ECONOMICS OF ARECANUT CULTIVATION IN KASARAGOD DISTRICT

By

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THESIS

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DECLARATION

I hereby declare that the thesis entitled **"Economics of Arecanut Cultivation in Kasaragod District"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.

Vellanikkara,

1994.

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CERTIFICATE

Certified that the thesis entitled **"Economics of Arecanut Cultivation in Kasaragod District"** is a record of research work done independently by **Mr. Dineshkumar, E.V.**, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

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Introduction

INTRODUCTION

The Arecanut palm, Areca catechu L. is the source of common masticatory nut, popularly known as arecanut, betelnut or supari. It is extensively used in India by all sections of the people as a masticatory and is an essential requisite for several religious and social ceremonies. With regard to the medicinal properties arecanut is stated to be used against many of the human diseases like leucoderma, leprosy, cough, fits, obesity etc. Bavappa et al. (1982). It has also been mentioned for its use as a purgative. In an ointment along with several other ingredients it is used for the treatment of nasal ulcers. Bhavamista in thirteenth century A.D. mentioned the use of arecanut as a stimulant and appetizer.

In India arecanut is mostly grown in high rainfall regions of Karnataka, Kerala, Assam, West Bengal, Tamil Nadu and Maharashtra. The largest area under the crop is found in gravelly laterite soils of Kerala and coastal Karnataka. In the plain regions of Karnataka arecanut is planted in fertile clay loam soils. Arecanut is grown in India with a wide range of temperature varying from a minimum of 4°C to a maximum of 40°C.

Bavappa et al. (1982). The Arecanut Palm CPCRI Kasaragod. pp.1-4.

India is the largest producer and consumer of arecanut in the world. As far as production is concerned India accounts for 88 per cent of the world production. The economic importance of the arecanut sector can be realised from the fact that nearly 56 million people in this country are either directly or indirectly connected with it.

Within India, Karnataka has got the largest area and highest production of arecanut. That State accounts for about 30.35 per cent of the total area and 38.8 per cent of the total production of India, closely followed by Kerala with a share of 30.00 per cent of the area and 24.24 per cent of the production of arecanut. Assam also contribute significantly to make India as the highest producer of arecanut in the world. State-wise area and production of arecanut is given in Table 1.1.

In Kerala, the area and production of arecanut is found to be high in the northern districts rather than the south. Among the various districts Kasaragod, Kannur, Malappuram have major share in area and production of arecanut. Among this, Kasaragod district has got an area of 18.93 per cent and production of 21.96 per cent of the total. Kannur district occupies 16.79 per cent of the area and 21.5 per cent of production. Malappuram district covers 18.72 per cent of the area and 17.32 per cent of production.

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Table 1.1 All India estimate of arecanut (1987-88)

State	Area (thousand hectares	Percentage	Production (million nuts)	Percentage
Andhra Pradesh	0.20	0.10	0.20	0.09
Assam	58.70	29.35	61.40	26.86
Goa	1.30	0.65	1.10	0.48
Karnataka	60.70	30.35	88.70	38.80
Kerala	60.00	30.00	55.40	24.24
Maharashtra	1.90	0.95	2.10	0.93
Meghalaya	6.60	3.30	6.30	2.75
Mizoram	0.10	0.05	0.10	0.04
Tamil Nadu	4.10	2.05	3.80	1.66
Tripura	1.20	0.60	2.20	0.96
West Bengal	5.20	2.60	7.30	3.19
All India	200.00	100.00	228.60	100.00

Source: Area and Production of Principal Crops of India 1992, Directorate of Economics and Statistics. pp.179.

District-wise area and production of arecanut is given in Table 1.2.

As Kasaragod district ranks first in Kerala with regard to the acreage and production of arecanut, this district has been selected for the present study. The specific objective of the study are indicated below.

1. To estimate the costs and returns in arecanut cultivation.

2. To evaluate the resource use efficiency of yielding arecanut plantation.

3. To identify the problems of arecanut cultivators.

A study to fulfil these objectives, needs data on various items of costs relating to all aspects, as they occur at different stages. The data were collected from arecanut growers by personal interview method for this study.

This thesis is divided into six chapters including the introductory chapter. A brief description of the agro-climatic and economic aspects of Kasaragod district is given in chapter 2. The relevant literature has been reviewed in chapter 3. Chapter 4 deals with the methods of sample selection and analysis followed in the study. The results of the study and the discussion thereon are dealt with in

chapter 5 which comprises of the cost of cultivation of arecanut, capital productivity analysis, resource use efficiency and the general problems faced by the sample farmers. Chapter 6 deals with the summary of the major findings of the study.

Table 1.2 District-wise area and production of arecanut in Kerala (1990-91)

District	Area (ha)	Percentage	Production (million nuts)	Percentage
Thiruvananthapuram	1886	2.91	276	2.11
Kollam	2082	3.21	351	2.69
Pathanamthitta	1332	2.05	291	2.22
Alappuzha	1653	2.55	165	1.26
Kottayam	1349	2.08	202	1.55
Idukki	1558	2.40	479	3.66
Ernakulam	3836	5.93	626	4.79
Thrissur	5476	8.45	1204	9.21
Palakkad	2789	4.30	392	3.00
Malappuram	12135	18.72	2265	17.32
Kozhikode	6011	9.27	861	6.59
Wayanad	1556	2.41	280	2.14
Kannur	10885	16.79	2811	21.50
Kasaragod	12269	18.93	2871	21.96
State	64817	100.00	13074	100.00

Source: Farm Guide 1993. Farm Information Bureau Government of Kerala. p.8

Review of Literature

REVIEW OF LITERATURE

Economics of arecanut cultivation has not received considerable attention as a subject matter of study among research workers and hence only a few studies have been reported on this topic. (Bavappa et al., 1982). In this chapter review of available work on arecanut is made first and in view of the fact that methodologically studies on coconut are similar, review of studies on coconut would also be made.

Studies on coconut

Reporting on coconut production in Sri Lanka, Abeywardena (1975) noted that an economic analysis of fertilizer use based on local costs and prices indicated that the local grower could expect a return on investment in fertilizers of 107 per cent after the first year, rising to 447 per cent in the tenth year. An analysis based on export prices of coconut products and full import prices of fertilizers indicated that returns to the Government could rise to 624 per cent by the tenth year.

Joseph (1980) in 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 17 per cent and the benefit cost ratio equal to 2:1.

The cost of establishing one hectare west coast tall 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.10630. 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 twelth year a steady average yield of 50 nuts per palm was expected giving a gross return of Rs.10,500. On the basis of 1980 prices, annual expenditure worked to be Rs.3560. Thus net profit per hectare came to Rs.6940 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 would 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 the costs incurred during the pre-bearing stage was made by Bastine (1982). The following

conclusions were arrived at. Average cost of maintenance per hectare was 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.7560.98 and Benefit cost ratio at cost C was 2.19. Analysis of resource 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 of N, P and K applied per hectare on an average were 5.70 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 of 68:34:136.

Mandal and Metha (1982) in a case study of the performance of coconut cultivar (Benanlim) 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.14,120 respectively. The study revealed that irrigation alone increased the yield per hectare by 12.9 per cent and irrigation cum manuring by 24.5 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.

From a survey of coconut farms in Bouol, Quicoy and Caintic (1982) reported that the most common problems encountered were low productivity, high labour costs, poor transport facilities, pests, thieves and lack of capital.

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 return per hectare was Rs.10953.15 Benefit cost ratio was 4.838 at cost A and 2.425 at cost B.

The economics of coconut cultivation in Puzhakkal block in the command area of Peechi irrigation Project in Kerala was studied by Santha (1982) without taking into account costs incurred during the pre-bearing stage. The average cost of maintenance per hectare was calculated Rs.9029.81. On an average gross returns from coconut was Rs.14289.32 per hectare of which 89.15 per cent was through sale of coconut. Overall net income per year at total cost was Rs.5261.49 per hectare.

Das (1984) reported that the cost of production of coconuts in Kerala had been estimated 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 price of coconut as Rs.1.10 and Rs.1.50 per nut respectively, the net returns worked out to be Rs.4200 per hectare. The cost of bringing one hectare of coconut garden to bearing or the total establishment cost per hectare came to Rs.35,300. The annual maintenance cost came to Rs.5,500. Since coconut was a smaller 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 Rs.5760 per annum. The study thus revealed that under good management it was a profitable proposition in Kerala.

The average annual cost of maintaining a coconut garden in Kerala was estimated by George and Rajasekharan (1985), using the budgeting technique. It 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 9,000 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 return in coconut cultivation was calculated to be 15 per cent at the price of Rs.226 per 100 nuts.

Premaja (1986) 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 upto bearing stage (initial 7 years) was Rs.38,773 and the maintenance cost per hectare per year was Rs.5853/-. The average annual production of nuts per hectare during the stabilised period was estimated as 10049 nuts. Cost of production per nut was calculated as Rs.1.2/-. The estimated net returns on investment per hectare per year came to Rs.13,835/-.

Studies on arecanut

The report on the cost of cultivation of arecanut in

Mysore state by Lakshmanacher (1961) showed that the average cost of cultivation of an acre of arecanut in three districts of Shimoga, Chickmangalur and North Kanara of Malnad region as Rs.973 for large size holdings, Rs.1010 for medium and Rs.1083 for small holdings. The holdings in the sample were classified as large if they were having 70 Guntas (40 Guntas = 1 acre) and above, medium size if between 27 and 70 Guntas and small sized if they were less than 27 Guntas.

Naidu (1962) worked out the cost of cultivation of an acre of arecanut in maidan region of Mysore. He estimated that Rs.10,255 was required to establish an acre of area garden upto the maturing stage (8 years) and Rs.1,100 was required as recurring expenditure every year there after. He estimated the annual gross return per acre at Rs.2250 and net profit at Rs.1,150. He opined that major variation in costs in different zones could only be in the value of land utilized for raising the garden.

Bhat (1968) worked out the economics of individual arecanut palm at CPCRI, Vittal. He observed that 80 per cent of the palms yielded fruits in all the three years under observation, 14 per cent in two out of three years and two per cent no yield throughout the three year period. The cost of establishing the arecanut garden was estimated at Rs.37,000 and the recurring expenditure (inclusive of supervision

charges and interest on capital) at Rs.6,800 per hectare per annum. Thus cost of maintaining each tree of the garden with 1480 trees per hectare worked out to Rs.4.66 per year. To meet this expenditure the palm had to yield atleast 100 fruits under the existing price of nuts.

Bhat and Leela (1968) worked out the economics of arecanut cultivation and observed the effect of spacing on yield and net profit. They concluded that spacing of arecanut palm of 2.7 x 2.7 m gave the highest net profit per hectare of Rs.7,308 per year at existing price.

The committee to study the price structure of arecanut and other allied matters (1973) estimated that nearly four million people in India were engaged in the production, processing and trading of arecanut. The committee estimated a capital investment of about Rs.26,000 per hectare towards the cost of land, land preparation, layout, planting and recurring expenditure on cultivation upto bearing stage which takes nearly seven years and the yearly recurring expenditure later at about Rs.2,654 per ha.

Singh et al. (1976) conducted studies on the cost of production of arecanut at CPCRI, Mohitnagar (W.B.), Vittal (Karnataka), Palode (Kerala) and Hirewali (Karnataka). At Mohitnagar the average cost of production during the first

five years of plantation was estimated at Rs.5,680 per hectare. On an average 806 man days of labour were required per year per hectare. At Vittal the cost of production was Rs.5218.8 per ha. whereas the yield was 2055 kg per ha. (Husked Kernal) which gave a gross income of Rs.16,440/- at the rate of Rs.8/- per kg. At Hirewali the cost was Rs.8,492/- per ha. for tender processed arecanut giving a gross income of Rs.21,960/- per ha. at Rs.7.50 per kg. At Peechi the cost was Rs.4,592.60 with a net income of Rs.7,049.76 per ha. At Palode the cost was Rs.2,494 per ha. with net income of Rs.1,782 per ha.

Naidu (1962) worked out the costs and returns in arecanut as a pure crop (without any intercrop) with the help of data collected in the pilot schemes undertaken by the Indian Central Arecanut Committee during 1959-60 and 1960-61. He estimated that cost C was about Rs.232/- per quintal during that period ranging between Rs.201/- in large holdings to Rs.3061/- in smaller ones. On the average, cost A was 52 per cent, A_1 69, A_2 61, and B 90 per cent of cost C. In general cost A and Cost B per ha varied directly proportional to the size of holding whereas cost A_2 and cost C were inversely proportional to it. The cost of production of arecanut per quintal was however inversely proportional to the size of holding whatever the components of cost B.

Singh et al. (1979) in a study on the economics of Arecanut cultivation at CPCRI, Vittal found out the various economic parameters like pay back period, B.C. ratio, net present worth, IRR etc. He obtained a pay back period of 7 years, NPV of Rs.38924 and 29771 per ha. respectively for 10 and 12 per cent discount rates. The internal rate of return was found to be 29.32 per cent and the B-C ratio at 12 per cent discount rate was 1.9.

Shantha (1982) worked out the cost of maintenance per hectare of arecanut as Rs.4575.74 of which 33.24 per cent accounted for rental value of land. Among the paid out costs manures constitute maximum (27.20 per cent) followed by hired human labour (13.45 per cent). The imputed value of family labour was 6.44 per cent. Arecanut yielded an average return of Rs.7604.54 per ha. The net income computed was Rs.3028.8 per ha.

Bhalarao et al. (1983) in a sample study on profitability of arecanut cultivation in Jalpaiguri 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 high) NPV at 10 per cent discount rate ranged from Rs.47,874 for medium to Rs.54,420/- for large farmers. At 12 per cent discount rate NPV ranged from Rs.32,507 for medium to

Rs.35,052 for large farmers. The value of IRR ranged from 24.4 per cent for medium to 24.8 per cent for small farmers. The B-C ratio obtained were 2.3 for medium farmers to 2.5 for large farmers.

Area of Study

AREA OF STUDY

In this chapter some general information about the study area is given and it is hoped that it will provide a useful background information to the details that follow.

Kasaragod district is located towards the northern most end of the state of Kerala. The district is bounded on the south by Kannur district, on north and east by the state of Karnataka and on the west by the Arabian Sea. It is situated between north latitudes 12° 2' and 12° 45' and east longitudes 74° 52' and 75° 26'.

The headquarters of the district is Kasaragod. There are only two taluks in the district, viz. Hosdurg and Kasaragod. The whole district is also divided into four community development blocks, 37 panchayaths and two municipalities. The total geographical area of the district is 1961.3 sq km which forms 5.05 per cent of the total area of the state.

Based on the physical features, the entire district can be divided into three natural divisions.

1. The highland region, situating at the eastern part of the district.
2. The flat coastal belt
3. The undulating midland in between the above two regions

The district has a coastal length of about 77 km. Like most of the other parts of the state it also has a salubrious climate. The most important rainy season in the district is the south-west monsoon commencing from June and ending in September followed by the north-east monsoon which generally lasts from October to November. It receives a highly uneven distribution of rainfall. The monthly distribution of rainfall in Kasaragod district is shown Table 3.1.

Weather in the district is dry during December to January. The temperature varies between 17° C to 38° C.

The soils of this district are of three major types. In the narrow coastal belt the soil is sandy while laterite soil occurs in the major part of the district. The high land is covered by forest soils, which is very rich in organic matter. Laterite soil is found in the midland region which is suitable for garden/plantation crops like coconut, arecanut and fruit crops.

The district is blessed with a number of rivers. The important rivers are Chandragiri, Kariangote, Shiriya and Uppale.

The total population of the district is 8,72,740. As much as 50.57 per cent of the population is living in rural areas and the rest 49.43 per cent in urban areas.

Table 3.1 Average monthly rainfall for Kasaragod district 1991

Month	Rainfall (in mm)
January	--
February	--
March	--
April	13
May	128
June	1231
July	1240
August	574
September	95
October	128
November	13
December	--
Annual	3422

Source: Farm Guide, 1993. Farm Information Bureau, Government of Kerala. pp. 28.

The land use pattern of Kasaragod district is shown in Table 3.2. Net sown area contribute more than 71.15 per cent of the total geographic area as against 73.83 per cent in the state as a whole.

The cropping pattern for the year 1991-92, showing the area under different crops and their percentages to total is given in Table 3.3. Coconut which accounts for 31.3 per cent of cropped area is the most important crop followed by cashew, rubber, rice and arecanut. Thus cropping pattern shows highly commercialized nature of agriculture.

The area under irrigation (crop-wise) in the district during 1990-91 is given in Table 3.4. The total area under irrigation was 33,756 ha which was 23.80 per cent of gross cropped area. Though in terms of acreage, larger share of irrigation was for coconut, in terms of coverage of the crop, arecanut ranked the first with as much as 60.47 per cent of it under irrigation. The net area irrigated (source-wise) during 1990-91 is given in Table 3.5. The major source of irrigation in the district is private tanks and wells which furnish irrigation to an area of 13,683 ha during 1990-91.

The area covered in the study is shown in the map of Kasaragod district (Fig.1).

Table 3.2 Land use pattern of Kasaragod district, 1990-91

	Area (ha)	Percentage
Total geographical area	1,96,133	100.00
Area under forest	5,625	2.87
Land put to non-agricultural area	15,146	7.70
Barren and uncultivable land	11,989	6.10
Permanent pastures and other grazing lands	297	0.15
Land under miscellaneous tree crops	2,342	1.20
Cultivable waste land	17,284	8.80
Fallow other than current fallow	1,537	0.78
Current fallow	2,357	1.20
Net area sown	1,39,556	71.15
Area sown more than once	2,174	1.10
Total cropped area	1,41,730	72.25

Source: Farm Guide, 1993. Farm Information Bureau, Government of Kerala

Table 3.3 Cropping pattern in Kasaragod district during the year 1990-91

Crop	Area (in ha)	Percentage
Rice	14292	10.08
Pulses	868	0.61
Sugar crops	77	0.05
Pepper	6803	4.79
Chillies	294	0.21
Ginger	6803	4.79
Turmeric	92	0.06
Cardamom	840	0.59
Arecanut	12269	8.66
Tamarind	215	0.15
Nutmeg	60	0.042
Jack	1901	1.34
Mango	2325	1.64
Banana	823	0.53
Pineapple	58	0.04
Papaya	318	0.22
Other fruits	311	0.22
Cashew	24739	17.46
Drumstick	436	0.31

Contd.

Table 3.3 (Contd.)

Crop	Area (in ha)	Percentage
Sweet potato	332	0.23
Tapioca	2433	1.72
Other tubers	313	0.22
Vegetables	5141	3.63
Coconut	44334	31.28
Sesamum	38	0.03
Others oilseed crop	52	0.04
Tobacco	252	0.18
Rubber	18308	12.92
Cocoa	286	0.20
Fodder crops	52	0.04
Green manure crops	900	0.64
Other non food crops	4137	2.92
Total cropped area	141730	100.00

Source: Farm Guide, 1993. Farm Information Bureau, Government of Kerala. pp.7-12.

Table 3.4 Crop-wise area under irrigation in Kasaragod district during 1990-91 (in ha.)

Crop	Area	Percentage to the area under the crop
Paddy	4627	32.37
Tubers	12	3.80
Vegetables	789	15.35
Coconut	18906	42.60
Arecanut	7420	60.47
Spices and condiments	74	0.36
Banana	999	40.50
Betal vine	24	96.00
Others	905	2.10
Total	33756	23.80

Source: Farm Guide, 1993. Farm Information Bureau, Government of Kerala. pp.32.

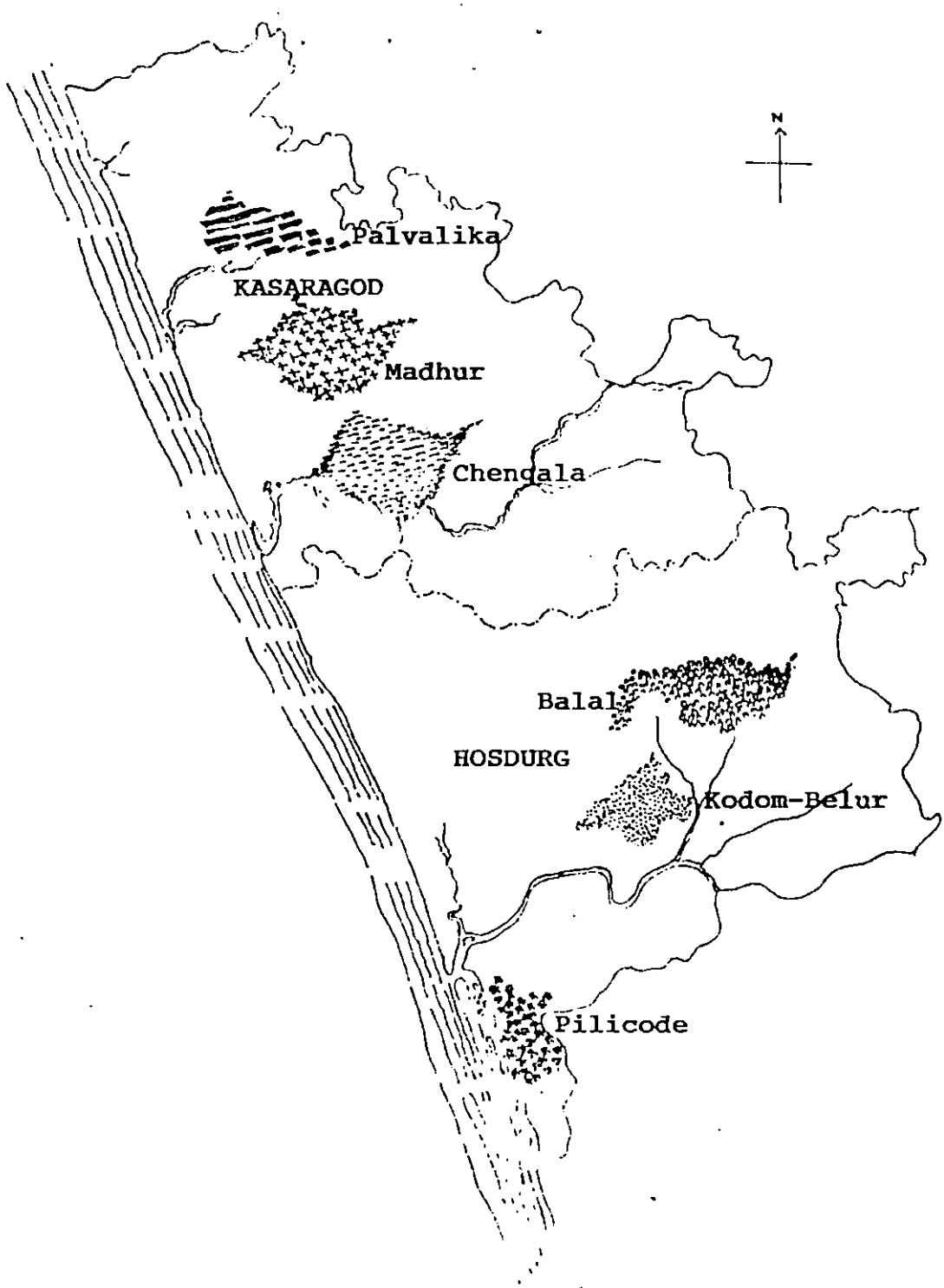
Table 3.5 Source-wise net area irrigated in Kasaragod district during 1990-91

Source	Area (in ha.)
Government canals	306
Private canals	364
Government tanks and wells	95
Private tanks and wells	13683
Minor and lift irrigation	292
Others sources	14812
Total	29552

Source: Farm Guide, 1993. Farm Information Bureau, Government of Kerala. pp.33.

Methodology

Fig.1 Map of Kasaragod district showing the study area



METHODOLOGY

The present study on economics of arecanut cultivation in Kasaragod district is based on data collected from a sample of cultivators in the study area. The procedure adopted in selecting sample farmers as well as the method of analysis are explained in this chapter.

Sampling procedure

The district of Kasaragod has two taluks, Hosdurg and Kasaragod. Three stage random sampling design was used for selection of sample farmers for collection of data from each taluk with Panchayat as first stage unit. Panchayat ward as second stage unit and arecanut growers as third stage unit. From each taluk a sample of three panchayats were selected with probability proportional to the area under arecanut. The panchayats thus selected were Pilicode, Balal and Kodom-Belur from Hosdurg taluk and Chengla, Madhur and Paivalika from Kasaragod taluk. From each selected panchayat, two wards were selected at random. Lists of arecanut growers in the selected panchayat ward were preferred and their holdings were stratified in the age group of 0-5 (planting to flowering stage) 5-10 (flowering to steady bearing stage) and 11-30 (steady bearing stage). Four cultivators were selected from

each of these three groups at random. Thus in total, a sample of 144 cultivators were selected. The selected cultivators were personally interviewed and data recorded on a well structured interview schedule. A specimen of the schedule is given in Appendix-I.

The selected 144 farmers were grouped into three strata based on their area under arecanut as indicated below:

Stratum I - Upto 0.4 ha

Stratum II - 0.4 - o.8 ha

Stratum III - 0.8 ha and above

Collection of data

The coverage of this study is confined only to pure crop. Inter/mixed cropping have not been analysed. Further the crop dealt here is grown on irrigated condition during summer.

The information collected included the area under arecanut, item-wise and year-wise costs and returns, problems faced by the cultivators and the resource use efficiency. From the holdings of 0-5 age group, data on labour charges incurred, costs of various inputs utilised and other details of operations such as preparatory cultivation, digging pits, purchase of seedings, planting, gap filling and shading,

application of farm yard manure and fertilisers, intercultivation operations and plant protections were collected. From the sixth year onwards, details of harvesting operations were also collected, in addition to the other details. Labour hours spent and expenses incurred for harvesting, transportation, dehusking, drying etc. were also included. The survey was conducted during March-June, 1992 and the reference period taken into consideration was 1991-92.

Method of analysis

Percentage analysis, capital productivity analysis and functional analysis were used for analysing and interpreting the data.

Concepts used in the study

Human labour

a. Family labour: The actual work done by the members of the family on crop production was taken as family labour.

b. Hired labour: The actual wage labour engaged in crop production was considered as hired labour.

Both family and hired labour were treated alike, considering 8 hours of work as one man-day and evaluated on the basis of actual wages paid to hired farmer.

Land tax

It was taken at the actual rate paid to the revenue department, which was Rs.10 per acre.

Cost of cultivation

Cost of cultivation refers to the total expenses incurred in cultivating one hectare of arecanut. The life-span of arecanut palm is expected to be 30-35 years. Generally the palm starts yielding from the 6th year and yield get stabilised by the 11th year of planting. From 11th year onwards items of cost remain the same, while steady yield would continue upto 30 years and yields decline from thirty to thirty five years. Beyond 35 years the returns over cost would be small and the present worth of this income would be negligible at the current interest rate. For this reason analysis was limited to 35 years. Data on costs and returns were collected upto steady bearing stage (11th year) and it was projected to 35 years. Total cost of cultivation year-wise and item-wise upto steady bearing were calculated and the percentages of individual items to total costs were worked out for stratum I, Stratum II, Stratum III and for the district.

Being a perennial crop, practical difficulties were experienced in obtaining correct information on income and expenditure relating to periods much earlier to the period of

data collection. Moreover it was also observed that the costs of inputs had increased considerably over the years. Hence an attempt was made here to present the cost of cultivation as it would have been present at 1991-92 prices. For this, information was gathered on the quantities of inputs applied by the sample cultivators during different years from planting to steady bearing.

The cost items included were cost of human labour (both hired and family labour), cost of inputs like seedlings, organic manure, fertilisers, plant protection chemicals and materials for shading, harvesting charges, cost of tools and implements, land tax and other miscellaneous expenditures.

Cost of production

The cost of production of arecanut was worked out in terms of the cost involved in producing one quintal of arecanut (Kottadakka). In the computation, the actual expenditure incurred by the sample cultivators was considered.

Cost of production is made up of two major components, establishment costs and maintenance costs. For estimating the cost of production, the following considerations have been taken into account.

Investment on an arecanut plantation is on asset that cannot be recycled. The return from the plantation during its yielding period should cover the entire investment plus a fair rate of interest (in this case 10 per cent), in addition to the annual maintenance cost in the bearing stage (Das, 1984). The total investment namely costs from the first to the end of the fifth year and compound interest thereon were reduced to a capital recovery factor. The capital recovery factor was based on the following formula.

$$C = \frac{P}{\sum_{t=1}^{n} \frac{1}{(1+i)^t}}$$

where,

C = capital recovery factor

P = total investment

i = rate of interest

n = economic life of the plantation

The capital recovery factor was added to the annual maintenance charges to arrive at the total annual cost per hectare. This cost was then divided by the average annual production of nuts to arrive at the cost of production per quintal. Estimation was done separately for Stratum I, Stratum II, Stratum III and for the district.

Capital productivity analysis

Capital productivity analysis 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 are (1) pay-back period (2) benefit-cost ratio (3) net present worth and (4) internal rate of return. The estimated annual cost of cultivation and returns obtained over the economic life of the palm were used for these computations. The first one is an undiscounted measure and all others are discounted measures.

Pay-back period

The pay-back period is the length of time from the beginning of the project till the time when net benefit pay up fully the cost of the capital investment (Gittinger, 1976). 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.

The other three measures are discounted measures of investment worth.

Benefit cost ratio

The benefit-cost ratio indicates the return on a rupee investment. It is defined as the ratio between the present

worth of benefits and that of costs (Gittinger, 1976). A project with benefit-cost ratio greater than unity is considered viable.

$$\text{Benefit cost ratio} = \frac{\text{Present worth of benefits}}{\text{Present worth of costs}}$$

$$\frac{\sum_{t=1}^{n} \frac{B_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{C_b}{(1+i)^t}}$$

where,

B_t = Benefits in t^{th} year

C_t = Cost in t^{th} year

n = Total number of years of the project

i = Rate of interest

The rate of interest used for estimating present worth is 14 per cent per annum being the interest rate at which long term credit is availed.

Net present worth

The most straight forward discounted cash flow measure of project worth is the net present worth. This is simply the present worth of the net cash flow stream (Gittinger, 1976). It tries to project the feasibility of cultivation and is the difference between the present worth of benefits and present worth of costs. The formal selection criterion for the net present worth measure of project worth is to accept all project with a positive net present worth when discounted at the opportunity cost of capital.

Symbolically, net present worth (NPW)

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

The symbols are the same as mentioned earlier.

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 worth of the cash flow equal 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, (1976). The formal selection criterion for the internal rate

of return measure of project worth is to accept all projects having an internal rate of return above the opportunity cost of capital.

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

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

The symbols are the same as mentioned earlier. The value of 'i' was determined by trial and error method.

Sensitivity analysis was done to see how sensitive the returns from arecanut cultivation to 20 per cent fall in price.

Resource use efficiency

The best method of measuring the nature of resource use efficiency is by fitting a production function (Heady, 1946). A production function is an algebraic equation expressing the relationship between the output factor and each of the input factors. A production function can be used as a guide to farmers in decision making.

In this study, Cobb-Douglas production function was applied for studying the relationship between the output and the various input variables used. Cobb-Douglas production function was used since it is the best method of measuring the nature of resources used in agriculture and it allows diminishing marginal productivity, increasing or decreasing return to scale.

The function can be represented as

$$Y = bo\ x_1^{b_1}\ x_2^{b_2}\ x_3^{b_3}\ x_4^{b_4}\ x_5^{b_5}\cdots$$

where,

Y = Gross income per hectare per year in rupees

x_1 = Labour charges per hectare in rupees excluding that of irrigation

x_2 = Cost of manures and fertilisers per hectare per year in rupees

x_3 = Cost of plant protection in rupees

x_4 = Cost for irrigation in rupees

b_1, b_2 b_3 b_4 are the regression coefficients. Resource use efficiency evaluation was done for the sample as a whole.

Results and Discussion

RESULTS AND DISCUSSION

This chapter deals with the results of the study and the discussion thereon. As already mentioned in previous chapters this study is based mainly on data generated through a sample survey of arecanut farmers in selected panchayats of Kasaragod district. This chapter is divided into six sections. In the first section, an account of certain general socio-economic features of the sample farmer household is attempted. Cost of cultivation of arecanut is dealt with in section II. Cost of production is dealt in section III. Section IV deals with the capital productivity analysis while section V deals with resource use efficiency. The general problems faced by the sample arecanut farmers are dealt with in section VI.

Section I: General socio-economic features of the sample farmer households

To obtain a background information about the general socio-economic features of the sample farmer households, their family details regarding education, occupation, holding size, cropping pattern, family income etc. were studied.

Family size

The distribution of respondent families on the basis of size is given in Table 5.1. The average size of family was 6.79 for the sample as a whole. Family size increased with size of holding and ranged from 6.34 to 7.17. In a recent study in Idukki district, Jayesh (1994) found that average family size was smaller at Thodupuzha block, the average being 4.25, when compared to Kattappana block with a family size of 6.54. It can be seen that 55.22 per cent of the total families in stratum I, 42.86 per cent in stratum II and 42.85 per cent in stratum III had 4-6 members. Similarly 44.78 per cent in stratum I, 51.02 per cent in stratum II and 42.85 per cent in stratum III had 7-9 members. The families having more than nine members were none in stratum I 6.1 per cent in stratum II and 14.29 per cent in stratum III.

Age

In Table 5.2 the respondents have been classified on the basis of age. It reveals that 20 per cent of the respondent in stratum I, 16 per cent in stratum II and 10.34 per cent in stratum III belonged to the age group of 31 to 40 years. The percentage of respondents in the age group of 41 to 50 years was 29.23 in stratum I, 34 in stratum II and 51.7 in stratum III. 38.46 per cent of the respondents in

Table 5.1 Distribution of respondent families on the basis of size

Family size (Number of members)	Stratum I		Stratum II		Stratum III		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
4-6	37	55.22	21	43.75	12	41.38	70	48.61
7-9	30	44.77	24	50.00	13	44.83	67	46.53
Above 9	--	--	3	6.25	4	13.79	7	4.86
Total	67	100.00	48	100.00	29	100.00	144	100.00
Average family size	6.34		6.87		7.17		6.79	

Table 5.2 Age group classification of respondents

Age (in years)	Stratum I		Stratum II		Stratum III		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
31-40	14	20.89	7	15.58	3	10.34	24	16.66
41-50	19	28.36	17	35.42	16	55.17	52	36.11
51-60	26	38.80	16	33.30	6	20.68	48	33.30
Above 60	8	11.94	8	16.60	4	13.79	20	13.88
Total	67	100.00	48	100.00	29	100.00	144	100.00
Average age	49.68		50.71		49.29		49.89	

stratum I, 34 per cent in stratum II and 20.68 per cent in stratum III were in the age group of 51 to 60 years and those above 60 years were 12.31 per cent in stratum I, 16 per cent in stratum II and 17.24 per cent in stratum III. The average age for the sample respondents was 49.68 years in stratum I, 50.71 in stratum II and 49.29 in stratum III and 49.89 for the sample as a whole. Thus the respondents as a whole can be considered to be in fairly early to middle but of their working life.

Education

Literacy plays an important role in the development of the rural people. An examination of the levels of education of members of the sample families showed a high level of literacy. Excluding those below five years, it has been found that 99.48 per cent of the members were literate. Illiterate were found only in the first two strata. Those educated upto Lover Primary School were 29.8 per cent in stratum I, 27.46 per cent in stratum II and 26.53 per cent in stratum III. It was found that 23.1 per cent in stratum I, 25.07 per cent in stratum II and 26.02 per cent in stratum III were educated upto Upper Primary School and those educated upto High School were 23.76 per cent in stratum I, 21.49 per cent in stratum II and 20.9 per cent in stratum III. Eight to eleven per cent were educated upto undergraduate level and 6.6 per cent in

Table 5.3 Distribution of family members of respondents on the basis of education

Level of education	Stratum I		Stratum II		Stratum III		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
0-5	32	7.55	27	8.06	18	9.18	77	8.06
Illiterate	2	0.47	3	0.90	--	--	5	0.52
Lower Primary School	127	29.95	92	27.46	52	26.54	271	28.38
Upper Primary School	98	23.11	84	25.07	51	26.02	233	24.40
High School	101	23.82	72	21.49	41	20.92	214	22.41
Under graduate	37	8.73	26	7.76	22	11.22	85	8.90
Graduate	27	6.37	31	9.26	12	6.12	70	7.33
Total	424	100.00	335	100.00	196	100.00	955	100.00

stratum I, 9.25 per cent in stratum II and 6.12 per cent in stratum III were graduates. The distribution of family members on the basis of education is given in Table 5.3.

Occupation

Occupation-wise distribution of family members of the respondents is given in Table 5.4. It can be observed that most of the members in the sample had more than one occupation. The total number of individuals in the working age group of 14 to 60 years was 725. Those engaged in sole occupation of agriculture contributed 23.86 per cent of the total. Only 21.57 per cent in stratum 1, 24.92 in stratum II and 26.85 per cent in stratum III were engaged in agriculture. Another 28.55 per cent was engaged in agriculture as well as service. There was not much difference in percentage among the three strata. Thirty two per cent of those in the working age group was engaged in business as well as agriculture. Percentage of those engaged in business and agriculture declined with increase in size of holding. Those engaged in business were 36.64 per cent in stratum I, 29.85 per cent in stratum II and 25.92 per cent in stratum III. Almost 15 per cent was engaged in agriculture, business and service. They were 13.01 per cent in stratum I, 17.23 per cent in stratum II and 17.59 per cent in stratum III.

Table 5.4 Occupation-wise distribution of the families of respondents

Occupation	Stratum I		Stratum II		Stratum III		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Agriculture alone	63	21.57	81	24.92	29	26.85	173	23.86
Agriculture + Service	84	28.77	91	28.00	32	29.63	207	28.55
Agriculture + Business	107	36.65	97	29.85	28	25.93	232	32.00
Agriculture + Service + Business	38	13.01	56	17.23	19	17.59	113	15.59
Total	292	100.00	325	100.00	108	100.00	725	100.00

Family income

Family income is the income of the household from all sources per annum. Information on family income is given in Table 5.5. There exerted wide disparity in family income, both within stratum as well as between strata. Largest percentage of families was in income range of 15000 to 25000 followed by 5000 to 15000. Majority of the families in all the strata were in the income class of 15000 and above. Families with less than 15000 annual income occurred mainly in the first and second strata.

Cropping pattern

Table 5.6 summaries cropping pattern of sample holdings. An analysis of the cropping pattern showed that for the sample as a whole more than fifty per cent of the area were devoted to arecanut. In all the strata a sizeable percentage of the gross cropped area was devoted to the cultivation of arecanut. Percentage of area devoted to arecanut increased with size of holding and these were 40.82 in stratum I, 42.67 in stratum II and 50.52 in stratum III. The second crop in importance was coconut followed by rubber and banana. Other crops like paddy, tapioca, ginger, spice crops, cashew etc. were also seen in the sample household, which altogether came to 3.95 percentage of the gross cropped area.

Table 5.6 Cropping pattern of the sample holdings

Crop	Gross cropped area (in hectares)				Percentage to the gross cropped area			
	Stratum I	Stratum II	Stratum III	Total	Stratum I	Stratum II	Stratum III	Total
Arecanut	16.51	25.25	28.30	70.06	46.18	43.63	53.99	47.97
Coconut	9,24	13.62	11.40	34.26	25.85	23.53	21.75	23.46
Rubber	7.10	14.20	8.60	29.90	19.86	24.54	16.40	20.40
Banana	1.26	2.62	2.18	6.06	3.52	4.53	4.16	4.15
Others	1.64	2.18	1.94	5.76	4.59	3.77	3.70	3.95
Total	35.75	57.87	52.42	146.04	100.00	100.00	100.00	100.00

Table 5.5 Distribution of respondents on the basis of family income

Family income (in rupees)	Stratum I		Stratum II		Stratum III		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Upto 5000	3	4.48	4	8.33	2	6.90	9	6.25
5000-15000	22	32.84	16	33.33	6	20.69	44	30.56
15000-25000	33	49.25	21	43.76	9	31.03	63	43.75
Above 25000	9	13.43	7	14.58	12	41.38	28	19.44
Total	67	100.00	48	100.00	29	100.00	144	100.00

Section II: Cost of cultivation

Cost of cultivation refers to the total expenses incurred in cultivating one hectare of the crop. Arecanut, being a perennial crop, the costs for its cultivation are incurred over a period of time. Practical difficulties were experienced in obtaining correct information on income and expenditure relating to periods much earlier to the period of data collection for this study. Here an attempt is made to present the cost of cultivation as it would have been incurred at 1991-92 prices. For this, information was gathered on the quantities of various inputs applied by the sample cultivators during different years from planting to steady bearing years. The inputs used were tabulated and the per hectare requirement of the different inputs for the various years of cultivation have been worked out. The inputs were valued at the rates that prevailed during 1991-92. Every effort was made to obtain data on input use s accurately as possible under the circumstances by checking and crosschecking. Total cost for cultivating one hectare of arecanut for 11 years (planting to steady bearing) is presented in Table 5.7.

On an average total expenditure was Rs.1,07,133/- and ranged from Rs.1,08,463/- in the first stratum to Rs.1,04,966/- in the third stratum. Thus a clear cut inverse relationship was found between holding size and total

Table 5.7 Estimated cost of cultivation of arecanut per hectare for 11 years (in rupees at 1991-92 prices)

Year	Stratum I		Stratum II		Stratum III		District	
1.	18663	(17.21)	18095	(17.06)	17671	(16.83)	18210	(16.99)
2.	7786	(7.18)	7592	(7.16)	7623	(7.26)	7684	(7.17)
3.	7934	(7.31)	7812	(7.37)	7751	(7.38)	7848	(7.32)
4.	8127	(7.49)	8030	(7.57)	8114	(7.73)	8095	(7.56)
5.	8311	(7.66)	8247	(7.78)	8176	(7.79)	8255	(7.70)
6.	8628	(7.95)	8741	(8.24)	8692	(8.28)	8679	(8.10)
7.	8693	(8.01)	8748	(8.25)	8713	(8.30)	8715	(8.13)
8.	9122	(8.41)	9014	(8.50)	8976	(8.55)	9050	(8.45)
9.	9664	(8.91)	9521	(8.98)	9562	(9.11)	9594	(8.96)
10.	9664	(8.91)	9521	(8.98)	9562	(9.11)	9594	(8.96)
11.	11871	(10.94)	10714	(10.10)	10126	(9.65)	11409	(10.65)
Total	108463	(100)	106035	(100)	104966	(100)	107133	(100)

Figures in parentheses represent the percentages to the total

Table 5.8 Input-wise break up of the total cost of cultivation for 11 year (in rupees)

Item	Stratum I		Stratum II		Stratum III		District	
Human labour	49214	(45.37)	47148	(44.46)	46822	(44.61)	47947	(44.75)
Materials for shading	5218	(4.81)	5112	(4.82)	5026	(4.79)	5134	(4.79)
Seedlings	6736	(6.21)	6568	(6.19)	6484	(6.18)	6608	(6.17)
Manures and Fertilizers	28632	(26.39)	27124	(25.58)	25818	(24.59)	27769	(25.92)
Plant protection Chemicals	9276	(8.55)	10216	(9.63)	10524	(10.02)	9897	(9.24)
Depreciation charges	4420	(4.07)	4420	(4.17)	4420	(4.21)	4420	(4.13)
Land tax	275	(0.25)	257	(0.26)	275	(0.26)	275	(0.26)
Miscellaneous	4692	(4.33)	5172	(4.88)	5597	(5.33)	5083	(4.74)
Total	108463	(100.00)	106035	(100.00)	104966	(100.00)	107133	(100.00)

Figures in parentheses represent the percentages to the total

expenditure. Expenditure was highest during the first year. Average for the sample as a whole amounted to Rs.18,210/- constituting seventeen per cent of the total for 11 years period.

The high cost during the first year of cultivation was because of preparatory cultivation, cost of seedlings and planting.

Input-wise break up of the total cost of cultivation till the period of yield stabilisation i.e., 11 years is shown in Table 5.8. It can be seen from the table that the largest share of the total cost in all the cases was human labour accounting for about 45 per cent. Expenditure on manures and fertilizers accounted for about 26 per cent while plant protection costs accounted for about 9 per cent. For all the other items together the expenditure was found to be below 9 per cent.

A stratum-wise comparison of the expenditure on human labour shows an inverse relationship with size of holding. In fact, inverse relationship with size is found in the case of most of the inputs.

The cost of human labour came to Rs.49,214/- for stratum I, 47148 for stratum II, 46822 for stratum III and 47947 for the district which accounts for 45.37, 44.46, 44.61

and 44.75. Percentages of the total cost for stratum I, II, III and for the district respectively. The break up of the labour utilisation into hired and family labour in mandays along with their percentages for 11 years is shown in Table 5.9. Labour contributed by family members came to 43.66, 42.42, 38.65 and 41.66 per cent of the total labour requirement in stratum I, II, III and the district respectively.

In terms of mandays, labour put in by family members declined from 451 mandays in the first stratum to 420 in the second stratum and 361 in the third stratum, indicating a clear-cut inverse relationship with size of holding. The absolute decline in family labour is attributable to the higher socio-economic status of larger sized holdings.

The cost of seedlings per hectare was Rs.6,736, Rs.6,568, Rs.6,484 and Rs.6,608 respectively for stratum I, stratum II, stratum III and for the district as shown in Table 5.8. Cost of seedlings for gap filling has also been included under this. The average number of trees per hectare was 1,674, 1,632, 1,611 and 1,639 in stratum I, II, III and the district.

The expenditure on materials for shading came to 4.81, 4.82, 4.79 and 4.79 percentages of the total cost of cultivation in stratum I, II, III and the district

Table 5.9(a) Hired and family labour utilization for arecanut per hectare (in mandays)

Stratum I

Year	Hired		Family		Total	
1.	104	(59.43)	71	(40.57)	175	(100.00)
2.	40	(52.63)	36	(47.37)	76	(100.00)
3.	43	(54.43)	36	(45.57)	79	(100.00)
4.	43	(55.84)	34	(44.15)	77	(100.00)
5.	43	(55.84)	34	(44.15)	77	(100.00)
6.	49	(46.32)	38	(43.68)	87	(100.00)
7.	49	(56.32)	38	(43.68)	87	(100.00)
8.	49	(56.32)	38	(43.68)	87	(100.00)
9.	54	(56.25)	42	(43.75)	96	(100.00)
10.	54	(56.25)	42	(43.75)	96	(100.00)
11.	54	(56.25)	42	(43.75)	96	(100.00)
Total	582	(56.34)	451	(43.66)	1033	(100.00)

Figures in parentheses represent the percentages to the total

Table 5.9 (b) Hired and family labour utilization for arecanut per hectare (in mandays)

Stratum II

Year	Hired		Family		Total	
1.	106	(61.27)	67	(38.73)	173	(100.00)
2.	42	(55.26)	34	(44.74)	76	(100.00)
3.	42	(55.26)	34	(44.74)	76	(100.00)
4.	42	(58.33)	30	(41.66)	72	(100.00)
5.	41	(57.75)	30	(42.25)	71	(100.00)
6.	46	(56.09)	36	(43.90)	82	(100.00)
7.	46	(56.09)	36	(43.90)	82	(100.00)
8.	46	(56.09)	36	(43.90)	82	(100.00)
9.	53	(57.61)	39	(42.39)	92	(100.00)
10.	53	(57.61)	39	(42.39)	92	(100.00)
11.	53	(57.61)	39	(42.39)	92	(100.00)
Total	571	(57.68)	420	(42.42)	990	(100.00)

Figures in parentheses represent the percentages to the total

Table 5.9 (c) Hired and family labour utilization for arecanut per hectare (in mandays)

Stratum III

Year	Hired		Family		Total	
1.	112	(68.71)	51	(31.29)	163	(100.00)
2.	43	(58.11)	31	(41.89)	74	(100.00)
3.	43	(58.11)	31	(41.83)	74	(100.00)
4.	45	(61.64)	28	(38.36)	73	(100.00)
5.	45	(61.64)	28	(38.36)	73	(100.00)
6.	46	(60.53)	30	(39.47)	76	(100.00)
7.	46	(60.53)	30	(39.47)	76	(100.00)
8.	46	(60.53)	30	(39.47)	76	(100.00)
9.	49	(59.04)	34	(40.96)	83	(100.00)
10.	49	(59.04)	34	(40.96)	83	(100.00)
11.	49	(59.04)	34	(40.96)	83	(100.00)
Total	573	(61.35)	361	(38.65)	934	(100.00)

Figures in parentheses represent the percentages to the total

Table 5.9(d) Hired and family labour utilization for arecanut per hectare (in mandays)

District

Year	Hired		Family		Total	
1.	107	(62.94)	63	(37.06)	170	(100.00)
2.	42	(55.26)	34	(44.74)	76	(100.00)
3.	43	(55.84)	34	(44.15)	77	(100.00)
4.	43	(58.11)	31	(41.89)	74	(100.00)
5.	43	(58.11)	31	(41.89)	74	(100.00)
6.	47	(57.32)	35	(42.68)	82	(100.00)
7.	47	(57.32)	35	(42.68)	82	(100.00)
8.	49	(58.33)	35	(41.66)	84	(100.00)
9.	52	(57.77)	38	(42.22)	90	(100.00)
10.	52	(57.77)	38	(42.22)	90	(100.00)
11.	52	(57.77)	38	(42.72)	90	(100.00)
Total	577	(58.34)	412	(41.66)	989	(100.00)

Figures in parentheses represent the percentages to the total

respectively. The expenditure was Rs.5,218 for stratum I, Rs.5,112 for II, Rs.5,026 for stratum III and Rs.5,134 for the district, as evident from the Table .

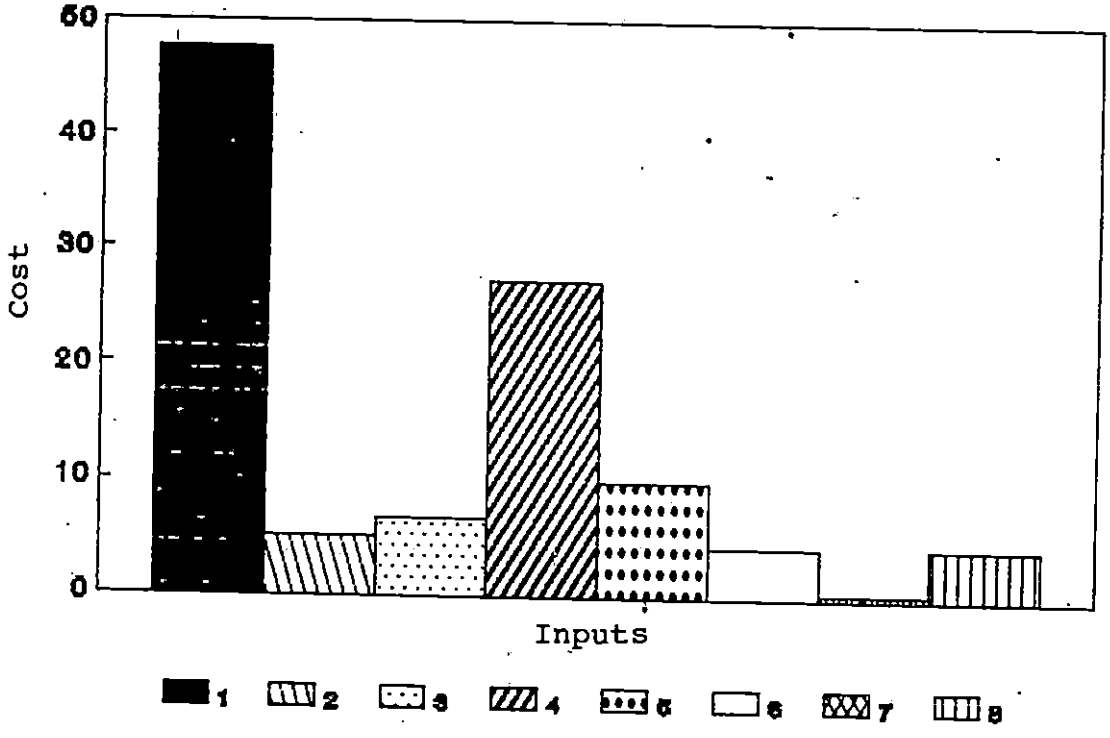
Total expenditure on manures and fertilizers was Rs.28,632 for stratum I Rs.27,124 for stratum II, Rs.25,818 for stratum III and Rs.27,769 for the district. This worked out to 26.39, 25.58, 24.59 and 25.92 percentages of the total cost of cultivation for eleven years in stratum I, stratum II, stratum III and the district respectively.

Expenditure on plant protection included cost of chemicals, application and hire charges of equipment. The total expenditure was found to be Rs.9,276, Rs.10,216, Rs.10,521 and Rs.9897 for stratum I, II, III and the district respectively. This was 8.55, 9.63, 10.02 and 9.24 percentages of the total cost of cultivation for 11 years in stratum I, stratum II, stratum III and the district respectively.

Depreciation is the decline in the value of a given asset as a result of the use, wear and tear, accidental damage and time absolesence (Johl and Kapur, 1987). Here depreciation charges of tools, implements and machineries were found out by straight line method.

$$= \frac{\text{Purchase price of the asset - the Junk value}}{\text{No. of useful years of expected life}}$$

Fig.2 Input-wise total cost of cultivation per hectare of arecanut for 11 years for the distirct (in Rs.)



1 Cost of human labour

2 Cost of materials for shading

3 Cost of seedlings

4 Cost of manures and fertilizers

5 Cost of plant protection chemicals

6 Depreciation charges

7 Land tax

8 Miscellaneous

The expenditure on depreciation for tools, machinery implements etc. for 11 years came to Rs.4,420 which accounts for 4.07, 4.17, 4.21 and 4.13 percentages for strata I, II, III and the district respectively.

Land tax was taken at the actual rate paid to the revenue department which was Rs.25 per hectare during the year 1991-92. The expenditure for this item for 11 years came to Rs.275 in all the strata and the district.

All the other expenditure were taken as miscellaneous expenditure. It come to Rs.4,692, Rs.5,172, Rs.5,597 and Rs.5,083 for stratum I, stratum II, stratum III and for the district respectively which was 4.33, 4.88, 5.33 and 4.74 percentages respectively of the total cost of cultivation.

Considering the crop cycles of arecanut as 35 years the costs and returns per hectare for the strata and the district for the entire period has been worked out and presented in Table 5.10. It has been assumed that the costs from the eleventh year to the thirty fifth year remain the same. The yield of nuts would decline from the thirtieth year to the thirty fifth year.

Section III: Cost of production

Cost of production of Arecanut is the cost incurred in producing one quintal of Arecanut kernal (Kottadakka). The

Table 5.10 Costs and returns per hecatare for a crop cycle of arecanut (in rupees)

Year	Cost				Returns			
	Stratum I	Stratum II	Stratum III	District	Stratum I	Stratum II	Stratum III	District
1.	18663	18095	17671	18210	--	--	--	--
2.	7786	7592	7623	7684	--	--	--	--
3.	7934	7812	7751	7848	--	--	--	--
4.	8127	8030	8114	8095	--	--	--	--
5.	8311	8247	8176	8255	--	--	--	--
6.	8628	8741	8692	8679	7651	7420	7143	7442
7.	8693	8748	8713	8715	13210	13126	12918	13104
8.	9122	9014	8976	9050	28712	28134	26128	27826
9.	9664	9521	9562	9594	42970	40360	38017	40833
10.	9664	9521	9562	9594	64721	62118	60920	62906
11-30	11871	10714	10126	11409	68318	64368	61418	65249
31.	11871	10714	10126	11409	60816	55225	53360	57114
32.	11871	10714	10126	11409	56420	54283	53064	54864
33.	11871	10714	10126	11409	50116	50025	51016	50339
34.	11871	10714	10126	11409	45117	43120	42785	43887
35.	11871	10714	10126	11409	41228	40714	40075	40758
					135000	135000	135000	135000

actual expenditure incurred by the sample cultivators in each stratum was taken for the computation of costs. The economic life of an arecanut palm was considered as 35 years with yield obtained from sixth year onwards.

The cost of bringing one hectare of arecanut garden upto bearing stage and the average annual maintenance cost per hectare was found to be Rs.50,821 and Rs.11802 for stratum I, Rs.4,97,761/- and Rs.10,393/- for stratum II, Rs.49,335 and Rs.9,921/- for stratum III and Rs.50,092 and Rs.10,952/- for the district. The total investment, namely initial five years expenditure and the compound interest there on were reduced to an annuity hearing 14 per cent interest. The annuity value in this study came to Rs.9,409 for stratum I, 9228 for stratum II, 9157 for stratum III and 9285 for the district. It was added to the overall annual maintenance charges to arrive at the total annual cost per hectare. Here the total annual cost came to Rs.21,211 for stratum I, Rs.19,621 for stratum II, Rs.19,078/- for stratum III and Rs.20,237/- for the district. This total cost have been divided by the average production of nuts per hectare to arrive at the cost of production per quintal. Accordingly the cost of production came to Rs.1,591/- for stratum I, Rs.1,513/- for stratum II, Rs.15,24[illegible]/- for stratum III and Rs.15,39[illegible]/- for the district. The computation of cost of production per quintal is shown in Table 5.11.

Table 5.11 Estimated cost of production of arecanut (Rupees/hectare)

Sl.No.	Particulars	Stratum I	Stratum II	Stratum III	District
1.	Investment during establishment of plantation upto bearing	50821	49776	49335	50092
2.	Compound interest on investment at 10% (1-5 years)	14964	14742	14682	14821
3.	Total investment	65785	64518	64017	64913
4.	Annuity value (share of total investment to be adjusted over a period of 30 years)	9409	9228	9157	9285
5.	Annual maintenance cost	11802	10393	9921	10952
6.	Total cost per hectare per year	21211	19621	19078	20237
7.	Average production of nuts per hectare per year (qtls)	13.68	12.97	12.52	13.15
8.	Cost of production per quintal	1551	1513	1524	1539

Section IV: Capital productivity analysis

Arecanut has a long gestation period and considerable investments are made over several years before the crop starts to yield. The returns are spread over a long period. The economics of investments on such a crop has to be evaluated taking into consideration the total period of the crop in the field.

Capital productivity analysis brings out the efficiency of capital use in production. An attempt is made here to measure the productivity of capital taking alternator measures of capital productivity into consideration, viz. (1) pay back period (2) benefit-cost ratio (3) net present worth and (4) internal rate of return. The estimated cost of cultivation and returns obtained were used for these computations.

Pay back period

The pay back period is the length of time from the beginning of the project before the net benefits return the cost of capital investment (Gittinger, 1976). It is an undiscounted measure of worthiness of an endeavour, which measures the efficiency of cultivation by indicating the period within which the return offset the investment.

The pay back period for the three strata and the district were estimated to be as follows.

Stratum I

Net return on progressive total for 8th year = Rs.-27691

Net return on progressive total for 9th year = Rs.5615

$$\text{Pay back period} = 8 + 1 \left[\frac{-27691}{-27691 - 5615} \right]$$

$$= 8.83 \text{ years}$$

Stratum II

Net return on progressive total for 8th year = Rs.-27599

Net return on progressive total for 9th year = Rs.3240

$$\text{Pay back period} = 8 + 1 \left[\frac{-27599}{-27599 - 3240} \right]$$

$$= 8.89 \text{ years}$$

Stratum III

Net returns on progressive total for 9th year = Rs.-1070

Net returns on progressive total for 10th year = Rs.50286

$$\text{Pay back period} = 9 + 1 \left[\frac{-1070}{-1070 - 50286} \right]$$

$$= 9.021 \text{ years}$$

District

Net returns on progressive total for 8th year = Rs.-28164

Net returns on progressive total for 9th year = Rs.3075

$$\text{Pay back period} = 8 + 1 \left[\frac{-28164}{-28164 - 3075} \right]$$

$$= 8.91 \text{ years}$$

The above results indicate that stratum I has a shorter pay back period than the rest. Detailed computation of pay back period is given in Appendix II.

Pay back period has two major drawbacks as a measure of investment worth: (1) the pay back period fails to consider earnings after the pay back period and (2) it fails to take into consideration differences in the timing of earnings during the pay back period.

The other three measures are discounted measures of investment worth. The costs and returns are discounted at 14 per cent rate of interest, being the rate at which long term credit could be obtained.

Benefit cost ratio

The benefit cost ratio indicates the return on a rupee of investment. It is defined as the ratio between the present worth of benefits and that of costs (Gittinger, 1976). A

project with benefit cost ratio greater than unity is considered viable. All costs and all benefits were discounted for each year. The present worth of benefits and that of costs were then compared. The benefit cost ratio for the three strata and the district were estimated as follows.

Stratum I

Present worth of benefits = Rs.176276

Present worth of costs = Rs.75064

Benefit cost ratio = $\frac{176276}{75064}$

= 2.35

Stratum II

Present worth of benefits = Rs.167247

Present worth of costs = Rs.72060

Benefit cost ratio = $\frac{167247}{77060}$

= 2.32

Stratum III

Present worth of benefits = Rs.159966

Present worth of costs = Rs.70932

Benefit cost ratio = $\frac{159966}{70932}$

= 2.25

District

Present worth of benefits = Rs.169099

Present worth of costs = Rs.73593

Benefit cost ratio = $\frac{169099}{73593}$

= 2.29

Since these ratios are much greater than unity, the investments are economically justified. In all these the B-C ratio is greater than 2. This indicates the high profitability of arecanut cultivation. The computation of benefit cost ratio is given in Appendix III.

Net present worth

The most straight forward discounted cash flow measure of a project is the net present worth. This is simply the present worth of the cash flow stream (Gittinger, 1976). It tries to project the feasibility of cultivation and is the difference between the present worth of benefits and present worth of costs. The formal selection criterion for the net present worth measure of project worth is to accept all projects with a positive net present worth when discounted at the opportunity cost of capital.

The net present worth of a hectare of arecanut

plantation for the three strata and the district were estimated as follows:

Stratum I

Present worth of benefits	=	Rs.176276
Present worth of costs	=	Rs.75064
Net present worth	=	176276 - 75064
	=	Rs.101212

Stratum II

Present worth of benefits	=	Rs.167247
Present worth of costs	=	Rs.72060
Net present worth	=	167247 - 72060
	=	Rs.95187

Stratum III

Present worth of benefits	=	Rs.159966
Present worth of costs	=	Rs.70932
Net present worth	=	159966 - 70932
	=	Rs.89034

District

Present worth of benefits	=	Rs.169099
Present worth of costs	=	Rs.73593
Net present worth	=	Rs.95506

The net present worth is positive for all three strata and the district. Stratum I has higher net present worth than the other two. The computation of net present worth is given in Appendix III.

Internal rate of return

Internal rate of return is that discount rate which just makes the net present worth of the cash flow equal zero (Gittinger, 1976). It represents the average earning power of the money used in the project over the project life. The formal selection criterion for the internal rate of return measure of project worth is to accept all projects having an internal rate of return above the opportunity cost of capital.

The internal rate of return for the three strata and the district were estimated as follows:

Stratum I

Present worth of incremental benefit at 25% = Rs.7376

Present worth of incremental benefit at 28% = Rs.-99

$$\text{Internal rate of return} = 25+3\left[\frac{7376}{7376-(-99)}\right]$$

$$= 27.96\%$$

Stratum II

Present worth of incremental benefit at 25% = Rs.7130

Present worth of incremental benefit at 28% = Rs.-889

Internal rate of return $= 25+3\left[\frac{7130}{7130-(-889)}\right]$

$= 27.67\%$

Stratum III

Present worth of incremental benefit at 25% = Rs.5564

Present worth of incremental benefit at 28% = Rs.-1999

Internal rate of return $= 25+3\left[\frac{5564}{5564-(-1999)}\right]$

$= 27.36\%$

District

Present worth of incremental benefit at 25% = Rs.7096

Present worth of incremental benefit at 28% = Rs.-955

Internal rate of return $= 25+3\left[\frac{7096}{7096-(-955)}\right]$

$= 27.64\%$

The internal rate of return for all the strata are well above the opportunity cost of capital. Here the internal rate of return is highest for stratum I. The computation procedures are shown in appendix IV.

Sensitivity analysis

Sensitivity analysis was done to see how sensitive the returns from arecanut cultivation to a fall in prices. The market price of arecanut is taken into consideration for estimating the returns which was Rs.4850 per quintal. With a 20 per cent fall in price, it came to Rs.3880/- per quintal. Internal rate of return was computed under this changed price situation. The values were estimated as follows.

Stratum I

Present worth of incremental benefit at 23% = Rs.3605

Present worth of incremental benefit at 25% = Rs.-1915

$$\text{Internal rate of return} = 23+2\left[\frac{3605}{3605-(-1915)}\right]$$

$$= 24.31\%$$

Stratum II

Present worth of incremental benefit at 23% = Rs.2511

Present worth of incremental benefit at 25% = Rs.-2677

$$\text{Internal rate of return} = 23+2\left[\frac{2511}{1511-(-2677)}\right]$$

$$= 23.97\%$$

Stratum III

Present worth of incremental benefit at 23% = Rs.1093

Present worth of incremental benefit at 25% = Rs.-3794

Internal rate of return = $23+2\left[\frac{1093}{1093-(-3794)}\right]$

= 23.45%

District

Present worth of incremental benefit at 23% = Rs.2402

Present worth of incremental benefit at 25% = Rs.-2796

Internal rate of return = $23+2\left[\frac{2402}{2402-(-2796)}\right]$

= 23.92%

The above results indicate that arecanut cultivation is profitable even under the changed situation of 20 per cent fall in prices. Since the internal rate of return in all cases are above the opportunity cost of capital the investments are worthwhile.

Section V: Resource use efficiency

A scientific study of input-output relationship based on production function analysis will provide a sound basis for developing the economic aspect of crop production on a pattern that would guide the farmers to operate at the least cost and

highest profit combinations (Dhondayal, 1958). The productivities of individual resources particularly marginal productivities or elasticities can be derived from the production function which would indicate the efficiency of individual resources when used in varying proportion.

Specification of the model

The specification of the function fitted is as follows:

$$\text{Log } Y = \log a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4$$

where Y = Value of output in rupees

x_1 = Labour charges per hectare in rupees excluding that of irrigation

x_2 = Cost of manures and fertilisers per hectare per year in rupees,

x_3 = Cost of plant protection per hectare in Rupees,

x_4 = Cost for irrigation per hectare in rupees,

b_1, b_2, b_3, b_4 are the elasticity coefficients of respective variables.

The production function was fitted for the sample as a whole. The coefficient of multiple determination (R^2), regression coefficients, F-ratio, and t-values were determined and are given in Table 5.

The coefficient of determination (R^2) explains the proportion of variation in the dependent variable (Y) explained by the independent variables included in the function. The independent variables included in the fitted function could explain 35.4 per cent variation in the output for the sample.

The estimated regression coefficients (b_i) of independent variables are the production elasticities of the respective factors (x_i). The regression coefficient b_i indicates the percentage by which the output y would change if input x_i changes by one unit while all other factors remain constant at their geometric mean level.

The elasticity coefficients were found to be positive for all the variables indicating the positive effect on total output. The variables found to be significant are, cost of manures and fertilizers and cost of irrigation, implying that gross income increased with increase in each of these factor.

Returns to scale

By returns to scale it is meant the behaviour of production or returns when all the productive factors are increased or decreased simultaneously in the same ratio. In Cobb-Douglas production function regression coefficients are the production elasticities of each variable input. Therefore

Table 5.12 Regression coefficients and t values

Variables	Regression coefficients	t value
Manures and fertilizers	0.05141	2.417 *
Plant protection	0.013727	1.126
Irrigation	0.41079	4.06 *
Labour	0.0696	0.498

$F = 5.89$ *

$R^2 = 0.354$

* Significant at 5 per cent level

the sum of regression coefficients (b_i) of all the input variables provides us directly with a ready estimate of returns to scale. If sum of b_i s is not significantly different from one, constant returns to scale is indicated. It sum of b_i s is less than one, decreasing returns to scale is indicated and if it is greater than one, increasing returns to scale is indicated. Here the sum of regression coefficient is found to be 0.5455 which is significantly different from one indicating decreasing return to scale.

Marginal productivity analysis

Marginal productivity is the measure of the increase in total production for the addition of one unit of a particular resource above its mean level while other resources are held constant at their respective mean levels. Marginal value product is the marginal physical product represented in its value terms. The resource use efficiency has been judged on the basis of criterion that each factor of production is paid according to its marginal value productivity. A significant difference between marginal value product and market price of individual input would indicate whether the farmers are using their production factors inefficiently or efficiently (Thakur et al., 1990).

Marginal value productivity of the input factors were estimated by taking the partial derivatives of productivity

with respect to the inputs concerned, calculated at the geometric mean levels of the inputs.

$$MVP = \frac{\triangle x}{\triangle x_i} = \frac{b_i \, y}{x_i}$$

The marginal value productivity indicates the returns which on the average can be expected by adding one more unit of the input factor to the present average level of use, the other factors remaining at their geometric mean levels.

The Table 5.13 gives a clear indication that the two resources, manures and fertilizers and irrigation are really restricted resources since the MVP of a rupee invested in each case have appeared higher than unity. This suggests that if the farmer has unlimited amount of money the per hectare gross income from arecanut cultivation can be increased by expanding investment in these inputs. Thus a rupee of additional investment in manures and fertilizers and irrigation will add Rs.1.26/- and Rs.7.07/- respectively to the per hectare gross income from arecanut. Similarly the MVP of the other two inputs, plant protection and labour have appeared to be less than unity which indicates that the use of these resources are in excess and by the additional investment of a rupee will add only Rs.0.84/- in case of plant protection and Rs.0.91/- in case of labour.

Table 5.13 Geometric mean and marginal value product

Variables	Geometric mean	Regression coefficients	Marginal value product
Y (output)	60158	--	--
Manures and fertilizers	2451	0.05141	1.262
Plant protection	984	0.0137	0.839
Irrigation	3493	0.41079	7.07
Labour	4611	0.0696	0.908

Section VI: General problems faced by the sample farmers

The study was also aimed at understanding the problems of farmers engaged in the cultivation of Arecanut.

Management of the crop in almost all the holdings was affected by several socio-economic constraints.

There was a general antipathy among the farmers to chemical fertilizer application. The high cost of fertilizer was one of the factors behind it. Most of the farmers were using organic manures such as cattle manure, green leaf manure etc. in abundance for their crop. Water scarcity was another problem faced by the sample farmers. In the peek of summer season, water scarcity was a major problem for irrigating their gardens. Though most of the farmers have got pumpsets for irrigation the rising prices of fuel and electricity was another problem in irrigation.

Another drawback among the cultivators was adoption of improper spacing which will lead to further decline in production and net returns. This is because the farmers plant their holdings with maximum number of seedlings due to lack of knowledge about the scientific spacing of arecanut.

The increasing wage rate was said to be another problem of cultivators. The cultivators were not at all satisfied with the high wage rate prevalent in the region.

Summary

Occurrence of diseases especially mahali disease is a devastating problem in the arecanut growing belt of the district. Many of the farmers are fed up by applying fungicide and they are saying that a lot of money were spending for the control of thus disease. Farmers are spraying Bourdeux mixture four or five times or even more to get the control in an year.

Marketing of produce was found to be another problem faced by the cultivators, poor transportation facilities and high transportation costs rendered marketing difficult. Price fluctuations were said to be very high in arecanut. Though a high price is getting nowadays the farmers are afraid of quick fluctuation in the price of arecanut. Most of them were confronted with the problem of capital shortage for various cultivation operations. The interest rates charged by the financial institution were said to be too high and the farmers complained that they were not getting any incentives from any agencies or institutions that other plantation crops have.

Moreover there was no strong organisation among the cultivators. Still co-operative organisation like CAMPCO are helping the farmers to get their produce a fair price. The central Arecanut and cocoa marketing and processing co-operative was established in 1973 in order to safeguard the common interest of arecanut and cocoa growers of Kerala and Karnataka state.

SUMMARY

The present study on the economics of arecanut cultivation in Kasaragod district was undertaken with the following objectives in view. (1) To estimate the costs and return in arecanut cultivation, (2) To evaluate the resource use efficiency of yielding arecanut plantation, (3) To identify the problems faced by arecanut cultivators.

The respondents of the district were classified into three strata based on the size of the arecanut holding. They are:

Stratum I - upto 0.4 ha.
Stratum II - 0.4 to 0.8 ha
Stratum III - 0.8 ha and above

The data for the study were collected by personal interview method based on a well structured interview schedule from a sample of 144 arecanut cultivators. The sample was selected by three-stage random sampling with panchayat as first stage unit, panchayat ward as second stage unit and arecanut cultivators as third stage unit.

A study of the general socio-economic features of the sample former households showed that the size of family was

6.79 and 48.61 per cent of the sample farmers had four to six members in their family. The average age for the sample had more than one occupation. Only 23.86 per cent of the total respondents were pure agriculturists. the total family income per annum of most of the respondents come in the range of Rs.15,000 to 25,000. Analysis of the cropping pattern revealed that a major percentage of the gross cropped area was devoted to the cultivation of arecanut. The other important crops were rubber, paddy, coconut, banana, etc.

Data on costs and returns on arecanut were collected for a period of 11 years from the year of planting and the eleventh year was referred as the period of yield stabilisation. Cost of cultivation per hectare was calculated based on 1991-1992 prices.

Total cost of cultivation for 11 years was estimated to be Rs.108463, Rs.106035 and Rs.104966 for stratum I, stratum II and stratum III respectively and the average for the district was Rs.107133. Expenditure was the highest during the first year of planting because of preparatory cultivation, cost of seedling and planting.

The major item of expenditure was human labour constituting about 45.37 per cent (Rs.49214/-), 44.86 per cent (Rs.47148/-), 44.61 per cent (Rs.46822/-) and 44.75 per cent

(Rs.47947/-) of the total cost for 11 years in stratum I, stratum II, stratum III and the district respectively. Labour requirement was the highest during the first year of the crop which was due to the high use of labour for cleaning the fields, fencing, digging pits and planting. The total labour requirements for 11 years was 1033 mandays per hectare in stratum I and the corresponding values in stratum II, stratum III and the district were 990, 934 and 989, respectively.

The expenditure on seedling was Rs.6736, Rs.6568, Rs.6484 and Rs.6608 respectively for stratum I, II, III and the district. Materials for shading accounted for 4.81 per cent (Rs.5218/-), 4.82 per cent (Rs.5112/-), 4.79 per cent (Rs.5026/-) and 4.79 per cent (Rs.5134/-) of the total cost of cultivation in stratum I, stratum II, stratum III and the district. Expenditure on manures and fertilizers accounted for 26.39 per cent (Rs.28632/-), 25.58 per cent (Rs.27124/-), 24.59 per cent (Rs.25818/-) and 25.92 per cent (Rs.277691/-) in stratum I, stratum II, stratum III and the district. Plant protection accounted for 8.55 per cent (Rs.9276/-), 9.63 per cent (Rs.10216/-), 10.02 percent (Rs.10524/-) and 9.24 per cent (Rs.9897/-) for stratum I, II, III and the district respectively.

The depreciation charges of the various implements and machineries accounted for 4.07 per cent, 4.17 per cent, 4.21 per cent and 4.13 per cent for stratum I, stratum II, stratum III and for the district.

Land tax accounted for 0.25 per cent, 0.26 per cent, 0.26 per cent and 0.26 per cent for the three strata and the district. All other expenditure were taken as miscellaneous expenditure which was 4.33 per cent (Rs.4692/-), 4.88 per cent (Rs.5172/-), 5.33 per cent (Rs.5597/-) and 4.74 per cent (Rs.5083/-) respectively for stratum I, stratum II, stratum III and the district.

Cost of production per quintal was estimated as Rs.1551 for stratum I, Rs.1513 for stratum II, Rs.1524 for stratum III and Rs.1539 for the district.

Pay back period for stratum I, II, III and the district was found to be 8.83, 8.89, 9.02 and 8.91 years respectively. Benefit-cost ratios were 2.35, 2.32, 2.25 and 2.29 for the three strata and the district. Net present worth for stratum I, stratum II, stratum III and the district were estimated as Rs.101212/-, Rs.915187/-, Rs.89034/- and Rs.95506/-, respectively. Internal rate of return were 27.96 per cent, 27.67 per cent, 27.36 per cent and 27.64 per cent for stratum I, stratum II, stratum III and for the district.

Capital productivity analysis showed that the investments were highly worthwhile in all the three strata and the district.

Resource use efficiency of yielding arecanut plantation was studied by fitting a Cobb-Douglas production function for the sample as a whole. The independent variables included in the fitted function could explain 35.9 per cent variation in the output for the sample. The sum of all the regression coefficients which directly gives the return to scale was found to be 0.5455 indicating decreasing return to scale. The marginal value productivity which indicates the returns which can be expected by adding one more unit of the input factor to the present average level of use, the other factors remaining at their geometric mean level.

The marginal value productivity for the factors manures and fertilizers and irrigation was found to be 1.262 and 7.07 indicating that a rupee additional investment in these inputs will add Rs.1.26/- and Rs.7.07/- respectively to the per hectare gross income from arecanut. The MVP of other two inputs, labour and plant protection were found to be less than unity which shows these inputs are in excess use.

The general problems faced by the sample farmers were identified as shortage of enough irrigation facilities

especially during the peak summer months, high labour charges, occurrence of diseases especially mahali in majority of the plantations, problems relating to marketing of their produce which include poor transportation facilities and high transportation costs, high fluctuation in the price of the produce etc.

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Appendices

APPENDIX-I

QUESTIONS FOR DATA COLLECTION

ECONOMICS OF ARECANUT CULTIVATION IN KASARAGOD DISTRICT

1. Name and address of cultivator :

   Village :

   Taluk :

   Block :

2. Distance to the nearest market :

3. Family details:

Sl. No.	Name	Age	Sex	Relation with head	Education	Occupation

4. Total area cultivated

   a. Leased in

   b. Leased out

5.

Livestock	No.	Maintenance cost	Returns
a. Bullocks			
b. Cows			
c. Goat			
d. Poultry			

6. Agricultural machinery and implements

Item	No./year of purchase	Purchase price	Maintenance cost
1. Ploughs			
2. Tractor			
3. Tiller			
4. Sprayer			
5. Duster			
6. Carts			
7. Pumpsets			
8. Mammotties			
9. Others			

7. Cropping patters

Crop	Area					
	Virippu		Mundakan		Puncha	
	Owned	Leased	Owned	Leased	Owned	Leased
A. <u>Seasonal crop</u>						
1. Paddy						
2. Pulses						
3. Vegetables						
4. Others						

B. Annual crop	No. of plants/trees	Area	
		Owned	Leased in
1. Tapioca			
2. Banana			
3. Others			

C. Perennial trees	No. of plants/trees	Area	
		Owned	Leased in
1. Coconut			
2. Arecanut			
3. Fruit trees			
4. Others			

8. Taxes

   a. Land revenue

   b. Water tax

   c. Panchayat tax

   d. Income tax

   e. Others (specify)

9. Sources of irrigation

Source	Area irrigated	
	Arecanut	Others
Canals		
Tanks		
Wells		
Others		

Hours required for irrigation of arecanut plot :

Frequency of irrigation of Arecanut :

Total number of months during which irrigation was undertaken :

10. Particulars of arecanut garden

1. Total area in ha :
2. No. of trees in the area :
3. Age of the garden :
4. Average spacing adopted :
5. No. of bearing trees :
6. Intercrop followed :
7. Permanent labour to maintain the arecanut garden :
8. Wage rate: Male: Female

11. Cost of cultivation of Arecanut garden

a. Nature of land : Plain/undulated

b. Soil type :

c. Age of the plantation :

I Year

Area: No. of trees: Year of planting:

Sl. No.	Particulars	Labour		Materials		Total cost
		Men	Women	Qty.	Value	
1.	Clearing, levelling and bunding					
2.	Digging pits					
3.	Curing and filling the pits					
4.	Cost of seedlings					
5.	Transport charges					
6.	Planting					
7.	Irrigation					
8.	Shading					
9.	Other (if any)					

Sl. No.	Particulars	2nd year				3rd year				4th year			
		No. of trees				No. of trees				No. of trees			
		Labour		Materials		Labour		Materials		Labour		Materials	
		Men	Women	Qty.	Value	Men	Women	Qty.	Value	Men	Women	Qty.	Value
1.	Cost of:												
	i. FYM												
	ii. Fertilisers:												
	N												
	P												
	K												
	iii. Application												
2.	i. Shading												
	ii. Mulching												
	iii. Gap filling												
3.	Intercultivation operation												
	i. Ploughing												
	ii. Weeding												
4.	Plant protection												
	1.												
	2.												
	3.												
5.	Irrigation												
6.	Others if any												

Sl. No.	Particulars	5th year				6th year				7th year			
		No. of trees				No. of trees				No. of trees			
		Labour		Materials		Labour		Materials		Labour		Materials	
		Men	Women	Qty.	Value	Men	Women	Qty.	Value	Men	Women	Qty.	Value
1.	Cost of:												
	i. FYM												
	ii. Fertilisers:												
	N												
	P												
	K												
	iii. Application charge												
2.	Mulching												
3.	Intercultivation operation												
	i. Ploughing												
	ii. Weeding												
4.	Plant protection												
5.	Irrigation												
6.	Others, if any												

Sl. No.	Particulars	8th year				9th year				10th year			
		No. of trees				No. of trees				No. of trees			
		Labour		Materials		Labour		Materials		Labour		Materials	
		Men	Women	Qty.	Value	Men	Women	Qty.	Value	Men	Women	Qty.	Value
1.	Cost of:												
	i. FYM												
	ii. Fertilisers:												
	N												
	P												
	K												
	iii. Application charge												
2.	Mulching												
3.	Intercultivation operation												
	i. Ploughing												
	ii. Weeding												
4.	Plant protection												
5.	Irrigation												
6.	Harvesting charges												
7.	Transportation charges												
8.	Others (if any)												
Returns		Qty.		Value		Qty.		Value		Qty.		Value	
	Nuts												
	Dry leaves												
	Total												

Sl. No.	Particulars	11th year				12th year				13th year			
		No. of trees				No. of trees				No. of trees			
		Labour		Materials		Labour		Materials		Labour		Materials	
		Men	Women	Qty.	Value	Men	Women	Qty.	Value	Men	Women	Qty.	Value
1.	Cost of:												
	i. FYM												
	ii. Fertilisers:												
	N												
	P												
	K												
	iii. Application charge												
2.	Mulching												
3.	Intercultivation operation												
	i. Ploughing												
	ii. Weeding												
4.	Plant protection												
5.	Irrigation												
6.	Harvesting charges												
7.	Transportation charges												
8.	Others (if any)												

Returns	Qty.	Value	Qty.	Value	Qty.	Value
Nuts						
Dry leaves						
Total						

12. Other sources of income

    1. Dairying/poultry

    2. Government and private jobs

    3. Business

13. Gross total income of the family

14. Problems if any faced by the cultivator

Appendix - II(a)

Computation of payback period for stratum I

Year	Estimated cost of cultivation (Rs./ha)	Progressive total of cost (Rs./ha)	Returns (Rs./ha)	Progressive total of returns (Rs./ha)	Net return on progressive total
1.	18663	18663	--	--	-18663
2.	7786	26449	--	--	-26449
3.	7934	34383	--	--	-34383
4.	8127	42510	--	--	-42510
5.	8311	50821	--	--	-56821
6.	8628	59449	7651	7651	-51798
7.	8693	68142	13210	20861	47281
8.	9122	77264	28712	49573	-27691
9.	9664	86928	42970	92543	-5615
10.	9664	96542	64721	157264	60672
11-30	11871	108463	68318	225582	117119
31.	11871	120334	60816	286398	166064
32.	11871	132205	56420	342818	210613
33.	11871	144076	50116	392934	248858
34.	11871	155947	45117	438051	282104
35.	11871	167818	41228	479279	311461

$$\text{Payback period} = 8 + 1 \left[\frac{-27691}{-27691-5615} \right]$$

$$= 8.83 \text{ years}$$

Appendix - II(b)

Computation of payback period for stratum II

Year	Estimated cost of cultivation (Rs./ha)	Progressive total of cost (Rs./ha)	Returns (Rs./ha)	Progressive total of returns	Net returns on progressive total
1.	18095	18095	--	--	-18095
2.	7592	25687	--	--	-25687
3.	7812	33499	--	--	-33499
4.	8030	41529	--	--	-41529
5.	8247	49776	--	--	-49776
6.	8741	58517	7420	7420	-51097
7.	8748	67265	13126	20546	-46719
8.	9014	76279	28134	48680	-27599
9.	9521	85800	40360	89040	+3240
10.	9521	95321	62118	151158	55837
11-30	10714	106035	64368	215528	109493
31.	10714	116749	55225	270751	154002
32.	10714	127463	54283	325034	197571
33.	10714	138177	50025	375059	236882
34.	10714	148891	43120	418179	269288
35.	10714	159605	40714	458893	299288

Payback period $= 8 + 1 \left[\frac{-27599}{-27599-3240} \right]$

$= 8.89$ years

Appendix - II(c)

Computation of payback period for stratum III

Year	Estimated cost of cultivation (Rs./ha)	Progressive total of cost (Rs./ha)	Returns (Rs./ha)	Progressive total of returns	Net returns on progressive total
1.	17671	17671	--	--	-17671
2.	7623	25294	--	--	-33045
3.	7751	33045	--	--	-33045
4.	8114	41159	--	--	-41159
5.	8176	49335	--	--	-49335
6.	8692	58027	7143	7143	-50884
7.	8713	66740	12918	20061	-46679
8.	8976	75716	26128	40189	-29527
9.	9562	85276	38017	84206	-1070
10.	9562	94840	60920	145126	+50286
11-30	10126	104966	61418	206544	101578
31.	10126	115092	53360	259904	144812
32.	10126	125218	53064	312968	187750
33.	10126	135344	51016	363984	228640
34.	10126	145470	42785	406769	261299
35.	10126	155596	40075	446844	291248

Payback period $= 9 + 1 \left[\frac{-1070}{-1070-50286} \right]$

$= 9.021$ years

Appendix - II(d)

Computation of payback period for the district

Year	Estimated cost of cultivation (Rs./ha)	Progressive total of cost (Rs./ha)	Returns (Rs./ha)	Progressive total of returns	Net returns on progressive total
1.	18210	18210	--	--	-18210
2.	7684	25894	--	--	-25894
3.	7848	33742	--	--	-33742
4.	8095	41837	--	--	-41837
5.	8255	50092	--	--	-50092
6.	8679	58771	7442	7442	-51329
7.	8715	67486	13104	20546	-46940
8.	9050	76536	27826	48372	-28164
9.	9594	86130	40833	89205	3075
10.	9594	95724	62906	152111	563087
11-30	11409	107133	65249	217360	110227
31.	11409	118542	57114	274474	155932
32.	11409	129951	54864	329338	199387
33.	11409	141360	50339	379677	238317
34.	11409	152769	43887	423564	270795
35.	11409	164178	40758	464322	300144

$$\text{Payback period} = 8 + 1 \left[\frac{-28164}{-28164-3075}\right]$$

$$= 8.91 \text{ years}$$

Appendix - III(a)

Computation of benefit cost ratio and net present worth for Stratum I

Year	Estimated cost of cultivation Rs/ha	Benefit Rs/ha	Discount factor at 14%	Present worth of cost	Present worth of benefit
1.	18663	--	0.877	16367	--
2.	7786	--	0.769	5987	--
3.	7934	--	0.675	5355	--
4.	8127	--	0.592	4812	--
5.	8311	--	0.519	4313	--
6.	8628	7651	0.456	3934	3489
7.	8693	13210	0.410	3564	5416
8.	9122	28712	0.351	3202	10078
9.	9664	42970	0.308	2976	13235
10.	9664	64721	0.270	2609	17475
11-30	11871	68318	1.784	21185	121920
31.	11871	60816	0.015	178	912
32.	11871	56420	0.014	178	912
33.	11871	50116	0.013	164	692
34.	11871	45117	0.011	130	496
35.	11871	41228	0.010	119	412
			0.010		1350
				75064	176276

* Salvage value

Benefit cost ratio $= \frac{176276}{75064} = 2.35$

Net present worth = 176276 - 75064 = 101212

Appendix - III(b)

Computation of benefit cost ratio and net present worth for Stratum II

Year	Estimated cost of cultivation (Rs./ha)	Benefit (Rs./ha)	Discount factor at 14%	Present worth of cost	Present worth of benefit
1.	18095	--	0.877	15869	--
2.	7592	--	0.769	5838	--
3.	7812	--	0.675	5273	--
4.	8038	--	0.592	4754	--
5.	8247	--	0.519	4280	--
6.	8741	7420	0.456	3986	3383
7.	8748	13126	0.410	3587	5382
8.	9014	28134	0.351	3164	9875
9.	9521	40360	0.308	2932	12431
10.	9571	62118	0.270	2571	16772
11-30	10714	64368	1.7846	19120	114871
31.	10714	55225	0.015	161	828
32.	10714	54283	0.0142	152	784
33.	10714	50025	0.0138	148	690
34.	10714	43120	0.011	118	474
35.	10714	40711	0.01	107	407
		*135000	0.01		1350
				72060	167247

* Salvage value

Benefit-cost ratio = $\frac{167247}{72060}$ = 2.32

Net present work = 167247 - 72060 = 95187

Appendix - III(c)

Computation of benefit cost ratio and net present worth for Stratum III

Year	Estimated cost of cultivation (Rs./ha)	Benefit (Rs./ha)	Discount factor at 14%	Present worth of cost	Present worth of benefit
1.	17671	--	0.877	15497	--
2.	7623	--	0.769	5862	--
3.	7751	--	0.675	5232	--
4.	8114	--	0.592	4803	--
5.	8176	--	0.519	4243	--
6.	8692	7143	0.456	3963	3257
7.	8713	12918	0.410	3572	5296
8.	8976	26128	0.351	3151	9171
9.	9562	38017	0.308	2945	11709
10.	9562	60920	0.270	2945	16448
11-30	10126	61418	1.7846	18071	109606
31.	10126	53360	0.015	152	800
32.	10126	53064	0.0142	144	753
33.	10126	51016	0.0138	140	704
34.	10126	42785	0.011	111	471
35.	10126	40075	0.01	101	401
		*135000	0.01		1350
				70932	159966

*Salvage value

Benefit cost ratio $= \frac{159966}{70932} = 2.25$

Net present worth = 159966 - 70932 = 89034

Appendix - III(d)

Computation of benefit cost ratio and net present worth for Stratum district

Year	Estimated cost of cultivation (Rs./ha)	Benefit (Rs./ha)	Discount factor at 14%	Present worth of cost	Present worth of benefit
1.	18210	--	0.877	15970	--
2.	7684	--	0.769	5909	--
3.	7848	--	0.675	5297	--
4.	8095	--	0.592	4792	--
5.	8255	--	0.519	4284	--
6.	8679	7442	0.456	3958	3393
7.	8715	13104	0.410	3573	5373
8.	9050	27826	0.351	3176	9767
9.	9594	40833	0.308	2955	12577
10.	9594	62906	0.270	2590	16985
11-30	11409	65249	1.785	20360	116443
31.	11409	57114	0.015	171	857
32	11409	54114	0.014	162	768
33.	11409	50339	0.014	157	695
34.	11409	43887	0.011	125	483
35.	11409	40758	0.010	114	408
		*135000	0.010		1350
				73593	169099

* Salvage value

Benefit-cost ratio = $\frac{169099}{73593}$ = 2.29

Net present worth = 169099-73593 = 95506

Appendix - IV(a)

Computation of internal rate of return for Stratum I

Year	Estimated cost of cultivation (Rs./ha)	Annual benefit (Rs./ha)	Incremental benefit	D.F. at 25%	Present worth at 25%	D.F. at 28%	Present worth at 28%
1.	18663	--	-18663	0.80	-14930	0.781	-14576
2.	7786	--	-7786	0.64	-4983	0.610	-14576
3.	7934	--	-7934	0.512	-4134	0.477	-3784
4.	8127	--	-8127	0.410	-3332	0.373	-3031
5.	8311	--	-8311	0.328	-2726	0.291	-2418
6.	8628	7651	-977	0.262	-256	0.227	-222
7.	8693	13210	4517	0.210	+949	0.178	+804
8.	9122	28712	19590	0.168	3291	0.139	2723
9.	9664	42970	33306	0.134	4463	0.108	3597
10.	9664	64721	55057	0.107	5891	0.085	4679
11-30	68318	68318	56447	0.4268	24092	0.299	16878
31.	11871	60816	48945	--	--	--	--
32.	11871	56420	44549	--	--	--	--
33.	11871	50116	38245	--	--	--	--
34.	11871	45117	33246	--	--	--	--
35.	11871	41228	29357	--	--	--	--
					+7376		-99

Internal rate of return $= 25 + 3 \left[\frac{7376}{7376-(-99)}\right]$

$= 27.96\%$

Appendix - IV(b)

Computation of internal rate of return for Stratum II

Year	Estimated cost of cultivation (Rs./ha)	Annual benefit (Rs./ha)	Incremental benefit	D.F. at 25%	Present worth at 25%	D.F. at 28%	Present worth at 28%
1.	18095	--	-18095	0.80	-14436	0.781	-14132
2.	7592	--	-7592	0.64	-4859	0.61	-4631
3.	7812	--	-7812	0.512	-4000	0.477	-3726
4.	8030	--	-8030	0.410	-3292	0.373	-2995
5.	8247	--	-8247	0.328	-2705	0.291	-2399
6.	8741	7420	-1321	0.262	-346	0.227	-299
7.	8748	13126	+4378	0.21	+919	0.178	779
8.	9014	28134	19120	0.168	3212	0.139	2658
9.	9521	40360	30839	0.134	4132	0.108	3331
10.	9521	62118	52597	0.107	5628	0.085	4471
11-30	10714	64368	53654	0.4268	22917	0.299	16054
31.	10714	55225	44511	--	--	--	--
32.	10714	54283	43569	--	--	--	--
33.	10714	50025	39311	--	--	--	--
34.	10714	43120	32406	--	--	--	--
35.	10714	40714	3000	--	--	--	--
					+7130		-889

Internal rate of return $= 25 + 3 \left[\frac{7130}{7130-(889)} \right]$

$= 27.67\%$

Appendix - IV(c)

Computation of internal rate of return for Stratum III

Year	Estimated cost of cultivation (Rs./ha)	Annual benefit (Rs./ha)	Incremental benefit	D.F. at 25%	Present worth at 25%	D.F. at 28%	Present worth at 28%
1.	17671	--	-17671	0.80	-14137	0.781	-13801
2.	7623	--	-7623	0.64	-4879	0.610	-4650
3.	7751	--	-7751	0.512	-3968	0.477	-3697
4.	8114	--	-8114	0.410	-3327	0.373	-3026
5.	8176	--	-8176	0.328	-2682	0.291	-2379
6.	8692	7143	-1549	0.262	-406	0.227	-352
7.	8713	12918	+4205	0.21	+883	0.178	748
8.	8976	26128	17152	0.168	2881	0.139	2384
9.	9562	38017	28455	0.134	3813	0.108	3073
10.	9562	60920	51358	0.107	5495	0.085	4365
11-30	10126	61418	51292	0.4268	21891	0.299	15336
31.	10126	53360	43234	--	--	--	--
32.	10126	53064	42938	--	--	--	--
33.	10126	51016	40890	--	--	--	--
34.	10126	42785	32659	--	--	--	--
35.	10126	40075	29949	--	--	--	--
					+5564		-1999

$$\text{Internal rate of return} = 25 + 3\left[\frac{7376}{7376-(-1999)}\right]$$

$$= 27.36 \text{ per cent}$$

Appendix - IV(d)

Computation of internal rate of return for the district

Year	Estimated cost of cultivation (Rs./ha)	Annual benefit (Rs./ha)	Incre-mental benefit	D.F. at 25%	Present worth at 25%	D.F. at 28%	Present worth at 28%
1.	18210	--	-18210	0.800	-14568	0.781	-14222
2.	7684	--	-7684	0.640	-4918	0.610	-4687
3.	7848	--	-7848	0.512	-4018	0.477	-3743
4.	8095	--	-8095	0.410	-3319	0.373	-3019
5.	8255	--	-8255	0.328	-2708	0.291	-2402
6.	8679	7442	-1237	0.262	-324	0.227	-281
7.	8719	13104	4385	0.210	921	0.178	780
8.	9050	27826	18776	0.168	3154	0.139	2610
9.	9594	40833	31239	0.134	4186	0.108	3374
10.	9594	62966	53372	0.107	5711	0.085	4537
11-30	11409	65249	53840	0.426	22977	0.299	16098
31.	11409	57114	45705	--	--	--	--
32.	11409	54114	42705	--	--	--	--
33.	11409	50339	38930	--	--	--	--
34.	11409	53887	32478	--	--	--	--
35.	11409	40758	29349	--	--	--	--
					7096		-955

$$\text{Internal rate of return} = 25 + 3\left[\frac{7096}{7096-(-955)}\right]$$

$$= 27.64\%$$

Appendix - V(a)

Sensitivity analysis - 20 per cent fall in price

Computation of internal rate of return for stratum I

Year	Estimated cost of cultivation (Rs./ha)	Annual benefit (Rs./ha)	Incremental benefit	D.F. at 23%	Present worth at 23%	D.F. at 25%	Present worth at 25%
1.	18663	--	-18663	0.813	-15173	0.800	-14930
2.	7786	--	-7786	0.661	-5146	0.640	-4983
3.	7934	--	-7934	0.537	-4261	0.512	-4134
4.	8127	--	-8127	0.437	-3551	0.410	-3332
5.	8311	--	-8311	0.355	-2950	0.328	-2726
6.	8628	6121	-2507	0.289	-724	0.262	-657
7.	8693	10568	1875	0.235	441	0.210	394
8.	9122	22970	13848	0.191	2645	0.168	2376
9.	9664	34376	24712	0.155	3830	0.134	3311
10.	9664	51777	42113	0.126	5306	0.107	4506
11-30	11871	54654	42783	0.546	23188	0.426	18260
31.	11871	48653	36782	--	--	--	--
32.	11871	45136	33265	--	--	--	--
33.	11871	40093	28222	--	--	--	--
34.	11871	36094	24223	--	--	--	--
35.	11871	32982	21111	--	--	--	--
					3605		-1915

$$\text{Internal rate of return} = 23 + 2\left[\frac{3605}{3605-(-1915)}\right]$$

$$= 24.31\%$$

Appendix - V(b)

Sensitivity analysis - 20 per cent fall in price

Computation of internal rate of return for stratum II

Year	Estimated cost of cultivation (Rs./ha)	Annual benefit (Rs./ha)	Incremental benefit	D.F. at 23%	Present worth at 23%	D.F. at 25%	Present worth at 25%
1.	18095	--	-18095	0.813	-14711	0.800	-14476
2.	7592	--	-7592	0.661	-5018	0.640	-4859
3.	7812	--	-7812	0.537	-4195	0.512	-3999
4.	8030	--	-8030	0.437	-3509	0.410	-3292
5.	8247	--	-8247	0.355	-2928	0.328	-2705
6.	8741	5336	-2805	0.289	-811	0.262	-735
7.	8748	10501	1753	0.235	412	0.210	368
8.	9014	22507	13493	0.191	2577	0.168	2267
9.	9521	32288	22767	0.155	3529	0.134	3051
10.	9521	49694	40173	0.126	5066	0.107	4298
11-30	10714	51494	40780	0.542	22103	0.426	17405
31.	10714	44180	33466	--	--	--	--
32.	10714	43426	32712	--	--	--	--
33.	10714	40020	29306	--	--	--	--
34.	10714	34496	23782	--	--	--	--
35.	10714	32571	21857	--	--	--	--
					2511		-2677

Internal rate of return = $23 + 2\left[\frac{2511}{2511-(-2677)}\right]$

= 23.97%

Appendix - V(c)

Sensitivity analysis - 20 per cent fall in price

Computation of internal rate of return for stratum III

Year	Estimated cost of cultivation (Rs./ha)	Annual benefit (Rs./ha)	Incremental benefit	D.F. at 23%	Present worth at 23%	D.F. at 25%	Present worth at 25%
1.	17671	--	-17671	0.813	-14366	0.800	-14137
2.	7623	--	-7623	0.661	-5039	0.640	-4879
3.	7751	--	-7751	0.537	-4162	0.512	-3968
4.	8114	--	-8114	0.437	-3546	0.410	-3327
5.	8176	--	-8176	0.355	-2902	0.328	-2682
6.	8692	5714	-2978	0.289	-861	0.262	-780
7.	8713	10334	1621	0.235	381	0.210	340
8.	8976	20902	11926	0.191	2278	0.168	2004
9.	9562	30414	20852	0.155	3232	0.134	2794
10.	9562	48736	39174	0.126	4936	0.107	4192
11-30	10126	49134	39008	0.542	21142	0.426	16649
31.	10126	42688	32562	--	--	--	--
32.	10126	42451	32325	--	--	--	--
33.	10126	40811	30687	--	--	--	--
34.	10126	34228	24102	--	--	--	--
35.	10126	32060	21934	--	--	--	--
					1093		-3794

$$\text{Internal rate of return} = 23 + 2\left[\frac{1093}{1093-(-3794)}\right]$$

$$= \underline{23.45\%}$$

Appendix - V(d)

Sensitivity analysis - 20 per cent fall in price

Computation of internal rate of return for the district

Year	Estimated cost of cultivation (Rs./ha)	Annual benefit (Rs./ha)	Incremental benefit	D.F. at 23%	Present worth at 23%	D.F. at 25%	Present worth at 25%
1.	18210	--	-18210	0.813	-14805	0.800	-14568
2.	7684	--	-7684	0.661	-5079	0.640	-4918
3.	7848	--	-7848	0.537	-4214	0.512	-4018
4.	8095	--	-8095	0.437	-3537	0.410	-3319
5.	8255	--	-8255	0.355	-2930	0.328	-2708
6.	8679	5954	-2725	0.289	-787	0.262	-714
7.	8719	10483	1768	0.235	415	0.210	371
8.	9050	22261	13211	0.191	2523	0.168	2219
9.	9594	32666	23072	0.155	3576	0.134	3092
10.	9594	50325	40731	0.126	5132	0.107	4358
11-30	11409	52199	40790	0.542	22108	0.426	17409
31.	11409	45691	34282	--	--	--	--
32.	11409	43291	31882	--	--	--	--
33.	11409	40271	28862	--	--	--	--
34.	11409	35110	23701	--	--	--	--
35.	11409	32606	21197	--	--	--	--
					2402		-2796

Internal rate of return = $23 + 2 \left[\frac{2402}{2402-(-2796)}\right]$

= 23.92%

ABSTRACT

A study on the economics of arecanut cultivation in Kasaragod district was conducted during the period 1991-92 to evaluate the costs and returns, capital productivity, resource use efficiency of yielding plantation and the problems of arecanut cultivators.

Three stage random sampling was adopted for the study and the data were collected from a sample of 144 cultivators by personal interview method.

Total cost of cultivation for 11 years was estimated to be Rs.107133/- for the district, in terms of 1991-92 prices. The major item of expenditure was human labour constituting about 44.75 per cent of the total cost. Manures and fertilizers accounted for 25.92 per cent and cost on plant protection accounted for 9.27 per cent of the total cost for 11 years.

The cost of production per quintal was estimated as Rs.1539/- for the district.

Pay back period was found to be 8.91 years. Benefit-cost ratio was calculated as 2.29. Net present worth was Rs.95506/- and internal rate of return was calculated to be

27.64 per cent. The factors manures and fertilizers and irrigation were found to have significant influence on the gross income obtained from an arecanut garden. The marginal value product of these inputs were found to be 1.262 and 7.07 respectively.

High input costs, serious disease problems and difficulties associated with marketing were some of the general problems faced by the sample farmers.