returns, the following norms were used:

The estimate is for one hectare, planted with a spacing of 7.5m x 7.5m (175 palms per hectare). The total costs and returns of the sample farmers in each class were divided by the number of palms in each class to arrive at cost and returns per palm. This was then multiplied by 175 to estimate costs and returns per hectare of a coconut garden.

In this method, annuity value at the market rate of interest 14% has been calculated using formula (Nelson *et al*, 1973) given below

$$A = \frac{i}{i-(1+i)^{-n}}$$

Where A is the annuity index

i = rate of interest and n = bearing period in years.

To this, annual maintenance cost will be added, in working out the cost of production, deducting returns from by products.

4.3.2 Capital productivity analysis

Capital productivity analysis is the most important tool for evaluating the financial feasibility of perennial crops. It brings out the efficiency of capital use in production. There are various methods to measure the capital productivity. The four measures used in this study were:

a) Pay-back period (PBP)
b) Benefit cost ratio (BCR)
c) Net present value (NPV) and
d) Internal rate of return (IRR).

The cost of cultivation and returns obtained over the economic life of coconut was used for these computations. The first one - 'pay back period' is an undiscounted measure while other three measures are discounted measures of assessing investment worth. For estimating these parameters costs and returns are discounted at 14 per cent rate of interest, being the rate at which medium term and long term credit could be obtained from commercial banks.

4.3.2.1 Pay-back period

It is an undiscounted measure of the worth of an endeavour, which measures the efficiency of cultivation by indicating the period within which the returns offset the investment (Gittinger, 1984). Pay back period has two major drawbacks as a measure of investment worth: a) it does not consider earnings after this period and b) it fails to take into consideration difference in the timing of earnings during the pay back period. Given the expected life of the project, the shorter the pay-back period, the greater is the profitability. The pay-back period can be estimated by estimating the progressive total of returns and progressive total of costs. The year at which progressive total of returns exceeds progressive total of costs is considered as pay back period.

4.3.2.2 Benefit cost ratio

The benefit cost ratio indicates the return on a rupee of investment. It is the ratio between the present worth of benefits and that of costs (Gittinger, 1984). A project with benefit cost ratio greater than unity is considered viable.

$$BCR = \frac{\sum \{B_t/(1+i)^t\}}{\sum \{C_t/(1+i)^t\}}$$

Where, $t = 1 \ldots\ldots n$ years

(n = Total number of years of the project)

B_t = Benefits in t^{th} year

C_t = Costs in t^{th} year

i = Discount rate

4.3.2.3 Net present value

This is a most straightforward discounted cash flow measure of the project worth. This is simply the present worth of the net cash flow stream (Gittinger, 1984). In other words it is the difference between present worth of benefits and present worth of costs. The formal selection criterion for the net present value measure of project worth is to accept all projects with a positive net present value when discounted at the opportunity cost of capital.

Symbolically, net present value (NPV) is

$$NPV = \sum \frac{(B_t - C_t)}{(1+i)^t}$$

Where, $t = 1 \ldots\ldots n$ years

(n = Total number of years of the project)

Other symbols are same as mentioned earlier

4.3.2.4 Internal rate of return

Another way of using discounted cash flow for measuring the worth of a project is to find that discount rate which just makes the net present value of the cash flow equal to zero. This discount rate is termed the internal rate of return and it represents the average earning power of the money used in the project over the project life (Gittinger, 1984). Based on this criteria a project is considered worth to be accepted if the internal rate of return is above the opportunity cost of capital.

Symbolically, internal rate of return (IRR) is that discount rate 'i' such that

$$NPV = \frac{\sum (B_t - C_t)}{\sum (1+i)^t} = 0$$

Where, $t = 1 \ldots\ldots n$ years

(n = Total number of years of the project)

Other symbols are as mentioned earlier.

4.3.2 Marketing

The concepts of marketing employed in the study are described below to have a working basis:

Market

Kotler (1989) viewed the concept of market from two angles- that of an economist and that of a marketer. For an economist the term market referred to the aggregation of buyers and sellers interested or potentially interested in a product group. For a marketer, the market embraces all persons or business units who buy or induce to buy a product or service. Thus market would indicate an organization or institution that performed the function of marketing which in turn is a process

by which goods and services were directed from the primary producer to the ultimate consumer.

Marketing

Marketing is defined as a social and managerial process by which individuals and groups obtained what they needed through creating, offering and exchanging products of value with others (Kotler, 1996).

Marketing Channel

Marketing channels are routes through which agricultural products move from producers to consumers (Acharya and Agarwal, 1987).

Marketing Cost

Marketing cost are the actual expenses required in bringing goods and services from the producers to the consumers (Jain, 1971).

Marketing Margin

Marketing margin is the difference between price paid by the consumer and price received by the producer for an equivalent quantity of farm produce. The total marketing margin includes all the cost and profits involved in moving the produce from the initial point of production till it reaches the ultimate consumer (Acharya and Agarwal, 1987). The net margin of each intermediary is the margin received by intermediaries over their cost in the disposal of a unit equivalent quantity of produce.

There are two types of marketing margins

Concurrent margins

It refers to the difference between the prices prevailing at successive stages of marketing at a given point of time. This method is used in this study.

Lagged margins

It is the difference between the price received by a seller at a particular stage of marketing and the price paid by him at the preceding stage of marketing during an earlier period.

Price Spread

It refers to the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of farm produce (Acharya and Agarwal, 1987).

4.3.3 Constraints in production and marketing of coconut

The following constraints for the production and marketing of coconut were identified from the pilot study, discussions with the officials of krishibhavans and were used for the sample survey.

Constraints in production and marketing

1. Pest and Disease attack
2. Low market price
3. Lack of water
4. Inadequate loan
5. Lack of credit
6. High interest rate
7. Procedural complications

The farmers were asked to rank the constraints from 1 to 7 according to the order of importance perceived by each of them. A weight of 7, was given to the first ranking constraint, 6 to the second ranking constraint, 5 to the third ranking, 4 to the fourth, 3 to the fifth, 2 to sixth and 1 to the seventh ranking constraint. These ranks were multiplied by the corresponding weights and total scores of each constraint were worked out.

Result

5. RESULTS

This chapter presents the analysis on the data of economics of production and marketing of coconut, which includes cost of production, capital productivity analysis and marketing study. Here, the notations representing different age groups are given as: C-I for one year old, C-II for 2-3 years old, C-III for 4-7 years old, C-IV for 8-14 years old, C-V for 15-40 years old and C-VI for 41 to 60 year old coconut garden.

5.1 General socio-economic features of the sample farmers

5.1.1 Age, sex and family size

Classification of the family members of respondents on the basis of age, sex and size is given in Table 5.1

Table 5.1. Distribution of sample farmers' family based on age and sex

Age group (years)	Sex	C-I		C-II		C-III		C-IV		C-V		C-VI		Aggregate	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<20	Male	8	9.1	12	11.7	10	8.7	14	13.6	51	17.5	29	10.5	124	12.7
	Female	7	8.0	14	13.6	15	13	17	16.5	34	11.6	48	17.5	135	13.8
20-40	Male	9	10.2	20	19.4	7	6.09	12	11.7	55	18.8	36	13.1	139	14.2
	Female	15	17.0	16	15.5	19	16.5	19	18.4	62	21.2	62	22.5	193	19.8
40-60	Male	12	13.6	11	10.7	18	15.7	27	26.2	44	15.1	40	14.5	152	15.6
	Female	9	10.2	17	16.5	15	13	9	8.7	33	11.3	36	13.1	119	12.2
>60	Male	10	11.4	7	6.8	13	11.3	3	2.9	5	1.7	10	3.6	48	4.9
	Female	18	20.5	6	5.83	18	15.7	2	1.9	8	2.7	14	5.1	66	6.8
Aggregate	Male	39	44.3	50	48.5	48	41.7	56	54.4	155	53.1	115	41.8	463	47.4
	Female	49	55.7	53	51.5	67	58.3	47	45.6	137	46.9	160	58.2	513	52.6
Total		88	100	103	100	115	100	103	100	292	100	275	100	976	100
Average family size		3.67		4.29		4.79		4.29		4.87		4.58		4.42	

Here we could find that, as much as 34 per cent of total members in aggregate belonged to the age group of 20-40 years followed by 27.8 per cent in the age group of 40-60 years. About 26.5 per cent of the members were in the age group of below 20 years and only about 11.7 per cent were above 60 years old. Females in total formed 52.6 per cent of the sample and the sex ratio worked out to 1107. Except in C-IV and C-V all other categories showed higher number of female members than male members. Average family size was 4.42 and the largest average size 4.87 was found in class C-V.

5.1.2 Main occupation

Distribution of respondents based on their main occupation of household head is presented in Table 5.2.

Table 5.2. Distribution of respondents based on occupation of head of household

	C-I		C-II		C-III		C-IV		C-V		C-VI		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Govt. Service	1	4.17	2	8.33	0	0	5	20.83	10	16.67	12	20	30	13.89
Private	2	8.33	0	0	8	33.33	4	16.67	14	23.33	0	0	28	12.96
Agriculture	21	87.5	16	66.67	15	62.50	14	58.33	34	56.67	46	76.67	146	67.59
Business	0	0	6	25	1	4.17	1	4.17	2	3.33	2	3.33	12	5.56
Total	**24**	**100**	**24**	**100**	**24**	**100**	**24**	**100**	**60**	**100**	**60**	**100**	**216**	**100**

From this table it can be observed that, majority of the respondents were engaged in agriculture (67.59%). Persons engaged in government service amounted to 13.89 per cent and 12.96 per cent of respondents were in private service. Business as an occupation was the last, with only 5.56 per cent of the respondents involved in that. Moreover, agriculture proved to be the most

prominent occupation in all the categories. None of the respondents in C-I were engaged in business.

5.1.3 Education

The results shown in Table 5.3 shows that all the sample farmers were literate. Majority of the respondents had an education level of below SSLC (41.67%), followed by primary level of education (37.96 per cent). Moreover, only 15.74 per cent of farmers had an education of SSLC, 3.7 per cent had a degree and 0.93 per cent were post graduates. The results also revealed that in all the categories more than 65 per cent of respondents had an education level below SSLC or primary level. It is also interesting to note that no degree holder was found in C-II and C-IV, whereas postgraduates were found only in C-I and C-VI.

Table 5.3. Educational status of the respondents

	C-I		C-II		C-III		C-IV		C-V		C-VI		Total	
	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)
Primary level	9	37.5	12	50	2	8.33	13	54.17	24	40	22	36.67	82	37.96
Below SSLC	8	33.3	12	50	14	58.34	8	33.33	21	35	27	45	90	41.67
SSLC	5	20.8	0	0	5	20.83	2	8.33	12	20	10	16.67	34	15.74
Degree	1	4.17	0	0	3	12.50	1	4.17	3	5	0	0	8	3.70
Post Graduation	1	4.17	0	0	0	0	0	0	0	0	1	1.66	2	0.93
Total	**24**	**100**	**24**	**100**	**24**	**100**	**24**	**100**	**60**	**100**	**60**	**100**	**216**	**100**

5.2 General characteristics of sample farms

5.2.1 Topography of coconut gardens

From Table 5.4, it could be observed that 81.95 per cent of the sample farmers were possessing plain land and only 18.05 per cent had undulated land.

Moreover, in all the categories 75 per cent or more of the farmers were having plain land.

Table 5.4. Topography of coconut garden

	Plain	(%)	Undulated	(%)
C-I	20	11.30	4	10.26
C-II	18	10.17	6	15.38
C-III	20	11.30	4	10.26
C-IV	18	10.17	6	15.38
C-V	51	28.81	9	23.08
C-VI	50	28.25	10	25.64
Total	**177**	**81.95**	**39**	**18.05**

5.2.2 Cropping pattern of sample households

Cropping pattern of the sample households is given in Table 5.5.

Table 5.5. Cropping pattern of the sample households (ha)

	Coconut upland	Coconut Wetland	Arecanut	Perennial purecrop	Perennial Intercrop	Annual purecrop	Annual Intercrop	Total
C-I	15.31 (36.48)	2.50 (5.96)	10.60 (25.26)	2.40 (5.72)	5.42 (12.91)	1.52 (3.62)	4.22 (10.05)	41.97 (100.00)
C-II	12.58 (41.68)	0.76 (2.52)	6.40 (21.21)	2.80 (9.28)	2.80 (9.28)	0.80 (2.65)	4.04 (13.38)	30.18 (100.00)
C-III	11.20 (25.61)	2.19 (5.01)	12.36 (28.26)	3.80 (8.69)	4.84 (11.06)	1.12 (2.56)	8.22 (18.81)	43.74 (100.00)
C-IV	10.75 (31.62)	0.84 (2.47)	8.40 (24.71)	2.80 (8.24)	3.60 (10.59)	1.54 (4.54)	6.06 (17.83)	33.99 (100.00)
C-V	39.24 (34.27)	2.92 (2.55)	27.04 (23.62)	8.80 (7.69)	13.48 (11.78)	6.67 (5.82)	16.35 (14.27)	114.50 (100.00)
C-VI	34.49 (29.69)	3.14 (2.71)	28.13 (24.22)	13.12 (11.30)	17.22 (14.83)	3.78 (3.25)	16.27 (14.01)	116.15 (100.00)
Total	**123.57 (32.47)**	**12.36 (3.25)**	**92.93 (24.42)**	**33.72 (8.86)**	**47.36 (12.45)**	**15.43 (4.05)**	**55.16 (14.50)**	**380.53 (100.00)**

Figures in parentheses indicate percentage to the total

Coconut upland and wetland area given in Table 5.5 implies the area under coconut in the whole farm. Coconut upland area (32.47%) followed by Arecanut (24.42%) occupies more than half of the area under cultivation. Then come the annual intercrops occupying 14.50 per cent and perennial intercrops occupying 12.45 per cent of the total area. Other crops occupy less than 10 per cent of the area under cultivation.

5.2.3 Distribution of sample palms

The total number of palms in each category is given in the Table 5.6.

Table 5.6. Distribution of sample palms in each category

Category	Distribution of sample palms		
	No	Yielding	(%)
C-I	666	0	0.00
C-II	572	0	0.00
C-III	565	0	0.00
C-IV	1196	1008	84.28
C-V	3605	3313	91.90
C-VI	2513	2139	85.12

Here, we could observe that 91.90 per cent of the palms in C-V are yielding while only 85.12 per cent and 84.28 per cent of palms in C-VI and C-IV respectively are yielding.

5.3 Cultivation practices of coconut in the sample farms

5.3.1 Source of planting material

Distribution of sample farmers based on the source of seedling is given in the Table 5.7. The major source of planting material noticed were private sources, Government farms, large growers and own farm production. It can be seen that 41.67 per cent of the farmers used seedlings produced in their own farms.

Only 4.16 per cent of the farmers used seedlings purchased from Government farms whereas 8.8 per cent of the farmers procured seedlings from private sources. In the case of 36.57 per cent of the farms the source of seedling was unknown.

5.3.2 Spacing of palms:

The choice of spacing standard for coconut depends upon how the crop is grown, whether as monocrop or in association with the other crops, whether as perennial or seasonal in character. Similar was the case in the study area where the spacing varied according to the type- whether as monocrop or intercropped. However, in the study area both under spacing and wider spacing of palms were noticed. The below given Table 5.8 shows the distribution of the farmers based on the spacing they have adopted in their coconut farms.

Table 5.7. Distribution of source of planting material (number)

	Private Sources	Government Farms	Large growers	Own farm	Not known	**Total**
C-I	8	2	5	9	0	**24**
	(33.34)	(8.33)	(20.83)	(37.50)	(0)	**(100)**
C-II	2	1	4	17	0	**24**
	(8.33)	(4.17)	(16.67)	(70.83)	(0)	**(100)**
C-III	4	4	2	14	0	**24**
	(16.67)	(16.67)	(8.33)	(58.33)	(0)	**(100)**
C-IV	4	0	4	16	0	**24**
	(16.67)	(0)	(16.67)	(66.66)	(0)	**(100)**
C-V	1	2	4	26	27	**60**
	(1.67)	(3.33)	(6.67)	(43.33)	(45)	**(100)**
C-VI	0	0	0	8	52	**60**
	(0)	(0)	(0)	(13.33)	(86.67)	**(100)**
Total	**19**	**9**	**19**	**90**	**79**	**216**
	(8.80)	**(4.16)**	**(8.8)**	**(41.67)**	**(36.57)**	**(100)**

Figures in parentheses indicate percentage to the total

Table 5.8. Distribution of farmers according to spacing adopted (number)

Particulars	Category						
	C-I	C-II	C-III	C-IV	C-V	C-VI	Total
Under Spacing	6 (25.00)	4 (16.67)	7 (29.17)	6 (25.00)	24 (40.00)	14 (23.33)	61 (28.24)
Wider spacing	5 (20.83)	2 (8.33)	1 (4.17)	4 (16.67)	9 (15.00)	8 (13.34)	29 (13.43)
Optimum spacing	13 (54.17)	18 (75.00)	16 (66.66)	14 (58.33)	27 (45.00)	38 (63.33)	126 (58.33)
Total	**24 (100)**	**24 (100)**	**24 (100)**	**24 (100)**	**60 (100)**	**60 (100)**	**216 (100)**

Figures in parentheses indicate percentage to the total

In this study, a spacing below 6.7m x 6.7m was considered as under spacing and a spacing above 9.2m x 9.2m was considered as wider spacing and in between these two was considered the optimum one. In all the categories under spacing was more common than over spacing. Also it could be observed that, 58.33 per cent of the farmers adopted optimum spacing whereas 28.24 per cent farmers had under spaced garden and 13.43 per cent of the farmers had wider spaced gardens. Adoption of optimum spacing was found to be the highest in C-II (75%). Almost in all the categories except C-V more than 50 per cent of the farmers adopted optimum spacing. The extent of under spacing was highest in case of C-V (40%).

5.3.3 Maintenance of young plantations:

In the first year of planting, care should be taken to see that water stagnation does not occur in the seedling pits during the rainy season. During summer, the seedlings should be provided proper shade. It reduces not only casualties but also the frequency of watering. Coconut leaves or palmyra leaves can be used for the purpose of providing shade and can be dispensed with after two

years of planting. In the study area, shading was practised in limited number of farms only.

5.3.4 Manuring

The young palms always respond to manuring and the properly fertilized palms grow vigorously and reach the flowering stage much earlier than unfertilised palms.

Distribution of farmers applying organic manure is given in the Table 5.9. It shows that no farmer under any category was found to use compost. In all the categories more than 75 per cent of the total farmers applied manure and wood ash to palms. Farmers who use manure, wood ash, neem cake or bone meal in combined forms comprised the next prominent group. The source of organic manure was equally from their own farms of the farmers as well as that was bought from nearby farms and that was transported to their places mainly from Tamil Nadu. Most of the farmers who applied wood ash were found utilising it from their own farm.

5.3.5 Fertilizer application

5.3.5.1 Number of farmers applying fertilizer

Out of the total 216 farmers considered for the study, 120 were found to apply fertilizer, which accounted 55.56 per cent. Distribution of farmers based on the application of different fertilizers is given in Table 5.10

Table 5.9. Distribution of farmers applying organic manure (number)

Particulars	Category					
	C-I	C-II	C-III	C-IV	C-V	C-VI
Compost	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Manure(Cattle/Poultry/ fish) + Wood ash	19 (79.2)	21 (87.5)	21 (87.5)	20 (83.33)	49 (81.67)	52 (86.67)
Manure + Woodash+Neemcake/ Bonemeal	5 (20.8)	3 (12.5)	3 (12.5)	4 (16.67)	11 (18.33)	8 (13.33)
Total	**24 (100)**	**24 (100)**	**24 (100)**	**24 (100)**	**60 (100)**	**60 (100)**

Figures in parentheses indicate percentage to the total

Table 5.10. Distribution of farmers applying fertilizers (number)

Fertilizer	Category						
	C-I	C-II	C-III	C-IV	C-V	C-VI	Total
Urea	2 (28.57)	7 (70.00)	0 (0)	0 (0)	3 (6.12)	5 (13.51)	14 (11.67)
Urea+ Factomphos	0 (0)	0 (0)	4 (33.33)	0 (0)	12 (24.49)	1 (2.70)	11 (9.17)
Urea+MOP	1 (14.29)	1 (10.00)	4 (33.33)	8 (47.06)	9 (18.37)	13 (35.14)	44 (36.67)
Urea+ Factomphos+ MOP	0 (0)	0 (0)	1 (8.34)	6 (35.29)	12 (24.49)	6 (16.22)	19 (15.83)
Coconut mixture	4 (57.14)	1 (10.00)	2 (16.67)	3 (17.65)	10 (20.41)	12 (32.43)	28 (23.33)
Urea+Coconut mixture	0 (0)	1 (10.00)	1 (8.33)	0 (0)	3 (6.12)	0 (0)	4 (3.33)
Total	**7 (100)**	**10 (100)**	**12 (100)**	**17 (100)**	**49 (100)**	**37 (100)**	**120 (100)**

Figures in parentheses indicate percentage to the total

It could be observed that farmers using both urea and Muriate of Potash (MOP) occupied 36.67 per cent of the total farmers applying fertilizer. They were

followed by farmers using coconut mixture (23.33%), urea + factomphos, muriate of potash (15.83%), urea alone (11.67%), urea, factomphos (9.17%). Farmers applying urea + coconut mixture combination were very less comprising 3.33 per cent of the total farmers who apply fertilisers. In C-I, farmers applying coconut mixture (57.14%) were the highest. Second major fertilizer applied in C-I was urea, which was covered by 28.57 per cent of the farmers. No farmer tried urea + coconut mixture combination or urea + factomphos + MOP combination. Urea alone was applied by 70 per cent of the farmers who apply fertilizers in C-II. Other than urea + factomphos and urea + factomphos + MOP combination that was not applied by any farmer, all other fertilizers were applied by 10 per cent of the farmers. In C-III, 33.33 per cent farmers each applied urea + factomphos and urea + MOP combination each. Coconut mixture was applied by 16.67 per cent of the farmers followed by urea-coconut mixture combination (8.33%). In this category no farmer applied urea alone. Urea alone, urea + factomphos and urea + coconut mixture combination was not at all applied by any of the farmer in C-IV. Urea + MOP was the major fertilizer combination used by majority of the farmers (47.06%) which was followed by urea + factomphos + MOP combination (35.29%). Coconut mixture alone was applied by 17.65 per cent of the farmers. Forty nine per cent each of the farmers apply urea + factomphos and urea + factomphos + MOP combination in C-V. Coconut mixture is applied by 20.41 per cent followed by urea + MOP combination, which occupied 18.37 per cent in this category. Urea alone is applied by only 6.12 per cent of the farmers. In C-VI, urea-MOP combination occupies the first position (35.14%). followed by coconut mixture (32.43%). Urea + factomphos + MOP combination is used by 16.22 per cent of the farmers followed by urea alone (6.12%) and urea + factomphos combination (2.70%).

5.3.5.2 Quantity of fertilizers applied

The quantity of nutrients applied per palm by the sample farmers in the study area is given in the Table 5.11. It is compared with the general recommendations given for coconut palms under average management condition as per the Package of Practices (KAU, 1996).

Considering the nutrients together, it is obvious that nutrient application is lower than the recommended level in all the categories. It was nearest up to 73.37 per cent of the recommendation in C-V and was farthest in C-I where only 35.37 per cent of the recommended dose were applied. All other categories were applying more than 50 per cent of the recommended dose.

Category wise analysis shows that in C-I more than 50 per cent of nitrogen was applied whereas phosphorus was applied at a level of 47.69 per cent whereas potassium was the lowest with an application level of only 22.65 per cent of the recommended dose. Around 26.44 per cent more of recommended nitrogen was applied by farmers under C-II. Phosphorus application came to 75.28 per cent of the recommended dose while potassium application was very low in this category as only 10.86 per cent of the recommended dosage was applied. In C-III, 86.40 per cent of nitrogen, 72.63 per cent of the phosphorus and 32.66 per cent of the potassium was applied. In the first yielding category C-IV, 85.94 per cent of nitrogen, 51.89 per cent of phosphorus and 46.65 per cent of potassium were applied whereas in C-V nitrogen and phosphorus were more than the recommended dose by 3.52 per cent and 7.9 per cent respectively. In C-VI, nitrogen, phosphorus and potassium applied were 72.45 per cent, 67.86 per cent and 41.75 per cent respectively.

Table 5.11. Quantity of nutrients applied by sample farmers (g\palm)

Cat gory	N			P			K			Total		
	Appl- ied	Recom men- ded	(%) adopt- ion	Appl- ied	Recom- mended	(%) adopt- ion	Appl- ied	Recom- mended	(%) adopt- ion	Appl- ied	Recom- mended	(%) adopt- ion
C-I	61.91	113.33	54.63	27.03	56.67	47.69	51.35	226.7	22.65	140.29	396.67	35.37
C-II	286.60	226.67	126.44	85.32	113.3	75.28	49.23	453.3	10.86	421.16	793.33	53.09
C-III	293.77	340	86.40	123.48	170	72.63	222.12	680	32.66	639.37	1190	53.73
C-IV	292.22	340	85.94	88.21	170	51.89	317.22	680	46.65	697.66	1190	58.63
C-V	351.98	340	103.52	183.47	170	107.9	337.65	680	49.65	873.09	1190	73.37
C-VI	246.35	340	72.45	115.36	170	67.86	283.91	680	41.75	645.62	1190	54.25

5.3.6 Mulching

Mulching is an effective method of conserving soil moisture. Mulching also adds organic matter to the soil and reduces soil temperature. Burying of fresh or dried coconut husk around the palms is a desirable practice particularly for soil moisture retention. Details of farmers adopting mulching is given in the Table 5.12

The table highlights that only very few farmers were doing husk burial. In case of categories C-I and C-III none did husk burial. A maximum of 23.33 per cent farmers from C-V did husk burial. In other categories only less than 15 per cent is doing husk burial. Mulching using leaves or stubbles was done by more than 80 per cent of the farmers in all the categories except in C-III, whereas in C-II and C-III all the farmers did mulching in their field. It is also interesting to note that C-I has more farmers who do not mulch compared to C-VI.

Table 5.12. Distribution of farmers adopting mulching (number)

Operation	Category					
	C-I	C-II	C-III	C-IV	C-V	C-VI
Husk Burial	0	2	0	3	14	5
	(0.00)	(8.33)	(0.00)	(12.50)	(23.33)	(8.33)
Not done	24	22	24	21	46	55
	(100.00)	(91.67)	(100.00)	(87.50)	(76.67)	(91.67)
Leaves/mulch	20	24	18	24	57	55
	(83.33)	(100.00)	(75.00)	(100.00)	(95.00)	(91.67)
Not done	4	0	6	0	3	5
	(16.67)	(0.00)	(25.00)	(0.00)	(5.00)	(8.33)
Total Farmers	24	24	24	24	60	60
	(100)	(100)	(100)	(100)	(100)	(100)

Figures in parentheses indicate percentage to the total

5.3.7 Irrigation

5.3.7.1 Source of irrigation water

It can be inferred from the Table 5.13 that the major source of irrigation was well in all the categories. It was followed by canal irrigation in all the categories except C-V, where farmers used other source of irrigation. The other sources of irrigation included river, pond etc. The farmers grouped under others were either having well and or canal in addition to other source. In total it can be realised that well was the main source of irrigation (56.59%) followed by canal irrigation (23.63%). Farmers who use other sources also for irrigation comes next with 13.19 per cent. Very few farmers do irrigate their coconut garden using both canal and well as the source.

Table 5.13. Source of Irrigation water

Class	Canals		Wells		Canals & Wells		Others		Total	
	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)
C-I	2	8.69	19	82.61	1	4.35	1	4.35	23	100
C-II	8	38.10	11	52.38	0	0.0	2	9.52	21	100
C-III	6	35.29	7	41.19	2	11.76	2	11.76	17	100
C-IV	9	39.13	10	43.48	0	0.0	4	17.39	23	100
C-V	5	10.00	30	60.00	7	14	8	16.00	50	100
C-VI	13	27.08	26	54.17	2	4.17	7	14.58	48	100
Total	**43**	**23.63**	**103**	**56.59**	**12**	**6.59**	**24**	**13.19**	**182**	**100**

5.3.7.2 Irrigation Practices

Table 5.14 reveals that 73.51 per cent of the farmers irrigated their palms, while the rest 26.85 per cent of farmers had rainfed garden.

Table 5.14. Irrigation practices adopted by sample farmers

Class	Pump		Pot		Manual		Drip		Total	
	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)
C-I	17	89.47	2	10.53	0	0	0	0	**19**	**79.17**
C-II	15	83.33	3	16.67	0	0	0	0	**18**	**75**
C-III	10	76.92	2	15.39	1	7.69	0	0	**13**	**54.17**
C-IV	14	77.78	0	0	3	16.66	1	5.56	**18**	**75**
C-V	40	81.63	0	0	8	16.33	1	2.04	**49**	**81.67**
C-VI	34	82.92	1	2.44	4	9.76	2	4.88	**41**	**68.33**
Total	**130**	**82.28**	**8**	**5.06**	**16**	**10.13**	**4**	**2.53**	**158**	**100**

Considering the farmers under different categories, it could be seen that around 81.67 per cent of the farmers irrigated their palms in C-V followed by 79.17 per cent in C-I and 75 per cent in C-II as well as in C-IV. Class C-VI had 60.33 per cent of irrigating farmers whereas only 54.17 per cent of the sample farmers irrigated in C-III. More than 75 per cent of farmers in all the categories used pumpset for irrigating their coconut garden. Pot irrigation was not adopted in C-IV and C-V categories. Also, manual irrigation by making channels was not found to be adopted in C-I and C-II. Only 4 farmers from the total sample used drip method of irrigation, distributed in C-IV, C-V and C-VI categories. But their share is less than 6 per cent in all these categories.

5.3.7.3 Pumpsets

Details of pumpsets used by the sample farmers for irrigation is shown in the Table 5.15

Table 5.15. Private and Public ownership of pumpsets

Pumpset	Category											
	C-I		C-II		C-III		C-IV		C-V		C-VI	
	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)
Privately owned	17	100	15	100	10	100	17	94.4	40	97.6	35	97.2
Public owned	0	0.0	0	0.0	0	0.0	1	5.6	1	2.4	1	2.8
Total	**17**	**100**	**15**	**100**	**10**	**100**	**18**	**100**	**41**	**100**	**36**	**100**

The above table shows the details of motors used by the sample farmers for the purpose of irrigation. Among the motors used for irrigation the farmers under categories C-I, C-II and C-III did not use the public owned motor facility. Public owned motor, here, refers to the Panchayat motor provided by the Panchayat installed at the banks of river for irrigation, for which the farmers have to pay. Farmers have to make channels from the main channel that reaches near their farm. The main draw back is that only farms near to the riverside are

benefited. It is clear that majority of the farmers use private source for their irrigation purposes.

5.3.7.4 Frequency of Irrigation

Table 5.16 shows the irrigation frequency and total hours of irrigation of the sample farms.

Table 5.16. Frequency of Irrigation adopted by sample farmers

Category	Particulars							
	Hours/ Day	(%)	Frequency/ week	(%)	Months	(%)	Total hours per palm	(%)
C-I	0.98	9.71	2.83	29.84	3.73	19.04	1.81	20.13
C-II	1.17	11.57	1.83	19.31	3.44	17.55	1.77	19.63
C-III	1.20	11.88	1.10	11.63	3.10	15.85	1.30	14.37
C-IV	2.50	24.80	1.54	16.24	3.35	17.13	1.85	20.57
C-V	2.23	22.11	1.10	11.58	2.92	14.89	0.95	10.53
C-VI	2.01	19.92	1.08	11.41	3.04	15.53	1.33	14.77
Total	**10.09**	**100**	**9.50**	**100**	**684.4**	**100**	**9.02**	**100**
Aggregate	***1.83***		***1.42***		***3.17***		***1.31***	

Here, the irrigation frequency as a whole in the study area is worked out. On an average 1.83 hours irrigation per palm per day was being done in the study area. Frequency of irrigation was very near to one and a half times (1.42) per week on an average. In aggregate, 1.31 hours of irrigation was received by each palm in the area during the average 3.17 irrigated months in a year.

5.4 Cost of cultivation for one hectare of coconut garden

Ipe and Varghese (1990) studied the economics of cultivation in Nutmeg in Ernakulam district of Kerala. In their methodology they had grouped the life period of a perennial crop into four stages. First one is the gestation period, next is the period of increasing yields followed by the period of stable yields and finally period of declining yields.

Coconut is a perennial crop with a gestation period of nearly 7 years and its economic life was considered to be 60 years after which replanting is to be done Das (1984). In coconut the first stage namely the gestation period is for seven years and is represented by three categories namely, C-I (one-year-old palms), C-II (two to three year old palms) and C-III (four to seven year old palms). The cost for establishing the coconut is accounted by C-I and it is the cost of establishing a coconut garden. Other two categories accounts the annual maintenance cost in the nonbearing stage of the palm. The total cost for C-I, C-II and C-III are added to arrive at the establishment cost of coconut palm.

The second stage of increasing yields is represented by C-IV (eight to fourteen years old palms). C-V (fifteen to forty years old palms) and C-VI (greater than forty years old palms) represents represent period of stable yields and period of declining yields respectively. These three categories accounts the annual maintenance cost in the yielding stage of the palms.

5.4.1 Cost of establishment of one year old palms

Cost of establishment per hectare for one-year-old palms is given in Table 5.17. The cost of cultivation was worked out to Rs.14126.32 for C-I (one-year-old category).

In C-I, irrigation (18.56%), land preparation (16.17%), digging, planting and fencing (16.04%) and seedlings (14.87%) were the major components of cost of establishment. Land preparation included operations weeding, ploughing and

levelling irrespective of whether it was barren land, paddy land or was under non perennial crops. Intercultivation operations comprised 5.38 per cent of the cost, while shading/gap filling in the coconut garden contributed 4.65 per cent of cost of establishing one hectare of coconut garden. It can be observed that organic manure (7.11%) contributed a greater proportion of cost than fertilizer/amendments (4.76%). Cost of plant protection chemicals and its application charges occupied only 3.05 per cent of cost.

Table 5.17. Cost of establishment (Rs per hectare) of one-year-old palms

	C-I
Cost of seedling	2100.00 (14.87)
Shading/Gap filling	656.91 (4.65)
Cost of organic manure	1003.75 (7.11)
Cost of fertilizer/amendments	673.72 (4.76)
Cost of PP chemicals/application charges	430.67 (3.05)
Land Preparations	2284.99 (16.17)
Cost of digging/planting and fencing	2266.25 (16.04)
Transportation/application charge of manure & fertilizer	878.50 (6.22)
Intercultivation operations	759.38 (5.38)
Irrigation cost	2621.50 (18.56)
Cost of machinery/implements	450.65 (3.19)
Total	**14126.32** **(100)**

Figures in parentheses indicate percentage to the total

5.4.2 Cost of maintenance of nonbearing palms

Table 5.18. Cost of maintenance (Rs per hectare) of non-bearing palms

	C-II	C-III
Shading/Gap filling	427.00 (3.18)	55.75 (0.39)
Cost of organic manure	1750.00 (13.02)	2112.25 (14.61)
Cost of fertilizer/amendments	1266.91 (9.43)	1700.75 (11.78)
Cost of PP chemicals/application charges	329.00 (2.45)	334.25 (2.32)
Transportation/application charge of manure & fertilizer	724.50 (5.39)	894.25 (6.2)
Mulching	586.25 (4.36)	1561.00 (10.82)
Intercultivation operations	4361.00 (32.46)	4693.50 (32.52)
Crown clearing	102.80 (0.77)	139.38 (0.97)
Irrigation cost	3461.50 (25.76)	2500.75 (17.33)
Cost of machinery/implements	427.59 (3.18)	441.11 (3.06)
Total	**13436.55 (100)**	**14432.99 (100)**

Cost of maintenance per hectare for nonbearing palms is given in Table 5.18. In C-II, the major component of cost of cultivation was Intercultivation operations (32.46%). Irrigation occupying 25.76 per cent of the total cost was the next followed by organic manure (13.02%) and fertilizers (9.43%). It is clear that both organic manure and fertilizer application was increased in quantity. Obviously there is a decline in cost of shading/gapfilling in both absolute term (Rs. 427) and as a

proportion to total cost (3.18%) compared to the category C-I. The farmers did mulching and it contributed 4.36 per cent of the cost of maintenance. Plant protection chemicals and its application charges contributed only 2.45 per cent of the total maintenance cost. Only 0.77 per cent of the total cost was spent for crown clearing.

Intercultivation operations occupied the prime position in C-III with 32.52 per cent of the total cost. This was followed by irrigation cost, which comprised 17.33 per cent of total cost, organic manure (14.61%) and fertilizers (11.78%). An increase in the costs of organic manure and fertilizer can be noticed here compared to the previous category, C-II. Mulching as an operation covered 10.82 per cent of the total cost, thus revealing a drastic increase in the adoption of this practice in C-III than in C-II. Plant protection operation covered 2.32 per cent of the total cost. Cost of shading and gap filling was very low here covering only 0.39 per cent of the total cost.

5.4.3 Cost of maintenance of palms under increasing yield stage

In the case of yielding categories, harvesting charges were also included in the cost of cultivation. Table 5.19 shows the details of cost of maintenance of yielding palms under increasing yield stage. The annual cost of maintenance worked out for C-IV was Rs. 19058.82 per hectare. In C-IV, intercultivation operations contributed 18.7 per cent, which is very near to the cost covered by harvesting (18.8%). Share of irrigation was 15.59 per cent. Organic manures and fertilizers together occupied a share of 17.99 per cent of the total cost. Mulching constituted 9.67 per cent of the total cost. Heaping and carting charges of coconut and leaves constituted 7.34 per cent of the total maintenance cost while crown clearing contributed only 3.16 per cent. Further, cost of plant protection covered only 1.91 per cent of the total cost.

Table 5.19. Cost of maintenance (Rs per hectare) of increasing yields stage

	C-IV
Cost of organic manure	2453.50 (12.87)
Cost of fertilizer/amendments	976.50 (5.12)
Cost of PP chemicals/application charges	364.00 (1.91)
Transportation/application charge of manure & fertilizer	848.75 (4.45)
Mulching	1842.75 (9.67)
Intercultivation operations	3564.75 (18.7)
Crown clearing	602.00 (3.16)
Irrigation cost	2971.50 (15.59)
Harvesting charges	3584.00 (18.80)
Heaping/Carting charges	1398.25 (7.34)
Cost of machinery/implements	452.82 (2.39)
Total	**19058.82 (100)**

5.4.4 Cost of maintenance of palms under stabilised yield stage

Annual maintenance cost for C-V was worked out to Rs. 19599.24 per hectare of coconut garden. Table 5.20 gives the details of cost of maintenance of palms under stabilised yielding stage of coconut. Category C-V had the harvesting charges as the major cost (20.11%) followed by intercultivation operations that

occupied 17.01 per cent of the total cost. Mulching contributed 13.69 per cent of the total maintenance cost whereas irrigation cost contributed 10.39 per cent of the total cost. Organic manure and fertilizers together occupied 20.52 per cent of the total cost which is more than that of C-IV in absolute terms also. Heaping and carting charges covered 5.13 per cent while plant protection operations contributed 3.08 per cent of the annual maintenance cost.

Table 5.20. Cost of maintenance (Rs per hectare) of stabilised yield stage

	C-V
Cost of organic manure	2647.75 (13.51)
Cost of fertilizer/amendments	1373.75 (7.01)
Cost of PP chemicals/application charges	603.75 (3.08)
Transportation/application charge of manure & fertilizer	899.50 (4.59)
Mulching	2682.75 (13.69)
Intercultivation operations	3333.50 (17.01)
Crown clearing	693.00 (3.54)
Irrigation cost	2037.00 (10.39)
Harvesting charges	3940.63 (20.11)
Heaping/Carting charges	1006.31 (5.13)
Cost of machinery/implements	381.31 (1.95)
Total	**19599.24 (100)**

5.4.5 Cost of maintenance of palms under declining yield stage

The cost of maintenance for palms under the stage of declining yield is given in Table 5.21. Annual maintenance cost for C-VI was worked out to Rs. 17811.84 per hectare of coconut garden. Intercultivation operations contributed the largest share (21.46%) followed by harvesting charges (21.07%). Cost of organic manure and fertilizer together contributed 13.81 per cent of the cost, while irrigation covered 13.54 per cent and mulching covered 11.21 per cent of the total cost. Heaping and carting charges contributed 6.91 per cent of the share of annual maintenance cost whereas crown clearing covered 2.66 per cent and plant protection operations occupied 3.48 per cent of the annual maintenance cost.

Table 5.21. Cost of maintenance (Rs per hectare) of declining yields stage

	C-VI
Cost of organic manure	1484.00 (8.33)
Cost of fertilizer/amendments	976.50 (5.48)
Cost of PP chemicals/application charges	619.50 (3.48)
Transportation/application charge of manure & fertilizer	672.00 (3.77)
Mulching	1996.75 (11.21)
Intercultivation operations	3822.00 (21.46)
Crown clearing	474.25 (2.66)
Irrigation cost	2411.50 (13.54)
Harvesting charges	3753.75 (21.07)
Heaping/Carting charges	1230.25 (6.91)
Cost of machinery/implements	371.34 (2.08)
Total	**17811.84** **(100)**

5.4.6 Cost of maintenance of palms under yielding stages (mean)

Table 5.22. Cost of maintenance (Rs. per hectare) of yielding palms (mean)

	Mean
Cost of organic manure	2216.14 (11.73)
Cost of fertilizer/amendments	1172.30 (6.20)
Cost of PP chemicals/application charges	569.96 (3.02)
Transportation/application charge of manure & fertilizer	813.14 (4.30)
Mulching	2309.69 (12.22)
Intercultivation operations	3539.15 (18.73)
Crown clearing	602.96 (3.19)
Irrigation cost	2318.48 (12.27)
Harvesting charges	3818.10 (20.21)
Heaping/Carting charges	1147.34 (6.07)
Cost of machinery/implements	389.58 (2.06)
Total	**18896.74 (100)**

Table 5.22 throws light on the mean maintenance cost for yielding palms in the study area. On an aggregate cost of cultivation for yielding categories was worked out to Rs. 18896.74 per hectare. Harvesting charges was the largest

contributor to the total cost of cultivation (20.21%) followed by intercultivation operations (18.73%). Irrigation cost and mulching occupied nearly 12.2 per cent of the total cost while cost of organic manure was 11.73 per cent of the total cost of cultivation. Cost of fertilizer as well as cost of heaping/ carting coconuts after the harvest contributed around 6 per cent of the cost of cultivation. The share of plant protection operations in the region came to 3.02 per cent of the mean annual maintenance cost.

Only in the non-yielding categories (C-I, C-II, C-III), cost of seedling, planting, shading, gap filling were accounted. The cost of maintenance of yielding categories included harvesting charges as well as heaping and carting charges. In the non-yielding cost for crown clearing was very low (less than one per cent) compared to yielding categories. Transportation and application charges were found be higher in the non-yielding (greater than 5 per cent) than in the yielding categories (less than 5 per cent). Irrigation cost was also found to be higher in the non-yielding categories (where it varied from 17.33 per cent to 25.76 per cent), than in yielding categories (where it was less than 16 per cent). The depreciation of farm machinery and implements were worked out and value proportionate to the area under coconut to total area was added to the total cost to arrive at the cost of cultivation.

5.5 Total labour utilization

Total labour estimate is given in Table 5.23. It includes the labour involved for all the operations except that involved for harvesting and crown clearing. This is because that for harvesting and crown clearing wage is given per tree, either as cash and or kind, and hence can not be included in working out mandays of labour. Female labour was converted to male equivalent by multiplying with the wage ratio of female to that of male labour (Rs.79.85 to Rs.141.20).

Labour utilization pattern showed that more hired labour (60.64%) was used compared to family labour (39.36%) in the coconut gardens of central region of Kerala. In all categories, more than 50 per cent of total labour were by hired labour. It was the highest in C-I (74.81%) followed by C-III (68.68%). It is also noticed that among the yielding categories (C-IV, C-V, C-VI), the proportion of hired labour was more in C-V amounting 57.16 per cent followed by C-IV (54.39%) and C-VI (52.24%). Details regarding operation-wise labour utilisation in a hectare of coconut garden is given as Annexure 1.

Table 5.23. Category wise distribution of total labour utilization of the sample farmers in mandays per hectare

	Hired	Family	Total
C-I	66.80	22.49	89.29
	(74.81)	(25.19)	(100.00)
C-II	34.33	29.01	63.34
	(54.20)	(45.80)	(100.00)
C-III	42.69	19.47	62.16
	(68.68)	(31.32)	(100.00)
C-IV	34.29	28.75	63.04
	(54.39)	(45.61)	(100.00)
C-V	29.98	22.47	52.45
	(57.16)	(42.84)	(100.00)
C-VI	29.40	26.88	56.28
	(52.24)	(47.76)	(100.00)
Aggregate	**30.88**	**20.05**	**50.93**
	(60.64)	**(39.36)**	**(100.00)**

Figures in parentheses indicate percentage to the total

5.6 Production Details

Table 5.24. Production details of sample farmers (ha)

Category	Particulars	
	Total nuts harvested (no)	Yield of nuts per palm (no)
C-IV	8594.17	49.11
C-V	10411.94	59.50
C-VI	7806.41	44.61
Aggregate	9219.47	52.68

Table 5.24 shows the details of production and productivity for different yielding categories. The production was found to be highest in C-V followed by C-IV and then by C-VI. The productivity was as high as 59.50 nuts per palm per year in C-V. It was 49.11 and 44.61 nuts per palm per year in C-IV and C-VI respectively. On an aggregate, the production was 9219.47 nuts per hectare with an aggregate productivity of 52.68 nuts per palm per year in the central region.

5.7 Cost of production of Coconut

Table 5.25 shows the computation of cost of production of coconut.

Table 5.25. Cost of production (Rs/nut) of Coconut

Sl No	Particulars	C-IV	C-V	C-VI	Aggregate
1	Establishment cost (Rs/ha)	98727.71	98727.71	98727.71	98727.71
2	Amortized value (Rs/ha)	13835.70	13835.70	13835.70	13835.70
3	Annual maintenance cost (Rs/ha/yr)	19058.86	19600.53	17809.30	18896.51
4	Interest on annual maintenance cost (Rs/ha)	1191.18	1225.03	1113.08	1181.03
5	Total cost (Rs/ha/yr)	34086.74	34661.26	32758.08	33913.24
6	Income from by products	1000.00	1400.00	1400.00	1276
7	Net cost of production (Rs/ha/yr)	33085.74	33261.26	31358.08	32637.24
8	Average production (nuts/ha)	8594.17	10411.94	7806.41	9219.47
9	**Cost of production (Rs/nut)**	**3.85**	**3.19**	**4.02**	**3.54**

An establishment cost of Rs. 98727.71 was obtained attained in case of central region of Kerala considering seven years as the establishment period for the crop. It was then amortized at 14 per cent to get an annualized (amortized) value of Rs. 13835.70 which was added to the annual cost of cultivation of the +palms during yielding phase to arrive at the cost of production of coconut. Further, interest on annual maintenance cost @ 12.5 per cent for a period of six months was also added to this to get the total cost for cultivating one hectare of coconut garden. Net cost of production was found out after deducting income from byproducts and this when divided by estimated production per hectare gave the cost of production per nut. Here, the cost of production in aggregate was estimated to be Rs.3.54 per nut. The cost of production was worked out to be Rs. 3.85, Rs.3.19 and Rs. 4.02 per nut for C-IV, C-V and C-VI respectively.

5.8 Capital Productivity Analysis

Capital productivity analysis brings out the efficiency of capital used in the production. An attempt is made here to measure the productivity of capital by estimating: a) pay back period b) net present worth c) benefit cost ratio d) internal rate of return. The estimated cost of cultivation and returns obtained were used for these computations. Average price received by farmers was taken into account to arrive at the returns of farmers from the sale of nuts. It was Rs. 36900 for C-IV, Rs. 44681.45 for C-V and Rs. 33494.45 for C-VI per hectare of coconut garden. The returns from by products from a hectare for C-IV, C-V, C-VI categories were Rs. 1000, Rs. 1400 and Rs. 1400 respectively. Salvage value of Rs.500 per palm was added to the returns at 60th year. Cash flow statement of the investment in coconut cultivation in central region of Kerala (per hectare) computed is provided in the Annexure 2.

Capital productivity analysis was done by considering the categorywise cost for the yielding phases as well as by considering the aggregate cost of yielding phases. The results of the capital productivity analysis of the investment in coconut is furnished in Table 5.26

Table 5.26. Financial viability of coconut garden (ha)

Project worth measures	
Pay back period (years)	13
Net present value (Rs.) (@14 per cent)	1946.38
Benefit cost ratio (@ 14 per cent)	1.02
Internal Rate of Return(%)	14.29

5.8.1 Pay back period

It measures the efficiency of investment by indicating the period within which the returns offset the investment. Pay back period was worked out to 13

years was obtained for the project indicating that after 13 years of planting only the net returns will start covering the establishment cost.

5.8.2 Net Present Value

Net present value is the present worth of the net cash flow streams. The formal selection criterion for the net present value measure of project is to accept all projects with a positive net present value when discounted at the opportunity cost of capital. Net present value obtained at 14 per cent opportunity cost of capital was Rs. 1946.38 for one hectare of coconut garden.

5.8.3 Benefit cost ratio

It is the ratio between present worth of benefits and that of costs. Benefit cost ratio indicates the return of a rupee of investment. If the benefit cost ratio is greater than unity the project is considered viable. The estimated benefit cost ratio was 1.02

5.8.4 Internal rate of return

Internal rate of return is the discount rate that makes the net present value of the cash flow equal to zero. If the internal rate of return is above the opportunity cost of capital the project is considered worth. The estimated internal rate of return was 14.29 per cent

5.9 Marketing

The marketing study was confined to the various aspects relating to the marketing of coconut and coconut products by the sample farmers only.

Data on marketing aspects were collected from a sample of 24 village traders/copra makers, 8 oil millers, 12 wholesalers and 12 retailers. The data were collected from February to June 2000.

5.9.1 Form of products marketed

Table 5.27: Distribution of farmers according to the form of products they sell

	Un Husked	Husked	Split	Copra	Oil	Total
C-IV	10 (41.67)	7 (29.17)	7 (29.17)	0 (0.00)	0 (0.00)	24 (100.00)
C-V	35 (58.33)	15 (25.00)	7 (11.67)	3 (5.00)	0 (0.00)	60 (100.00)
C-VI	28 (48.28)	8 (13.79)	19 (32.76)	1 (1.72)	2 (3.45)	58 (100.00)
Total	73.00 (51.40)	30.00 (21.13)	33.00 (23.24)	4.00 (2.82)	2.00 (1.41)	142.00 (100.00)

Figures in parentheses indicate percentage to total

The form of products marketed included husked nuts, unhusked nuts, split nuts, copra and coconut oil (Table 5.27). In all the categories, majority of the farmers sells coconuts as un-husked nuts. They constitute 51.40 per cent of the total sample farmers. 23.24 per cent of the farmers sell coconut as split nuts. Only 2.82 per cent of the farmers sell products as copra and 1.41 per cent marketed as coconut oil.

5.9.2 Marketing channels

Marketing channels are the routes through which products move from producers to consumers. The different marketing channels identified in the marketing of coconut in the study area are given below:

1. Producer – Copra maker – Oil miller – Wholesaler – Retailer – Consumer
2. Producer – Copra maker – Oil miller – Wholesaler – Consumer

3. Producer – Oil miller – Wholesaler – Retailer – Consumer
4. Producer – Oil miller – Consumer
5. Producer – Itinerant Traders –Wholesaler-Oil miller-Retailer-Consumer

Out of these five channels identified, the first channel was found more common in the study area. Hence only that channel was studied in detail. The third channel was applicable only to those farmers selling copra directly.

The Table 5.28 shows the details of distribution of respondents based on the type of buyers of the products offered for sale.

As a total 85.92 per cent of the farmers sell their produce on farm whereas 14.08 per cent sell it outside the farm. 82.39 per cent of the farmers sell their nuts to copra maker while 8.45 per cent sell to Itinerant traders (Table 5.2.2). This was followed by village traders and oil millers, each constituting 3.52 per cent of the total 142 farmers. Nobody sold to Itinerant traders outside the farm. Only 2.82 per cent of the farmers sold copra to oil miller and 1.41 per cent as oil to village traders.

Table 5.28: Distribution of respondents according to of buyers of products

On farm					
	Village merchant	Itinerant traders	Copra maker	Oil miller	Total
Coconut	3 (2.11)	12 (8.45)	107 (75.35)	0 (0.0)	122 (85.92)
Copra	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Oil	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Sub total	***3 (2.11)***	***12 (8.45)***	***107 (75.35)***	***0 (0.0)***	***122 (85.92)***
Out side farm					
	Village merchant	Itinerant traders	Copra maker	Oil miller	Total
Coconut	0 (0.0)	0 (0.0)	13 (9.15)	1 (0.70)	14 (9.86)
Copra	0 (0.0)	0 (0.0)	0 (0.0)	4 (2.82)	4 (2.82)
Oil	2 (1.41)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.41)
Sub total	***2 (1.41)***	***0 (0.0)***	***13 (9.15)***	***5 (3.52)***	***20 (14.08)***
Total	**5 (3.52)**	**12 (8.45)**	**117 (82.39)**	**5 (3.52)**	**142 (100)**

Figures in parantheses indicate percentage to total farmers selling their nuts

5.9.3 Marketing margins

There are two concepts of marketing margins such as concurrent margin and lagged margin. The concept of concurrent margin is used in the present study in which the price prevailing at different stages of marketing are compared with reference to a given point of time.

Table 5.29. Marketing margins and costs of various intermediaries

Sl No	Particulars	Coconut (Rs/100 nuts)
1	Price received by farmers	310.33 (60.58)
2	Selling price of copra maker/buying price of oil miller	415.25 (81.06)
3	Marketing cost of copra maker	33.60 (6.56)
4	Copra makers realization from byproducts	9.53 (1.86)
5	Net margin of copra maker	80.85 (15.78)
6	Price paid by wholesaler/selling price of oil miller	431.00 (84.14)
7	Milling and marketing cost of oil miller	16.00 (3.12)
8	Oil millers realization from by products	25.25 (4.93)
9	Net margin of oil miller	25.00 (4.88)
10	Marketing cost of wholesaler	0.50 (0.10)
11	Price paid by retailer	459.00 (89.60)
12	Net margin of wholesaler	27.50 (5.37)
13	Marketing cost of retailer	2.12 (0.41)
14	Net margin of retailer	51.13 (9.98)
15	Price paid by the consumer	512.25 (100.00)

Figures in parentheses indicate percentage to the price paid by the consumer

The marketing cost and margin of the first marketing channel given above was identified as the important one and is shown in the Table 5.29.

To find out the marketing margin and cost it was essential to convert the nuts to copra and oil as it changed its form. It was found that on an average from 100 nuts 15.5 kg of copra is made and from one kilogram of copra 62.5 per cent oil is made. This was used as the basis for converting nuts into copra and oil.

From the Table, it is clear that the price received by the farmer was Rs. 310.33 per 100 nuts and the price paid by the consumer was Rs. 512.25 per 100 nuts. Producers share in consumers rupee was 60.58 per cent. The figure for price spread is Rs. 201.92 per 100 nuts (39.42 per cent).

5.9 Problems in coconut cultivation

Table 5.30. Reasons for the incomplete/nonadoption of selected coconut cultivation practices

Reasons	Seedling selection		Spacing		Husk burial		Fertilizer application		Irrigation		Plant protection	
	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)
Ignorance	23	38.3	41	45.6	69	35.9	43	39.1	26	28.6	22	31.9
Inherited	22	36.7	32	35.6	0	0	26	23.6	17	18.7	15	21.7
Purchased from others	2	3.3	5	5.6	0	0	9	8.2	5	5.5	3	4.3
Inadequate finance	0	0.0	0	0.0	0	0	0	0.0	3	3.3	0	0.0
Unavailability of irrigation water	0	0.0	0	0.0	0	0	0	0.0	21	23.1	0	0.0
No seriousness	6	10.0	12	13.3	97	50.5	25	22.73	13	14.3	24	34.8
Not convinced	7	11.7	0	0.0	26	13.5	29	26.36	6	6.6	5	7.2
Total	60	100	90	100	192	100	110	100	91	100	69	100

5.10.1 Adoption of scientific recommendation

The number of farmers who had cited reasons for incomplete adoption or non-adoption of recommended cultivation practices is given in Table 5.30.

Seedling selection

From the Table 5.30 it is evident that out of the total 216 farmers only 60 farmers (27.78%) were found not adopting recommended seedling selection practices. Ignorance about such recommendations and inherited time tested knowledge on selecting the seedlings were found to be the main reasons behind this finding. Sulaja (1999) studied on the indigenous skills that are still practised as well as endangered in different farming systems of Mukundapuram taluk of Thrissur district. She gives a small description of indigenous skills used in seedling selection practised by the farmers in that area. The bunches were lowered by ropes and the nuts with large functional eyes were selected, are planted horizontally with the widest segment of the pot at the top and sown in sand. Some other farmers were selecting seedlings with 'narola'. So there are different time tested indigenous techniques that the farmers have developed through experience of generations and they act according to these inherited knowledge.

Spacing

Based on the recommendations of Package of practices (POP) of the Kerala Agricultural University (1996), in the present study, a spacing below 6.7m x 6.7m was considered as under spacing and a spacing above 9.2m x 9.2m was considered as wider spacing and in between these two was considered the optimum one. Nearly 90 farmers were not found adopting the optimum spacing. This comes to 41.67 per cent of the total farmers. Ignorance of the optimum spacing recommendation of Package of Practices (1996) of Kerala Agricultural University was noticed. However, here also inherited time tested knowledge of

farmers to utilise the limiting factor of land more purposefully was an important reason.

Husk Burial

Husk burial, as a practice was a very rare phenomenon in the study area. From the total respondents, 192 farmers (88.89%) did not adopt this practice at all in their farms. They were not serious about the advantages of husk burial in coconut cultivation. The lack of seriousness along with the selling of husks was the major reason for the non-adoption of this practice in the region. Moreover, ignorance of the importance of this practice was also found to be a reason for this.

Fertilizer Application

Major reasons for the non-adoption of recommended fertilizer application was opined as ignorance, farmers being not convinced, inherited perceptions that the farmers found worthy and lack of seriousness on this practice as they widely believed that low fertilizer application drastically reduced the incidence of pests and diseases. However, 81.48 per cent of the surveyed farmers were cultivating coconut in their homesteads. The finding of Babu *et al.* (1993) conforms to this finding. Homestead farming is a special type of farming which is practised around the home with a multispecies of annual and perennial crops for meeting the home demands of food, fodder, fuel, timber and organic mulch. Babu *et al.* (1993) state the coconut as a small holder's crop raised mostly under homestead condition where it is rarely sole cropped. In the absence of a technology recommendation for coconut in a holistic basis, farmers tend to apply nutrients at the recommended level for sole crop of coconut, including the intercultivated crops also. Babu *et al.* further says that the high density planting in the homesteads results in competition for solar energy, water and nutrients if the selection of crop combination is not appropriate.

Irrigation

The above Table shows that 91 farmers (42.13%) did not know about the recommended irrigation practices mainly due to ignorance about the advantages of recommended irrigation requirement. Here, unavailability of irrigation water and inherited perceptions were also found as the other important constraints. In many areas in the peak season even getting drinking water was a problem and farmers were not able to look after irrigation in this time.

Plant protection

With regard to plant protection, 69 farmers (31.94%) were not aware about the recommended control measures against various pests and diseases like rhinoceros beetle attack, bud rot, stem bleeding etc. But most of the farmers were aware of the control measures recommended against serious mite attack prevailing in the region. This was mainly due to lack of serious effort to know the control measures as well as due to ignorance about the recommended technologies. It shows the minimum care given by the farmers in the plant protection aspect in the central region as a whole, where the incidence of pests and diseases is more compared to the northern region.

Other than this, in case of specific problems like mite attack in coconut it was found that many farmers were not at all convinced about the efficacy of the present recommended control measures. Farmers feared the residual effect by spraying chemicals like Dicofol in their coconut palms. The plant protection chemicals and bio formulations like neem-garlic suspension were not supplied in adequate quantities and also lacking proper planning in application at Panchayat level. Many farmers complained adulteration in the chemicals and hence efficacy was said to be adversely affected. Because of this many of them did not even try any plant protection techniques in this case.

Table 5.31. Constraints in coconut cultivation

	1	2	3	4	5	6	7	Total Score	Rank
Score	7	6	5	4	3	2	1		
Pest/Disease	64	80	64	8	0	0	0	1280	2
Low market price	100	64	30	6	8	4	4	1294	1
Unavailability of irrigation water	34	30	58	13	28	45	8	942	3
Inadequate loan	5	12	22	45	68	38	26	703	5
Lack of Credit	3	8	18	60	14	33	80	587	6
High Interest	1	10	16	24	30	43	92	511	7
Procedural complications	9	12	8	60	68	53	6	731	4

5.10.2 Constraints in coconut cultivation

The constraints faced by the coconut growers were ranked and are presented in the Table 5.31. Prevalence of low market price for coconut was found to be the major problem that the farmers faced in the region under study. The low price was the main problem cited by the traders too. Hence, it was widely noticed that many small traders were leaving the business. However, the existing traders will try to keep their profits as high as that they received previously by reducing the price given to the producer farmer. This resulted in lack of bargaining power or low bargaining power for farmer because his option to select an alternate buyer of his produce became limited. Traders complained that even if support price is fixed it would be during the last week of April which is hardly of any use to farmers in Kerala where the peak season is during March to June. It only helps Coconut farmers in Tamil Nadu where the peak season starting by May. So they suffer heavy losses on the lot procured before the declaration of minimum support price if the minimum support price is lower than the price at which they had procured or they averted their risk by procuring at a lower rate than the existing market price in the Kochi market.

The problem of pests and diseases which was another factor found affecting the coconut cultivation adversely in this region. Lack of water source for irrigation in the peak summer was ranked as the third constraint that farmers felt that was adversely affecting them. This was noticed more in the rocky lateritic region. Procedural complications involved in the supply of inputs was the problem that ranked fourth. The problem includes all the procedural complications involved like getting good quality seedlings and other inputs, timely availability of inputs, time lag involved in getting any subsidy or some emoluments etc. The next problem cited were of inadequate loan for the coconut cultivation purposes which include loan for inputs like irrigation facilities, soil reclamation measures etc. and lack of credit for coconut development follows this. High interest rate was perceived as a problem of less prominence. This is understandable as nearly 84.85 per cent of farmers those who avail loan can avail it at prime lending rate of 14 per cent and the rest could avail from Self Help Groups (SHGs) at 16 per cent interest rate.

Discussion

6. DISCUSSION

The study on the economics and marketing of coconut was done in the central region of Kerala comprising Ernakulam, Thrissur and Palakkad districts. The results on the present study brought out in the previous chapter are discussed in this chapter under the following heads.

6.1 Cultivation practices of coconut in the sample farms
6.2 Cost of establishment of younger palms
6.3 Cost of maintenance of yielding palms
6.4 Total labour utilization
6.5 Production details of sample farmers
6.6 Cost of production of coconut
6.7 Capital productivity analysis
6.8 Marketing
6.9 Problems in coconut cultivation

6.1 Cultivation practices of coconut in the sample farms

6.1.1 Source of planting material

Supply of seedlings through Government farms included supply through Krishibhavans also. Even then this source of supply of seedlings were utilized by only 4.16 per cent of the total sample farmers. Moreover, majority of farmers was using seedlings produced in their own farm (Table 5.7). Lack of confidence of farmers in the seedlings supplied from government farms was widely noticed. Non availability of seedlings at appropriate time and higher cost of seedlings from private agencies coupled with the tradition of using the local seedlings were the main reasons for farmers using the seedlings from their own farm. Needless to say, this implies cultivation of hybrid palms is very limited in this study area.

6.1.2 Spacing

The analysis of spacing adopted in the sample farms showed that optimum spacing was followed in 58.33 per cent of the farms (Table 5.8). Compared to wider spacing (13.43%) under spacing was more common (28.24%). The prevalence of under spacing over wider spacing is mainly due to the fact that mainly cultivation being in homesteads in Kerala, farmers try to accommodate as many as crops as possible to best utilize their land, which is the limiting factor. This trend is likely to continue since most of the lands suitable for coconut cultivation have already been utilised. Further planting is done mainly as under planting in the already existing gardens or planting in marginal lands. This is supported by the finding of Narayana and Nair (1989) who opined that as almost all the land area is under cultivation in Kerala. It would be worthwhile to note that Babu *et al.* (1993) in their study have stated that price of coconut is determined by the price of copra and coconut oil, both being controlled by soap and cosmetics industries based at Mumbai. The market distortions by their manipulations have prevented the farmer from large scale replanting/underplanting of senile palms and low yielders.

6.1.3 Manuring

The result shows that all the sample farmers were found to apply organic manure in their coconut garden. Different types of manure like cattle manure, poultry manure, fishmeal, wood ash, neem cake, bone meal etc. were applied (Table 5.9). It clearly indicates the awareness and confidence of farmers in the advantages of organic manure. Farmers believed that application of organic manure reduced the incidence of pests and diseases. In contrast, no farmer was found to produce and use compost. This may be due to the lack of awareness among coconut farmers on the technology of compost making and its merits.

Only 55.56 per cent of the sample farmers were applying fertilizer to their palms. This shows that minimum care is given by farmers to perennial crops like coconut. The combination of fertilizers also varied much. Majority of the farmers (36.67%) applied urea along with MOP (Table 5.10). 23.33 per cent of the farmers applied coconut mixture alone and 11.67 per cent applied urea alone. Farmers who apply urea alone are either not aware of the importance of nutrients P and K or are those who believe that organic manure application compensates the requirement of P and K.

An analysis of the quantity of fertilizers in terms of nutrients revealed that nutrient application is lower than the recommended doses in all the categories (Table 5.11) (Fig 2). As stated earlier, confidence of farmers in the advantages of organic manure and their experience of decline in the incidence and intensity of pests and diseases by use of organic manure has mainly contributed for the reduction in the quantity of fertilizers applied. The study area being a highly susceptible area of major pest and disease attack the finding of farmers from their experience is relevant. Another reason could be that the farmers were not much aware about the higher economic returns by following optimum combination of fertilizers in the study area, especially where rootwilt incidence was not noticed. The situation is likely to worsen in the light of the declining prices in market for the coconut products. In C-V, fertilizer applied comes nearer to the recommendation by 73.37 per cent. It is the stabilised phase of coconut production and that could be the reason for farmers to apply more of fertilizers than in other categories.

6.1.4 Mulching

Mulching was found to be a widely adopted practice in the study area. More than 75 per cent farmers in all the categories adopt mulching as a practice (Table 5.12). All farmers of C-II and C-IV did it. In C-V and C-VI, more than 90 per cent of the farmers were found to adopt mulching. Even in C-III, where people

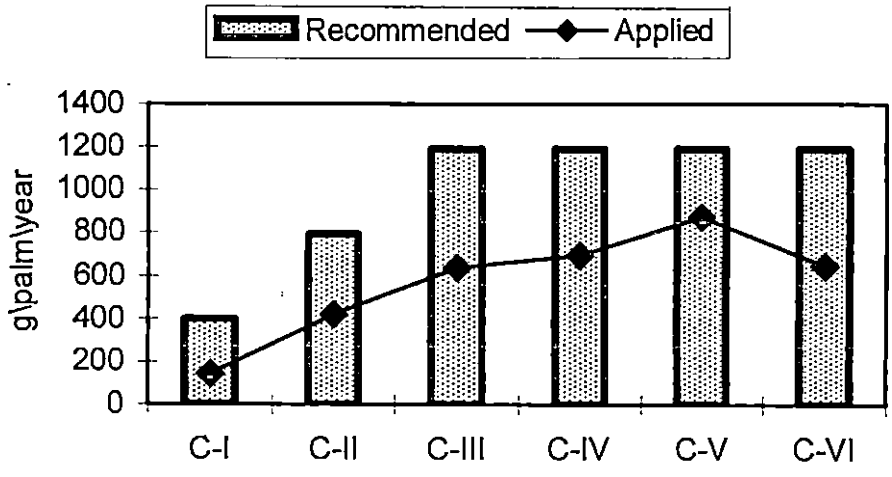

Fig. 2. Quantity of nutrients applied (g/palm/year)

adopting mulching is the lowest compared to the categories around, 75 per cent of the farmers were found to adopt mulching. Farmers do mulching by taking the mulch from their own farm or they buy it from outside. For the former they pay per each bundle of mulch and for the latter they use labour. Apart from the purchasing power of the farmer, the size of land owned and his cropping pattern decide the way he applies mulch. Further, transportation facility and convenience also influenced the decision of farmer to buy mulch or to take it from his own land.

Husk burial as an operation was done by very few farmers. No farmer in C-I and C-III was doing husk burial. Maximum husk burial was found in C-V, the stabilisation phase, where 23.33 per cent of farmers adopted the practice. The low adoption of husk burial is mainly due to the fact that majority of the farmers was selling unhusked nuts. Even if they sell husked nuts they used to sell the husks separately which earned them nearly Rs. 20 per 100 numbers. Uthaiah and Indiresh (1993), in their study on different mulches observed that coir pith was the best one, which was found to enhance the vegetative growth in the early stages of growth. But, this study revealed that, very few farmers considered husk burial as an important cultural practice to be adopted for betterment of coconut palms. This may be due to their lack of awareness of importance of this practice in improving the water retention level as well as the fertility and properties of the soil.

6.1.5 Irrigation

Out of the total 216 sample farmers 158 farmers (73.51%) irrigated their coconut gardens. The major source of irrigation was well. About 56.59 per cent of the source was well (Table 5.13). It is a feature of irrigation in Kerala to use well as the main source of irrigation. This is supported by the fact that cropping pattern in Kerala mainly comprises homesteads where majority has their own wells.

Pump irrigation is the dominant (82.28%) irrigation practice adopted by the sample farmers in aggregate of all the categories (Table 5.14). About 82.28 per

cent of the farmers were found to adopt pump irrigation. Manual irrigation by making channels from a water source was found to be adopted by 10.13 per cent of the total irrigating farmers. Pot irrigation was mainly done in the case of younger palms and also where water is limited in supply. About 5.06 per cent of the farmers were found to adopt pot irrigation practice. Drip and pot irrigation was practiced only by four farmers out of the total 158 irrigating farmers. This comes to 2.53 per cent of the irrigating farmers. Mostly large farmers were adopting this method. They had farm comprising a diversified cropping pattern that ensures increased returns through irrigation. Drip irrigation didn't get wide acceptance primarily because of the huge initial investment involved in it. Moreover, most of the farmers were small holders and they could not afford the same.

Details regarding pumpsets reveal that the farmers in all the categories (Table 5.15) mainly use their own motor. Public ownership in the form of Panchayat motors were observed in some localities nearer to the riverside where the concerned Panchayat had installed pumpset for irrigation. In the case of private ownership, more than 80 per cent of the total-irrigating farmers in all categories used electric motor. Almost all the houses of the sample farmers were electrified and the policy of government subsidising the use of electricity for agricultural purposes could be the main reason for wide adoption of electric motor.

At an aggregate level 1.83 hour of irrigation was done per day in the study area. The frequency of irrigation was nearly one and a half times a week and the number of irrigated months in a year on an average comes to 3.17 months (Table 5.16). On an average a single palm in the study area receives 1.31 hours of irrigation per annum. Irrigation was done during the summer season only. Irrigated months varied from December to May. Those farmers who irrigated their coconut palms were found varying in their level of irrigation in time and frequency. Abundant irrigation as well as life saving irrigation was noticed. It depended on many factors such as availability of irrigation water source, irrigation equipments, attitude of farmer, condition of the palms etc.

6.2 Cost of establishment and maintenance of non-bearing palms

The cost of establishment worked out for one-year-old category, C-I, was Rs. 14126.32. Here, irrigation (18.56%), land preparation (16.17%), digging, planting and fencing (16.04%) and seedlings (14.87%) were the major components of cost of establishment (Table 5.17). Land preparation included operations like weeding, ploughing and levelling irrespective of whether it was barren land, paddy land or was under non perennial crops. Conversion of paddy lands into coconut garden was noticed in many areas. The aims of this conversion was to change from paddy cultivation that has become non profitable and was facing many constraints such as acute labour shortage at the required time and spurt in the wages. By converting to coconut garden farmers not only think about facility for intercropping but also about the appreciation in land value as inhabitation are then possible. Intercultivation operations comprised 5.38 per cent of the cost, while shading/gap filling in the coconut garden contributed 4.65 per cent of cost of establishing one hectare of coconut garden. It can be observed that organic manure (7.11%) contributed a greater proportion of cost than fertilizer/amendments (4.76%). Cost of plant protection chemicals and its application charges occupied only 3.05 per cent of cost.

The cost of maintenance for 2 to 3 year old category (C-II) was worked out to Rs. 13436.35 (Table 5.18). In C-II, the major component of cost of cultivation was Intercultivation operations (32.46%). Basin is slightly widened in this stage. Irrigation occupying 25.76 per cent of the total cost was the next followed by organic manure (13.02%) and fertilizers (9.43%). It is clear that both organic manure and fertilizer application was increased in quantity. The application cost of organic manure is higher in this category also. There is an obvious decline in cost of shading/gapfilling in this category (3.18%) compared to the category C-I. The farmers did mulching and it contributed 4.36 per cent of the cost of maintenance. Plant protection chemicals and its application charges contributed only 2.45 per cent of the total maintenance cost. Only 0.77 per cent of the total cost was spent for crown clearing.

Intercultivation operations occupied the prime position in C-III with 32.52 per cent of the total cost (Fig 3). The final widening was done in the fourth year after planting by majority of the farmers. In some cases, it was done in the fifth year. This was followed by irrigation cost, which comprised 17.33 per cent of total cost, organic manure (14.61%) and fertilizers (11.78%). An increase in the costs of organic manure and fertilizer can be noticed here compared to the previous category, C-II. Mulching as an operation covered 10.82 per cent of the total cost, thus revealing a drastic increase in the adoption of this practice in C-III than in C-II. Plant protection operation covered 2.32 per cent of the total cost. Obviously cost of shading and gap filling was very low here covering only 0.39 per cent of the total cost.

Only C-I accounts for cost of seedlings. This clearly indicates that after the establishment of the crop in the first year no farmer did gap filling in his field. It is due to the fact that new planting is mainly done as under planting in coconut garden where farmers are not cultivating coconut alone. Hence, the seriousness they gave for the coconut cultivation is less. Another factor is that majority of the new planting other than under planting is in converted paddy land where the loss was minimum as fencing protected it. Cost of shading/gapfilling showed declining share in the annual cost from C-I to C-III. Cost of organic manure and fertilizer/amendments showed an increasing contribution to cost (Table 5.17). There was a gradual decline in share of total cost in plant protection operations. Mulching was not done in C-I, as the farmers believed that shading conserves moisture too apart from protecting the plant sun scorch. The share of mulching in the total cost for C-III is more than twice the share in C-II. The cost of cultivation worked out was Rs. 14126.32 for C-I, Rs. 13436.35 for C-II and Rs. 14432.99 for C-III.

Remold (2000) worked out the cost of cultivation for a hectare of rainfed coconut in Central State Farm, Aralam. His estimate for C-I was Rs. 33343, for C-II it was Rs. 23806 and for C-III it was Rs. 16151. There is a

huge difference in the cost of cultivation for C-I and C-II as compared to this study. For C-III, the estimate comes nearer to the cost of establishment estimated in this study. The difference between farmers level data and data from a farm may vary considerably due to the differences in practices followed. In a farm more scientific management is adopted and also the labour norms is also be different.

Sairam *et.al.*(1997) estimated the cost of cultivation for coconut garden in North Kerala. The estimate for C-I was Rs. 28600, for C-II it was on an average Rs. 15700 and for C-III it was Rs. 12450 under rainfed condition. Under irrigated conditions the cost of establishment worked out was Rs. 52560 for C-I, Rs. 13000 on an average for C-II and Rs. 16750 for C-III. The cost of cultivation is higher for both rainfed and irrigated coconut than that estimated in this study for the C-I. For C-II the estimate is higher than the estimate of present study in the case of rainfed coconut but conforms to this study in the case of irrigated coconuts. In the case of C-III the estimate of present study is higher than the estimate of Sairam et.al. in the case of rainfed coconut but lower than the irrigated coconut. It reflects the difference in operations in the farmers' field compared to Government farm. Mostly, cost involved is less in the field conditions of farmers compared to government farms. But in farmers' field when the imputed cost is high and this could be the reason that the cost of cultivation in some categories come near to that of studies done in the farm.

Cost of seedlings per hectare estimated by them is Rs. 2625, which conforms to that worked out as Rs. 2100 in this study. Cost of organic manure is higher than their estimate in C-I. In C-II and C-III, organic manure application was conforming to the present study. Farmers in this region were suffering from various pests and diseases and they believed widely that application of organic manure will decrease the incidence of pests and diseases. Also the availability of organic manure from their own and nearby farms made it easy for the farmers to apply it.

Sairam *et.al.*(1997) assumed that no fertilizer is applied for rainfed garden but only for irrigated garden. The present study shows that a higher amount is used for fertilizers in C-I. In the case of C-II the amount used for fertilizer comes close to their estimate. The amount utilised on fertilizer is less compared to their estimate for C-III. Fertilizer application was done by around 55 per cent of the farmers only and the quantity of fertilizers applied for the central region as compared to the Package of practice, Kerala Agricultural University (KAU, 1996) is low. So it could be inferred that the farmers gave minimum care to the palms.

6.3 Cost of maintenance of yielding palms

The cost of maintenance was worked out to be Rs. 19058.82 for C-IV, Rs. 19599.24 for C-V and Rs. 17811.84 for C-VI (Fig 4). It is evident that the maintenance adopted by the farmers is reflected in the cost of maintenance of the respective stages. The first yielding stage, C-IV, being the increased yielding stage of the palms, farmers were giving good care as reflected by the annual maintenance cost. In the stabilised phase of production, C-V, the cost of maintenance increased slightly indicating the farmers' confidence in returns as compared to the previous stage of production. Last stage of production being the declining stage, C-VI, farmers give less care as is evident from lowest cost of annual maintenance for the category compared to other two yielding categories. For the central region as an aggregate the annual cost of maintenance was worked out to be Rs. 18896.74 per hectare (Table 5.19 to Table 5.22) (Fig 5).

Harvesting charges contribute a major share of cost of maintenance in the yielding categories. The share of intercultivation operation to the total cost is reduced drastically when compared with C-II and C-III. In the younger palms land preparation and intercultivation operations contributed more than 30 per cent share of total cost. But in the yielding categories it came near to 20 per cent only. In the yielding categories harvesting and related operations contribute a major share of

the cost and hence the proportion of intercultivation to the total cost is reduced compared to other categories.

Share of organic manure to the total cost is found to be reduced in C-VI compared to C-IV and C-V. In aggregate it was estimated as 2216.14 which contributes 11.73 per cent of the total cost of maintenance. Cost of fertilizer's share to the total cost is found to be the highest in C-V (7.01%) which is the stabilized phase of production. In aggregate it contributed 6.20 per cent of the cost of maintenance. Contribution of organic manure was higher than that of fertilizer indicating a clear inclination towards organic manure by the farmers. As already stated farmers widely believed that chemical fertilizers were the main reason for the various diseases and pests of coconut in the study area. Hence they adopt organic manure application by replacing or by reducing the quantity of fertilizer applied.

Plant protection is contributing the highest share to the total cost in C-VI. In aggregate it contributes 3.05 per cent of the total cost. Palms under declining yield phase (C-VI) are found to be more susceptible to pests and diseases compared to other categories. But the initial stage of mite attack made the differences between the categories meagre because mite attack was noticed in all the categories alike in that period. Root wilt and mite attack were the maladies seen in the study area. Stem bleeding, rhinoceros beetle attack, bud rot etc. were the main pest and diseases seen in the study area. Farmers reduced their attention towards coconut since the outbreak of rootwilt became serious in that area. The occurrence of mite attack in the recent period has dug the nail into their coffin.

Of the three categories, mulching was contributing the highest share to the total cost in C-V. This being the stabilized phase of production, farmers were found to take more care in this group. In aggregate mulching contributed 12.22 per cent of the total cost. The common mulch used were leaves and stubbles. Mulching was seen practiced in almost all farms. This being a traditional practice, farmers

are well aware of the importance of this operation although they may not be knowing the scientific reason behind it. Crown clearing was also found widely adopted although diminishing trend of adoption was noticed in some localities

Remold (2000) in his study at Aralam farm worked out the cost of maintenance of coconut palms of age group 8 years and above as Rs. 17909. In the present study, aggregate cost of maintenance for central region of Kerala for palms of age group 8 years and above, the annual cost of maintenance was worked out to Rs. 18896.74 which is higher than compared to his study. This clearly indicates that care is given by the farmers to perennial crops like coconut in their yielding periods. Large-scale incidences of pests and diseases alongwith low and fluctuating prices has made the farmer to give minimum care to their coconut gardens. But coconut being a perennial crop they cannot change the cropping pattern at once and they are compelled to spend a higher amount on cultivation. In the case of young palms, Remold's estimate was much higher than the estimate of the present study. Hence, it can be rightly understood that farmers were giving good care to the palms under yielding categories. In the present study the cost of cultivation for C-IV was estimated as Rs. 19058.82, for C-V it was Rs. 19599.24. These are also higher than the estimate of Remold. For C-VI, the cost of cultivation worked out was Rs. 17811.84 that conforms to the estimation of Remold. The estimates for different categories are based on different number of palms in the sample and hence the difference arises. However, from the finding that farmers give good care to the yielding palms, it could be rightly concluded that coconut farmers operations are very much influenced by the profit motive and expectations. So, if there is a steady fall in price and farmers feel of complete loss in investment in coconut garden it could lead to poor management and care of their coconut garden resulting in perish of coconut cultivation in the region.

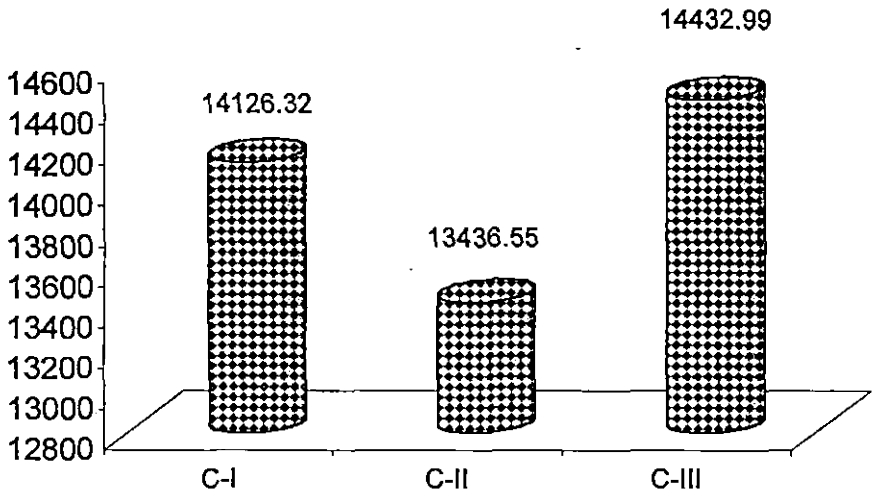

Fig. 3. Cost of establishment and maintenance cost of nonbearing palms(Rs/ha)

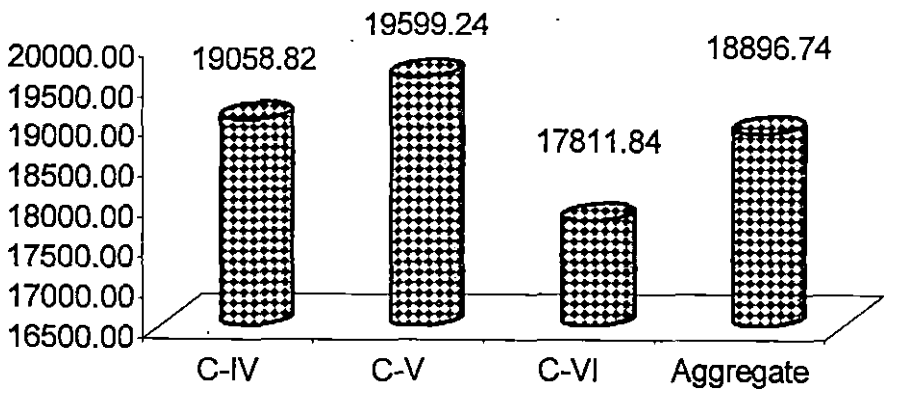

Fig. 4. Cost of maintenance of yielding palms(Rs/ha)

Sairam *et.al.* (1997), in his study of cost of cultivation of coconut under North Kerala conditions estimated the cost of cultivation. For the age group of 8-14 years, estimation was Rs. 21400 and Rs. 25700 for rainfed and irrigated conditions respectively. For the age group of 15 years and above, estimation was Rs. 23450 and Rs. 27750 for rainfed and irrigated coconuts respectively. These estimates are higher than the estimates worked out in the present study.

Cost of organic manure was only less than half the cost estimated by Sairam *et al* (1997). Similarly cost of fertilizer/amendments is much lower than their estimate (Rs. 630.84). Plant protection operation cost is less than their estimate in the present study. These findings justify that minimum care was given by the farmers in the study area for coconut. In the present study higher cost was found for irrigation (Rs. 1651.67) whereas their estimate comes to only Rs. 1300 per hectare. This is mainly due to the fact that they have considered drip system of irrigation, the bulk of the cost was hence accounted in the first year. Harvesting charge is found to be very less compared to the present study. It may be due to the difference in labour norms in actual field condition and in government farms.

6.4 Total Labour Utilization

Labour utilization in mandays per hectare revealed that 60.64 per cent of the total labour is accounted by hired labour and the rest 39.36 by family labour (Fig 6). From this, it can be inferred that hired labour is predominant in the central region. Moreover, in the category C-I more than 70 per cent of total labour requirement was fulfilled through hired labour. Requirement of high labour intensive operations like land preparation, digging pits and planting in the first year of establishment has led to this.

Remold (2000) worked out the labour requirement in mandays per hectare. He estimated that, 409 mandays to be in C-I, 258 in C-II, 174 in C-III. The categories C-IV, C-V and C-VI were found to utilize 194 mandays per hectare.

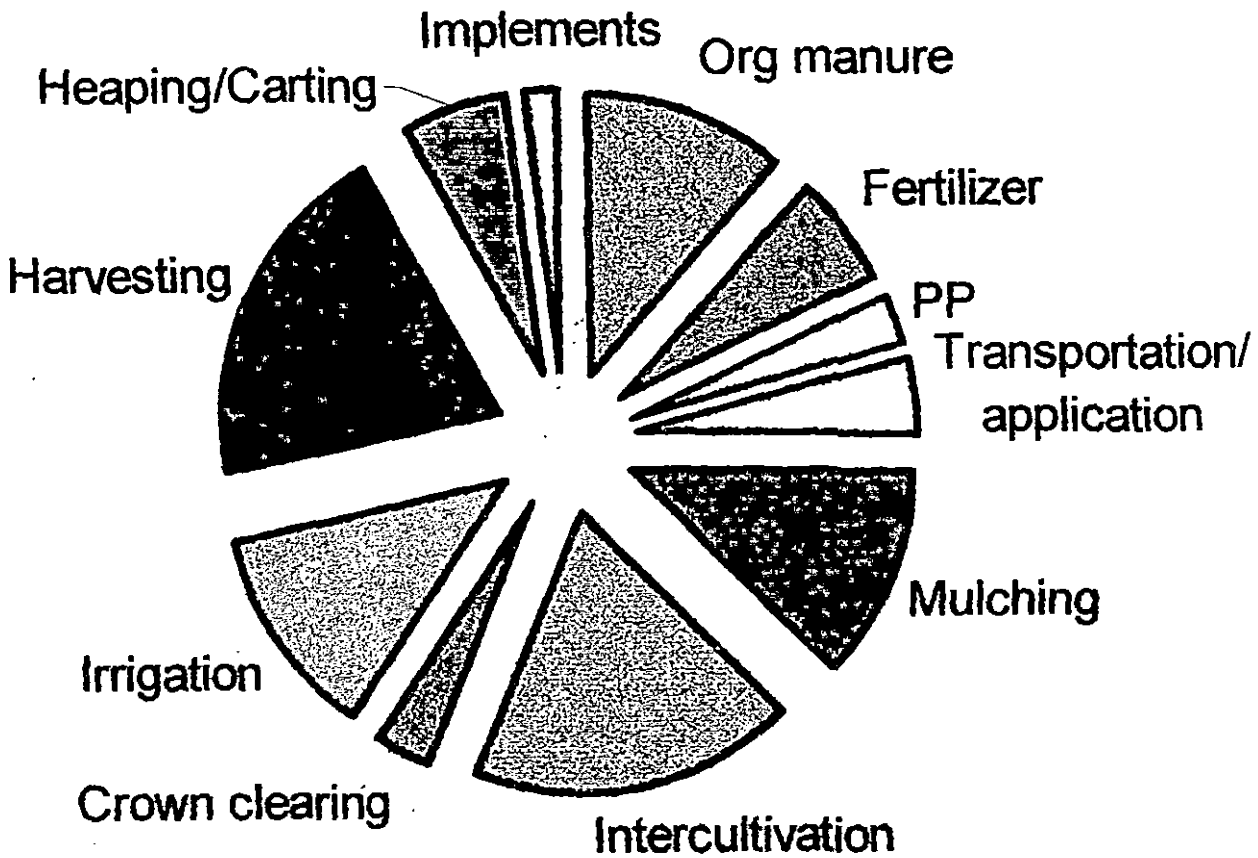

Fig. 5. Aggregate cost of maintenance for yielding categories

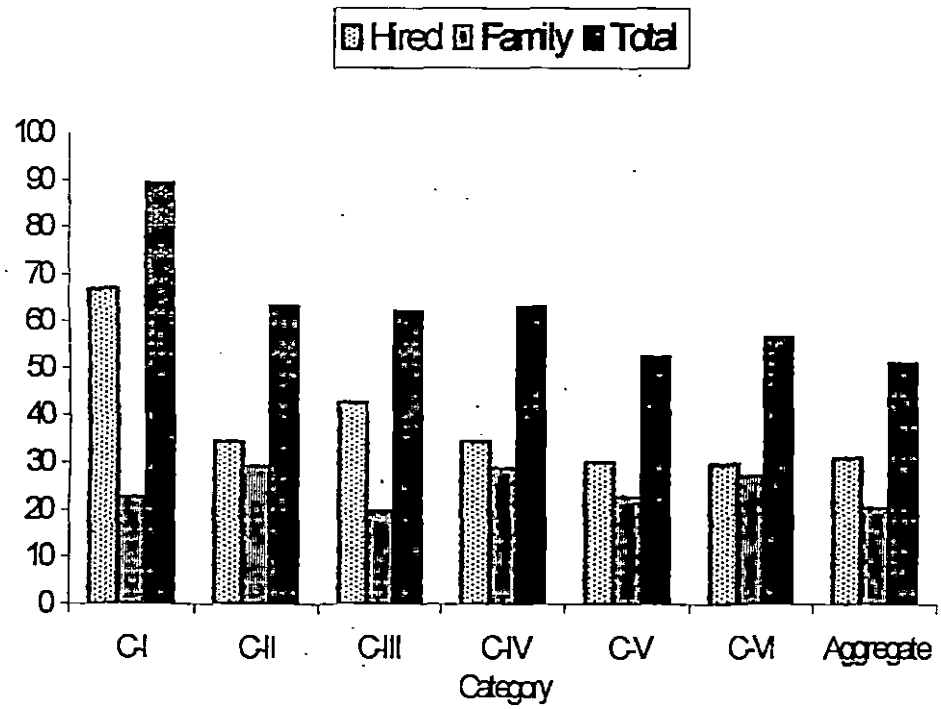

Fig. 6. Total labour utillisation (ha)

These estimates are much higher than the estimates of the present study. All the categories showed a less than 100 mandays of labour requirement per hectare.

Sairam *et.al.*(1997) estimated the labour requirement in mandays per hectare for rainfed garden and irrigated garden separately. For rainfed garden the estimate was 213 for C-I, 114 for C-II, 58 for C-III, 89 for C-IV and 97 for both C-V and C-VI. In the case of irrigated garden it was as: 203 for C-I, 74 for C-II, 88 for C-III, 119 for C-IV and 127 for both C-V and C-VI.

In the present study the labour requirement for the central region as a whole was worked out to be 50.93 mandays per hectare of coconut garden. For C-I labour requirement in mandays per hectare was 89.29, for C-II 63.34, for C-III 62.16, for C-IV 63.04, for C-V 52.45 and for C-VI 56.28 mandays per hectare.

Labour utilization in the coconut farms was found to be very less compared to the studies done. It could be rightly inferred that the labour utilization is diminishing in the study area. High labour cost and low returns from are reasons for this. Farmers were found avoiding many operations such as intercultivation operations, crown clearing etc. in many places under the study area. Most of them opined that depending upon coconut was nonprofitable, with a few exceptions.

6.5 Production details of sample farmers

On an aggregate 9219.47 nuts were produced per hectare in the study area. Yield of nuts per palm per year was estimated to be 52.68. In C-IV, the yield of nuts per palm per year was 49.11 while that in C-V it increased to 59.50 and it decreased to 44.61 nuts per palm per year in case of C-VI. Being the stabilised phase C-V has the highest productivity. C-IV being the establishment period showed less productivity while C-VI being the declining phase shows sharp fall in production of nuts.

CPCRI (1985) in a study on production loss due to root (wilt) disease, worked out the productivity per palm in Ernakulam district as 59 and in Thrissur district as 63. In the present study the aggregate per palm productivity for the central region as a whole came to 52.68, while for the stabilised production period it was 59.50. This result conforms to the result obtained in the present study implying that the productivity of nuts in the region has remained more or less the same.

Premaja (1987) estimated the annual production of coconut in the stabilised period as 10049 nuts per hectare in Calicut district. In the present study during the stabilised period yield estimated was 10411.94 nuts per hectare which is a little higher than the estimate of Premaja. But the estimate for the yielding categories as an aggregate was found to be 9219.47 nuts per hectare which is lesser than the estimate of Premaja. So, it can be inferred that the productivity in the central region of Kerala is low compared to the productivity of northern district of Calicut. It could be due to several factors such as attitude of farmers towards coconut cultivation in the central region may not be as favourable and enthusiastic as that of a farmer of northern region because of several factors like severe incidence of pests and diseases, abnormal fluctuations in prices, low returns from the crop compared to other enterprises such as rubber cultivation which is more prevalent in the central region than in the northern region of Kerala etc.

The average productivity of coconut palms was estimated as 57 nuts per palm per year for the southern region of Kerala, in a study on coconut root (wilt) disease, conducted by Jayashankar (1991). The average per palm productivity per year came near to 53 nuts in the present study. This is in conformation with the above study, which shows that even in the root (wilt) affected region, average productivity greater than 50 nuts per palm per year could be noticed. Both southern and central region being affected with root (wilt) disease, their productivity is lower than the productivity in the northern region of Calicut (Premaja, 1987) where the incidence of root (wilt) disease was negligible.

6.6 Cost of production of coconut

The establishment period was considered as 7 years and the establishment cost was estimated as Rs. 98727.71 per hectare. Amortized value obtained at 14 per cent for 60 years was Rs. 13835.70. At an aggregate level net cost of production was obtained as Rs. 32637.24. Average production per hectare of different categories was found out to arrive at cost of production. For the central region as an aggregate, the cost of production was worked out to Rs. 3.54 per nut. In C-IV the cost of production was worked out to be Rs. 3.85 per nut while it decreased to Rs. 3.19 per nut in C-V and increased to Rs. 4.02 per nut in C-VI. The category C-V shows highest productivity and hence has lowest cost of production. In C-VI productivity is lowest leading to higher cost of production.

Remold (2000) obtained cost of production per nut as Rs. 4.41 with a value of production Rs. 4.5 per nut. In the present study the cost of production obtained was Rs. 3.54 per nut. The cost of production obtained in this study does not conform to the results of Remold. The establishment cost estimated by Remold (Rs. 142014) is higher than that worked out in the present study (Rs. 98727.71). This led to a higher cost of production estimate by him. Establishment cost was lower in the study area indicating that even the farmers who newly cultivate it give not much seriousness to the coconut. An apathy towards coconut as a serious enterprise was noticed widely.

Sairam *et.al.* (1997) estimated the cost of production for the stabilised phase as Rs. 3.30 per nut in the case of rainfed garden whereas it came to Rs. 2.60 for irrigated gardens. In the present study cost of production for C-V, the stabilised phase, is Rs. 3.19 per nut, which is lower than their estimate for rainfed but higher than their estimate for irrigated garden. His estimate for rainfed garden comes nearer to the estimate in the present study.

6.7 Capital productivity analysis

Pay back period

Category-wise analysis of the yielding phase worked out pay back period to 13 years for the present project. It indicates that after 13 years only the net returns will cover the establishment cost. Pay back period is less than the project life. Hence the project is worth as far as pay back period is considered.

Premaja (1987) has worked out the payback period for coconut in Calicut district as 13.18 years. In the present study category-wise analysis shows that estimated payback period conforms to this finding.

In a case study undertaken from a 12 ha irrigated coconut farm near Bangalore, Nagaraj *et al.* (1987) examined the profitability and economic feasibility of investment in the enterprise by computing a few measures of project appraisal. The pay back period was worked out to be 10 years. The result obtained in the present study is a payback period of 13 years. The present study finds three more years are required for net returns to cover the establishment cost of coconut with the lower productivity in Kerala.

Patil *et.al.* (1989) in their study at Konkan region, Maharashtra, assessed the economic viability of coconut cultivation. The study revealed a payback period of 11 years whereas the present study reveals a payback period of 13 years.

Jaganathan (1992) in his study in Annamalai block of Coimbatore district in Tamil Nadu found out that in coconut gardens without intercropping the pay back period came to 11.86 years. The present study reveals that a further one and a quarter of a year were required for the returns to cover the initial investment.

Net Present Value

Net present value estimated at 14 per cent cost of capital was Rs. 1946.38 for one hectare of coconut garden. Since the net present value is positive the project is worth executing at 14 per cent cost of capital. However, the net present worth obtained is low compared to the long project life.

Joseph (1980) in an economic evaluation of three major plantation crops namely cashew, rubber and coconut in Kerala reported that net present value for coconut was equal to Rs. 4758. This study comes nearer to the estimate made in the present study.

Nagaraj *et.al.* (1987) estimated the net present value of coconut enterprise near Bangalore as Rs. 77167. This estimate is very high than the estimate under present study. Patil *et.al.* (1989) in their study in Konkan region of Maharashtra, worked out the net present value as Rs. 81186. Jaganathan (1992) estimated a Net present value of Rs. 23750 which is also very high than the Net present value estimated in this study. Although a positive Net present value indicates a worthy project, receiving such a low amount from a long time span of 60 years is definitely not an attractive project to consider with the low farm gate price prevailing.

Benefit cost ratio

Benefit cost ratio indicates the return on a rupee of investment. The benefit cost ratio was estimated to 1.02 for the central region. One of the criterions for a project to be worth is that benefit cost ratio should be greater than unity. As the present estimate is greater than unity the project is worth in terms of benefit cost ratio. But the fact that benefit cost ratio is just above unity and the project is for a long period imparts a very high risk.

George and Joseph (1973) in their study in coconut considering 7 years as establishment period and a project life of 40 years worked out benefit ratio to 1.07 which is only slightly higher than that of the present study. Joseph (1980) in his study reported a benefit cost ratio equal to 2. This is very high compared to the benefit cost ratio of 1.02 obtained in the present study.

Premaja (1987) worked out the benefit cost ratio for coconut in calicut district to be 1.44. This high value was attributed due to low cost of cultivation and higher yield in the Calicut district. In the present study higher cost of cultivation is the main reason for low benefit cost ratio. Nagaraj *et al.* (1987) estimated the benefit cost ratio of coconut farm near Banagalore as 1.69 at 12 per cent. This is also higher than the value obtained in the present study. Patil *et al.* (1989) in their study in Maharashtra reported a benefit cost ratio of 2.27 at 10 per cent discount rate. Jaganathan (1992) estimated a benefit cost ratio of 1.42 for coconut gardens without intercrop.

Internal Rate of Return

The internal rate of return was estimated to be 14.29 per cent. It is just higher than the cost of capital. Joseph (1980) had worked out the internal rate of return of investment in coconut as 17 per cent, which is higher than the estimate in this study. Premaja (1987) in her study in Calicut district had worked out the internal rate of return of investment in coconut as 16.39 per cent. The estimate of Patil et al. (1989) is 22.06, which is also much higher than the estimate of the present study.

The project worth measures indicate that the project is bankable. But the project is for a long span of 60 years and three project worth measures were just above the cut off level. Moreover, the average price per nut was estimated as Rs. 4.30 per nut. Even then the benefit cost ratio period was just 1.02, net present

worth was at a low level of Rs. 1941 and internal rate of return (14.29%) was also just above the opportunity cost of capital. Pay back period is 13 years.

It is clear that even a small fall in price can affect the project worth measures indicating that project becomes unworthy to implement. The situation after the reference period of study has shown drastic reduction in price and at present it is below Rs. 2 per nut. Evidently, the project is unworthy to implement at the present situation. Hence, it can be rightly concluded that it is not at all a promising prospect for the farmers to take up coconut cultivation as a monocrop in the current agricultural scenario at the prevailing price.

6.8 Marketing

The marketing study was conducted mainly to know the marketing details of the sample farmers. Around 51.40 per cent of the farmers who sell their nuts were found to sell as unhusked nuts (Table 5.27). The main reason for this trend is that it is easy for the farmers to sell it, as there is no additional effort involved. Selling nuts after splitting it into two halves and fixing prices according to their weight is being found increasingly adopted after the incidence of mite attack became severe. This helps farmers in accounting the deformed small nuts produced as a result of mite attack. The major marketing channel identified was the Producer-Copra maker-Oil miller-Wholesaler-Retailer-Consumer.

As a total 85.92 per cent of the farmers go for on farm sales and only the rest 14.08 per cent sell outside the farm. Farmers found it convenient and easy to sell in their own farm. Moreover, they had more bargaining power in the sales in their own farm since they can keep the coconuts there itself if expected price was not offered. The major type of buyer to which farmers offered their sale was copra maker. Around 82.39 per cent of the farmers preferred selling to copra maker. Only very few farmers were selling in the form of copra and coconut oil

(Table 5.28). Copra maker was the major primary intermediary found in the villages of the study area.

The marketing margin was estimated for 100 nuts or equivalent quantity of products. Producer's share in consumers rupee was 60.58 per cent. Price spread was worked out to Rs. 201.92 which comes to 39.42 per cent of the consumers rupee (Table 5.2.4). The net margin received by copra maker was highest occupying 15.78 per cent of consumer rupee. Net margin received by oil miller was the lowest (4.88%). Net margin received by wholesaler was 5.37 per cent while that of retailer was 9.98 per cent of consumer rupee.

Nair (1987) reported that price spread of 23.52 per cent of the retail price of oil constituted in his study in the Calicut region. This is less than the estimate of the present study where the price spread was worked out to 39.42 per cent of consumer rupee. Higher price spread indicates a lower share of the final price to the producer. Since there is wide fluctuations and instability in the prices of coconut in the recent times traders are trying to avoid their risk by reducing the money offered to the farmers. This mainly resulted in higher price spread.

6.9 Problems in coconut cultivation

It is evident from Table 5.26 that the main reasons for non adoption or incomplete adoption of the recommended cultivation practices are ignorance about the recommended scientific practises, inherited time tested knowledge that they found suited their locality and lack of seriousness of the advantages of the practice. Jnanadevan and Prakash (1991) in their study in Kollam district of Kerala on the constraints faced by farmers in fertilizer application as recommended by Kerala Agricultural University found that 42.5 per cent of the farmers apply 20 per cent or less of the recommended dose of fertilizer and none of the growers applied full dose of fertilizers. The constraints identified included the high cost of chemical fertilizer, lack of conviction of farmers in the efficacy of fertilizers, fear of

degradation of soil etc. However, the work of Sulaja (1999) identifies that many indigenous practises that farmers found that suited their locality existed even now. Farmers believe in the time tested indigenous practises and still practises many of them. The suggestion of Babu *et al.* (1993) that there should be recommendation in a holistic basis is noteworthy as homesteads are the major cultivated area in Kerala, especially for coconut. Needless, to say in a state like Kerala, where the population density is so high, land is a limiting factor. Hence, the farmers try to utilise the land in such a way, that they feel it provides maximum returns for them. Hence, recommendations in coconut should be in a holistic basis considering the type of land, soil, existing cropping pattern, extent of incidence of pest and diseases, scope for increasing productivity, marketing facilities in the region, expected returns for the farmers in the short run as well as in the long run etc. The co-ordinated activities of all the agricultural institutions in the state to identify various regions according to the above mentioned factors and develop separate packages for coconut development giving special attention to price stability should be given priority. It can be noted here that Salam *et al.* (1992) had developed a model homestead for 0.20 hectare irrigated homestead that could optimise the objective function of net returns while meeting the multiple requirements of a four member family. It is essentially a coconut based mixed farming system in which crop-livestock components interact synergistically to ensure optimum on-farm resource utilisation and enhanced productivity. The model provides for a net income of Rs. 17,513 by fully utilising the land and ensures a benefit of Rs. 1.84 per rupee invested. Similar co-ordinated studies for identified regions considering above-mentioned factors would be very useful in developing our coconut as a cost effective and profitable enterprise.

The main constraints were ranked by the farmers. Low market price and abnormal price fluctuations were the major constraints the farmers faced in the area under study. Price fluctuations are well above due to effect of seasonality. Off-farm sale was found increasingly replacing on-farm places in many places in

the study area. This situation is now increasingly adversely affecting the bargaining power of the farmer compared to the bargaining power they had in on-farm sales early. Traders are also affected by this problem very much and many of them were found leaving this business or reducing the business. However, the existing traders try to reduce their risk and maintain their profit by reducing the price paid to the farmers and by reducing or even stopping the sales promoting margin that farmers enjoyed earlier when there was competition between traders. So the suffering of the cultivator increases. George and Pillai (1999) support this finding. They opined that lack of competition in the marketing of coconut at the local levels also contributes to the instabilities in farm prices. Further, the analysis of price data showed that the variability of coconut prices at the farm level is more than that at the wholesale level. The other factors that contribute to the price fluctuations apart from seasonality includes the manipulations done by the Mumbai based oligopolies and the intense competition in the international trade as well as secular fall in demand due to competition from cheaper substitutes. It is essential to immediately implement all the possible steps to improve the low and fluctuating price situation by adopting cost effective methods that includes product diversification and value addition of coconut and its products. Possibilities of concepts such as group farming that will reduce the labour cost substantially by providing opportunity for mechanisation should be seriously thought of. We should remember that in this era of free trade competitiveness is a must and to be competitive our cost of production should be reduced. The cheap labour in Sri Lanka reduces their cost of production substantially and helps them sell their nut at a very low price than that of India.

Pest and disease problem was ranked as the second major problem faced by the farmers in the study region. Mite attack, root wilt, bud rot, rhinoceros beetle attack and stem bleeding were the major pest and diseases noticed in the study area. Many of the farmers whose palms were rootwilt affected were providing minimum care only. Mite attack was becoming severe in that region in the later

period of study and farmers started spraying against it. Most of the farmers were doing Panchayat subsidised spray. There were complaints on the efficacy of the spray and many of the farmers feared the residual toxicity of the inorganic chemical Dicofol. Moreover, farmers in the area widely believed that neem-garlic suspension provided by the local panchayats was adulterated. Some of the farmers who had already received the suspension did not spray against the mite, as the effect in the palms of lead farmers who had sprayed already was discouraging. However, farmers had contradicting views on the effectiveness of the spray. In the case of 'Dicofol' spray most of the farmers agreed that there was some control on mite if the spray was done after proper and neat cleaning of the crown and if care was taken to cover the spray effectively. But this was rarely practiced in a marathon like spray conducted by local panchayats. The labourers involved were trying to spray maximum number of the palms in a short time since their wages was fixed per tree basis.

The farmers ranked lack of water source for irrigation in the peak summer as the next problem. Mainly farmers from areas of low water table where there was no canal also cited this as a major problem. Procedural complication involved in the supply of inputs was ranked as the fourth problem. This included lack of supply of quality input, time lag involved in disbursing emoluments for agriculture and unavailability of inputs and subsidies at required time. Lack of credit, inadequate amount of agricultural loans to serve the purpose and charge of high interest rates was the other constraints cited by the farmers. Lack of credit for coconut development considered includes the credit for input facilities like irrigation etc. Inadequate amount of loan is to be viewed in the totality because if the farmer wants to develop his coconut garden his consideration to have a continuos irrigation source as well as intercropping in the garden. As farmer expects the investment for these purposes also as coconut development loan he feels it inadequate. The last score is given to the problem of high interest rate prevailing for loans and only a single farmer gave it rank number one revealing it

as an insignificant factor in the study region. This is understandable as nearly 84.85 per cent of farmers those who avail loan can avail it at prime lending rate of 14 per cent either from co-operative banks or from commercial banks and the rest could avail from Self Help Groups (SHGs) at 16 per cent interest rate.

Summary

7. SUMMARY

The present study on economics of production and marketing of coconut in central region of Kerala was conducted in the three districts Ernakulam, Thrissur and Palakkad. The objectives of the study were to estimate the cost of production of coconut in the central region of Kerala and to study the marketing details of the sample farmers.

Multistage random sampling method was adopted. From each of the three districts two blocks were selected randomly and from each block two panchayats were randomly selected. From each panchayat, a total of 18 farmers were selected thus making a total sample of 216 farmers. The 18 farmers selected from a panchayat was based on the age of their coconut garden. The groups based on age were, farmers having one year old, 2 to 3 year old, 4 to 7 year old, 8 to 14 year old, 15 to 40 years old and greater than 40 years old coconut gardens. Two farmers each from the first four categories and five farmers each from the last four categories were selected for the study.

Tabular analysis was used for data analysis. Project worthiness was worked out using project worth measures. Annuity value method was used to estimate cost of production of coconut.

The results showed that most of the farmers in all the categories procured seedlings from their own farm. Around 58.33 per cent of the farmers were found adopting optimum spacing in their coconut garden. All the farmers were found to apply organic manure to their palms irrespective of the category under which it belonged.

It could be observed that farmers using both urea and Muriate of potash (MOP) occupied 36.67 per cent of the total farmers applying fertilizer. Farmers applying urea + coconut mixture combination were very less comprising 3.33 per cent of the total farmers who apply fertilisers. Coconut mixture was applied by 23.33 per cent of the farmers.

Considering the nutrients N, P, K together, it is obvious that nutrient application was lower than the recommended level in all the categories. It was nearest up to 73.37 per cent of the recommendation in C-V and was farthest in C-I where only 35.37 per cent of the recommended dose was applied. All other categories were applying more than 50 per cent of the recommended dose.

Husk burial was rarely practiced by majority of the farmers in the study area whereas mulching using leaves and stubbles was widely practiced in the study area. It was found that 73.51 per cent of the farmers irrigated their palms, while the rest 26.85 per cent of farmers had rainfed garden. More than 75 per cent of farmers in all the categories used pumpset for irrigating their coconut garden. Electric motor was the main type of irrigation equipment used in the study area.

The total cost for establishment period of seven years for coconut was worked out to Rs. 14126.32 for C-I, Rs. 13436.35 for C-II and Rs. 14432.99 for C-III for one hectare. Land preparation and intercultivation operations were the main cost incurred in the initial stages of growth of palm. Irrigation cost was the next major contributor of total cost of establishment.

On an aggregate cost of maintenance for yielding categories was worked out to Rs. 18896.74 per hectare. The cost of maintenance worked out for C-IV was Rs. 19058.82, for C-V Rs. 19599.24 and for C-VI Rs. 17811.84 per hectare. Harvesting charges was the largest contributor to the total cost of maintenance (20.21%) followed by intercultivation operations (18.73%).

Labour utilization pattern showed that more hired labour (60.64%) was used compared to family labour (39.36%) in the coconut gardens of central region of Kerala. In all categories, more than 50 per cent of total labour were by hired labour.

The production was found to be the highest in C-V followed by C-IV and then by C-VI. The productivity was as high as 59.50 nuts per palm per year

in C-V. It was 49.11 and 44.61 nuts per palm per year in C-IV and C-VI respectively. On an aggregate, the production was 9219.47 nuts per hectare with an aggregate productivity of 52.68 nuts per palm per year in the central region.

The cost of production was worked out to be Rs. 3.85, Rs.3.19 and Rs. 4.02 per nut for C-IV, C-V and C-VI respectively. The cost of production in aggregate was estimated to be Rs.3.54 per nut for the central region of Kerala. Annuity value was estimated at 14 per cent annuity.

Capital productivity analysis brings out the efficiency of capital used in the production. Pay back period worked out was 13 years, net present value obtained at 14 per cent opportunity cost of capital was Rs. 1946.38 for one hectare of coconut garden. Benefit cost ratio came to 1.02 only while internal rate of return was only 14.29 per cent.

The project worthy measures thus can indicate an unworthy project even for a small fall in the price of coconut. Hence, coconut cultivation is not at all a promising prospect to take up especially under the current agricultural scenario where the price of nut has been falling down abnormally.

The marketing study was confined to the various aspects relating to the marketing of coconut and coconut products by the sample farmers only. Data on marketing aspects were collected from a sample of 24 village traders/copra makers, 8 oil millers, 12 wholesalers and 12 retailers.

Majority of the farmers was selling unhusked nuts constituting 51.40 per cent of the total sample farmers. Sale of nuts in the form of husked nuts or split nuts was seen in the case of around 20 per cent of the farmers. Nearly 86 per cent of the farmers was found to sell their produce in their farm itself and nearly 83 per cent of the farmers sold their produce to copra maker in their villages. Only very few farmers (3.52%) were selling as copra.

The major marketing channel identified was producer-copra maker-oil miller-wholesaler-retailer-consumer. The share of producer in consumers' rupee came to 60.58 per cent. Price spread was estimated as 39.42 per cent of consumers' rupee.

The main problems encountered by the farmers were of low price and abnormally fluctuating price of coconut followed by incidence of pest and disease. Reduction in number of traders and low demand for nuts has stolen the bargaining power of the farmers. Mite attack has increased the sale of nuts in the form of split nuts. Mainly ignorance of the recommended practices and their advantages as well as inherited time tested knowledge that made farmer understand the best method for their particular region resulted in incomplete adoption or non adoption of the recommended scientific practices by the Kerala Agricultural University. Immediately adequate steps need to be taken in all the aspects of coconut production, from cultivation to marketing, so as the industry to thrive the present crisis due to the abnormally low and fluctuating price.

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ECONOMICS OF PRODUCTION AND MARKETING OF COCONUT IN CENTRAL REGION OF KERALA

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ABSTRACT OF THE THESIS

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ABSTRACT

This study entitled "Economics of production and marketing of coconut in central region of Kerala" was conducted in the Ernakulam, Thrissur and Palakkad districts of central region of Kerala. The objectives were to estimate cost of production of coconut, to study the marketing details of the sample farmers and the general problems encountered by the coconut growers.

Multistage random sampling technique was adopted. A total sample of 216 farmers was selected having palms of different age groups. The groups based on age were, farmers having one year old, 2 to 3 year old, 4 to 7 year old, 8 to 14 year old, 15 to 40 years old and greater than 40 years old coconut gardens. Two farmers each from the first four categories and five farmers each from the last four categories were selected for the study.

Most of the farmers procured seedlings from their own farm. All the ssample farmers were found to apply organic manure in their farms. Considering the nutrients N,P,K together, it was observed that the nutrient application was lower than the recommendation of Package of Practices of Kerala Agricultural University. Husk burial was a very rare practice in the study area.

The cost of establishment of coconut for seven years was worked out to Rs.14126.32 for C-I (one year old), Rs. 13436.35 for C-II (2 to 3 years old) and Rs. 14432.99 for C-III (4 to 7 years old) for one hectare of coconut garden. On an aggregate cost of maintenance for yielding categories was worked out to Rs. 18896.74 per hectare. The cost of maintenance worked out for C-IV (8 to 14 years old) was Rs. 19058.82, for C-V (15 to 40 years old) Rs. 19599.24 and for C-VI (greater than 40 years old) Rs. 17811.84 per hectare. Labour utilization pattern showed that more hired labour (60.64%) was used compared to family labour (39.36%) in the coconut gardens of central region of Kerala.

On an aggregate, productivity of 52.68 nuts per palm per year was estimated in the central region.

The cost of production was worked to Rs.3.54 per nut for the central region of Kerala. Capital productivity analysis revealed a pay back period of 13 years, net present value of Rs. 1946.38 at 14 per cent opportunity cost of capital. Benefit cost ratio was just 1.02 while internal rate of return (14.29%) was just above the opportunity cost of capital. The project worth measures indicate a bankable project. But the project worth measures are just above the critical decision level and hence are very much sensitive even to a slight fall in returns or spurt in cost of the farmers indicating that coconut cultivation as such is not a much promising enterprise.

Majority of the farmers was selling unhusked nuts constituting 51.40 per cent of the total sample farmers. The major marketing channel identified was producer-copra maker-oil miller-wholesaler-retailer-consumer. The share of producer in consumers' rupee came to 60.58 per cent. Price spread was estimated as 39.42 per cent of consumers' rupee.

The main constraints ranked by the farmers in the study region is that of low and abnormally fluctuating market price of coconut followed by pest and disease incidence. Mainly ignorance of the recommended practices and their advantages as well as inherited time tested knowledge that made farmer understand the best method for their particular region resulted in incomplete adoption or non adoption of the recommended scientific practices by the Kerala Agricultural University. The need of the day is to implement new ideas and concepts in the cultivation to marketing and processing aspects, which will be cost effective, competitive and viable in this era of stiff competition of products and its substitutes.

ANNEXURE 1

	Discount rates (14%)	Cashoutflow	Cashinflow	Cashflow	Discounted Cashoutflow	Discounted Cashinflow	Discounted Cashflow
1	0.877193	14126.32	0.00	-14126.32	12391.50	0.00	-12391.50
2	0.769468	13436.85	0.00	-13436.85	10339.22	0.00	-10339.22
3	0.674972	13436.85	0.00	-13436.85	9069.49	0.00	-9069.49
4	0.592080	14432.07	0.00	-14432.07	8544.95	0.00	-8544.95
5	0.519369	14432.07	0.00	-14432.07	7495.57	0.00	-7495.57
6	0.455587	14432.07	0.00	-14432.07	6575.06	0.00	-6575.06
7	0.399637	14432.07	0.00	-14432.07	5767.60	0.00	-5767.60
8	0.350559	19058.86	37900.00	18841.14	6681.26	13286.19	6604.93
9	0.307508	19058.86	37900.00	18841.14	5860.75	11654.55	5793.80
10	0.269744	19058.86	37900.00	18841.14	5141.01	10223.29	5082.28
11	0.236617	19058.86	37900.00	18841.14	4509.66	8967.80	4458.14
12	0.207559	19058.86	37900.00	18841.14	3955.84	7866.49	3910.65
13	0.182069	19058.86	37900.00	18841.14	3470.03	6900.43	3430.39
14	0.159710	19058.86	37900.00	18841.14	3043.89	6053.01	3009.12
15	0.140096	19600.53	46081.45	26480.92	2745.97	6455.85	3709.88
16	0.122892	19600.53	46081.45	26480.92	2408.74	5663.03	3254.28
17	0.107800	19600.53	46081.45	26480.92	2112.93	4967.57	2854.63
18	0.094561	19600.53	46081.45	26480.92	1853.45	4357.51	2504.07
19	0.082948	19600.53	46081.45	26480.92	1625.83	3822.38	2196.55
20	0.072762	19600.53	46081.45	26480.92	1426.17	3352.97	1926.80
21	0.063826	19600.53	46081.45	26480.92	1251.02	2941.20	1690.17
22	0.055988	19600.53	46081.45	26480.92	1097.39	2580.00	1482.61
23	0.049112	19600.53	46081.45	26480.92	962.62	2263.16	1300.53
24	0.043081	19600.53	46081.45	26480.92	844.41	1985.22	1140.82
25	0.037790	19600.53	46081.45	26480.92	740.71	1741.43	1000.72
26	0.033149	19600.53	46081.45	26480.92	649.74	1527.57	877.82
27	0.029078	19600.53	46081.45	26480.92	569.95	1339.97	770.02
28	0.025507	19600.53	46081.45	26480.92	499.96	1175.41	675.46
29	0.022375	19600.53	46081.45	26480.92	438.56	1031.06	592.51
30	0.019627	19600.53	46081.45	26480.92	384.70	904.44	519.74
31	0.017217	19600.53	46081.45	26480.92	337.46	793.37	455.91
32	0.015102	19600.53	46081.45	26480.92	296.01	695.94	399.92
33	0.013248	19600.53	46081.45	26480.92	259.66	610.47	350.81
34	0.011621	19600.53	46081.45	26480.92	227.77	535.50	307.73
35	0.010194	19600.53	46081.45	26480.92	199.80	469.74	269.94
36	0.008942	19600.53	46081.45	26480.92	175.26	412.05	236.79
37	0.007844	19600.53	46081.45	26480.92	153.74	361.45	207.71
38	0.006880	19600.53	46081.45	26480.92	134.86	317.06	182.20
39	0.006035	19600.53	46081.45	26480.92	118.30	278.12	159.82
40	0.005294	19600.53	46081.45	26480.92	103.77	243.97	140.20
41	0.004644	17809.30	34894.55	17085.26	82.71	162.05	79.35
42	0.004074	17809.30	34894.55	17085.26	72.55	142.15	69.60
43	0.003573	17809.30	34894.55	17085.26	63.64	124.69	61.05
44	0.003135	17809.30	34894.55	17085.26	55.83	109.38	53.56
45	0.002750	17809.30	34894.55	17085.26	48.97	95.95	46.98
46	0.002412	17809.30	34894.55	17085.26	42.96	84.17	41.21
47	0.002116	17809.30	34894.55	17085.26	37.68	73.83	36.15
48	0.001856	17809.30	34894.55	17085.26	33.05	64.76	31.71
49	0.001628	17809.30	34894.55	17085.26	28.99	56.81	27.82
50	0.001428	17809.30	34894.55	17085.26	25.43	49.83	24.40
51	0.001253	17809.30	34894.55	17085.26	22.31	43.71	21.40
52	0.001099	17809.30	34894.55	17085.26	19.57	38.34	18.77
53	0.000964	17809.30	34894.55	17085.26	17.17	33.64	16.47
54	0.000846	17809.30	34894.55	17085.26	15.06	29.51	14.45
55	0.000742	17809.30	34894.55	17085.26	13.21	25.88	12.67
56	0.000651	17809.30	34894.55	17085.26	11.59	22.70	11.12
57	0.000571	17809.30	34894.55	17085.26	10.16	19.92	9.75
58	0.000501	17809.30	34894.55	17085.26	8.92	17.47	8.55
59	0.000439	17809.30	34894.55	17085.26	7.82	15.32	7.50
60	0.000385	17809.30	122394.55	104585.26	6.86	47.15	40.29
		1097940.04	**2248808.70**	**1150868.66**	**115089.07**	**117035.45**	**1946.38**
				Pay back period		13 years	
				Benefit cost ratio		1.02	
				Net present worth		1946.38	
				Internal rate of return		14.29%	

ANNEXURE 2

Employment generation in the coconut garden

Operationwise labour use in different age groups of Coconut (mandays/hectare)

	C-I			C-II			C-III			C-IV			C-V			C-VI		
	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total
Clearing,levelling,bunding	22.98 (47.99)	0.78 (3.49)	23.76 (26.61)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Raising the level of land	18.91 (43.16)	3.07 (13.66)	21.99 (24.62)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Digging/planting and fencing	13.99 (20.95)	1.35 (5.99)	15.34 (17.18)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Shading/Gap filling	0.26 (0.39)	0.15 (0.66)	0.41 (0.46)	0.61 (1.78)	0.17 (0.60)	0.78 (1.24)	0.97 (2.27)	0.00 90.00)	0.97 (1.56)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Transportation/application charge	2.67 (4.00)	1.12 (4.98)	3.79 (4.25)	3.38 (9.84)	2.13 (7.34)	5.51 (8.69)	4.43 (10.38)	1.98 (10.17)	6.41 (10.31)	4.80 (13.99)	1.37 (4.78)	6.17 (9.79)	2.82 (9.41)	1.60 (7.11)	4.42 (8.42)	2.75 (9.34)	1.52 (5.65)	4.27 (7.58)
Mulching	0.26 (0.39)	0.00 (0.00)	0.26 (0.29)	1.26 (3.68)	0.65 (2.25)	1.92 (3.02)	3.74 (8.77)	0.18 (0.90)	3.92 (6.30)	3.92 (11.45)	0.46 (1.59)	4.38 (6.95)	3.43 (11.450	0.21 (0.92)	3.64 (6.94)	3.16 (10.76)	1.03 (3.83)	4.19 (7.45)
Intercultivation operations	3.06 (4.58)	2.20 (9.80)	5.27 (5.90)	25.86 (75.32)	4.97 (17.15)	30.83 (48.68)	30.76 (72.05)	2.42 (12.45)	33.18 (53.38)	20.63 (60.16)	2.34 (8.12)	22.96 (36.42)	20.63 (68.81)	2.34 (10.39)	22.96 (43.78)	20.63 (70.16)	2.34 (8.69)	22.96 (40.80)
Irrigation	4.65 (6.96)	13.81 (61.41)	18.46 (20.68)	3.22 (9.38)	21.08 (72.67)	24.30 (38.37)	2.79 (6.53)	14.89 (76.49)	17.68 (28.44)	2.25 (6.57)	18.17 (63.19)	20.42 (32.39)	1.07 (3.55)	13.53 (60.23)	14.60 (27.83)	0.83 (2.83)	15.44 (57.46)	16.27 (28.92)
Heaping/Carting charges	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	2.69 (7.85)	6.42 (22.32)	9.11 (14.45)	2.03 (6.78)	4.80 (21.35)	6.83 (13.02)	2.03 (6.92)	6.55 (24.37)	8.58 (15.25)
Total	66.80 (100.0)	22.49 (100.0)	89.29 (100.0)	34.33 (100.0)	29.01 (100.0)	63.34 (100.0)	42.69 (100.0)	19.47 (100.0)	62.16 (100.0)	34.29 (100.0)	28.75 (100.0)	63.05 (100.0)	29.98 (100.0)	22.47 (100.0)	52.45 (100.0)	29.40 (100.0)	26.88 (100.0)	56.28 (100.0)

Figures in parentheses indicate percentage to the total