ECONOMICS OF PRODUCTION AND MARKETING OF BANANA IN THRISSUR DISTRICT

By
NAMBIAR SAJINI BALAKRISHNAN

THESIS

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Faculty of Agriculture

Kerala Agricultural University

Department of Agricultural Economics
COLLEGE OF HORTICULTURE
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KERALA, INDIA

2000

DECLARATION

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

Vellanikkara
31st Oct 2000

NAMBIAR SAJINI BALAKRISHNAN

Dr.E.K. THOMAS
Associate Professor and Head
Department of Agricultural Economics

CERTIFICATE

Certified that this thesis, entitled **"Economics of production and marketing of banana in Thrissur district"** is a record of research work done independently by **Miss. Nambiar Sajini Balakrishnan,** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her .

Vellanikkara
31st Oct 2000

Dr.E.K. THOMAS
Chairman
Advisory Committee

CERTIFICATE

We, the undersigned members of the Advisory Committee of **Miss. Nambiar Sajini Balakrishnan,** a candidate for the degree of **Master of Science in Agriculture**, with major in **Agricultural Economics,** agree that the thesis entitled **"Economics of production and marketing of banana in Thrissur district"** may be submitted by Miss. Nambiar Sajini Balakrishnan, in partial fulfilment of the requirement for the degree.

Dr.E.K. THOMAS
(Chairman, Advisory Committee)
Associate Professor and Head
Department of Agricultural Economics
College of Horticulture,
Kerala Agricultural University
Vellanikkara, Thrissur

Dr.K.JESY THOMAS
(Member, Advisory Committee)
Associate Professor
Department of Agricultural Economics
College of Horticulture,
Kerala Agricultural University
Vellanikkara, Thrissur

Dr.P. INDIRA DEVI
(Member, Advisory Committee)
Assistant Professor
Department of Agricultural Economics
College of Horticulture,
Kerala Agricultural University
Vellanikkara, Thrissur

Dr.V.K.G. UNNITHAN
(Member, Advisory Committee)
Associate Professor
Department of Agricultural Statistics
College of Horticulture
Kerala Agricultural University
Vellanikkara, Thrissur

18/4/2011
EXTERNAL EXAMINER

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Sajini Nambiar

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Introduction

1. INTRODUCTION

Banana is one of the earliest crops cultivated by man. It is called the 'apple of paradise' and botanically '*Musa paradisiaca*'. Banana and plantains play a major role in the diet of millions of people in the developing countries either as staple food or as food supplements (Sivashankar, 1997). Easily available round the year, high nutritive value and low market price have made banana a unique commodity (Singh, 1996). Though it is popularly known as poor man's fruit, it is relished by rich and poor alike. Edible banana are of two kinds: cooking banana known as plantains, which can be considered a starchy vegetable, and the fruit banana. (Vigneshwar, 1988).

Banana are rich source of easily digestible carbohydrates and hence useful as food supplements. They have a special place in diet low in fats, cholesterol and salts. Flour prepared from raw fruit is a highly nutritive baby food. Chips made from fully mature unripe fruit is very popular. Since time immemorial it has been considered as a magic herb and utilised in a number of forms as food, medicine, feed, fuel and industrial applications. (Chadha, 1992).

Banana is one of the most important fruits in India occupying an area of 3.97 lakh hectares with an annual production of 10.5 million tonnes (Nair, 1999). India accounts for 17.8 per cent of the world production of banana and is closely followed by Brazil (5.69 million tonnes), Eucador (5.3 million tonnes) and China (3.3 million tonnes) (Anonymous, 1997). In India banana is a commercial crop in states like Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, and Gujarat. Nearly 54 per cent of the area under this crop in the country is shared by these states. (Rao, 1996).

Though India has been growing banana from time immemorial, it has not assumed sufficient importance as an industry in spite of favourable soil and climatic conditions. Since 1961, the fruit production in India has grown by 6.2

inevitable to successfully compete with the heavy in flow of banana from neighbouring states.

The marketing system for banana in the state is not well organised and it being a highly perishable commodity, the produce suffer losses in quality and quantity before it reaches the consumers. The government of Kerala launched the Kerala Horticultural Development Programme (KHDP) with the objective of improving and stabilising farmers income and their overall economic situation through collective action. Under this programme, farmers establish and manage their own markets with active participation from the trade. Reduced marketing costs, saving in marketing time and efforts, improved bargaining power, prompt payment etc. are few of the many advantages that these markets offer to the growers. At the same time conflict among the farmers, lethargic and demotivated leadership, financial mismanagement etc. are serious threats to this novel participatory initiative (Basil, 1999).

In this context, information on the economics of production and marketing of this important fruit crop of Kerala, would be of immense help for sound agricultural policy formulation as well as for decision making at the micro level. Being a perishable crop, its perishable nature should also be taken into consideration for designing the policies for its marketing.

The study is undertaken with the following objectives.

1. To analyse the comparative economics of different varieties of banana viz. Nendran, Poovan and Palayankodan.
2. To assess the employment generation and marketing efficiency and
3. To study the constraints experienced by the banana growers.

1.1 Scope of the study

There are plenty of studies on the economics of production and marketing of plantain (Nendran) in the state. But specific studies on other banana varieties are scanty. In this regard a study on the economics of production and

marketing of three varieties viz. Nendran, Poovan and Palayankodan will be of considerable use in knowing their comparative economics.

1.2 Limitations of the study

The results of the study are based on farm level data which were collected from farmers and traders through interview method. Since the farmers do not maintain records on the cultivation practices adopted, responses were drawn from their memory, which may be subjected to recall bias. However, every effort was made to minimize the errors by cross questioning and cross checking.

1.3 Plan of work

This thesis consists of seven chapters including the present one. A review of the relevant literature is given in chapter two. A brief description of the area of study is given in chapter three. Chapter four deals with the materials and methods used in this study. Results of the study are presented in chapter five, while chapter six deals with discussion. The summary of major findings of the study is given in the final chapter.

Review of Literature

2. REVIEW OF LITERATURE

A comprehensive review of past studies is useful to formulate concepts, methodologies and tools of analysis to be used for any research. In this chapter an attempt has been made to review important past studies relevant to the present study.

The chapter has been divided into two sections. In section I literature relating to cost of cultivation and functional analysis are included. Section II consists of review of past studies in marketing.

COST OF CULTIVATION AND FUNCTIONAL ANALYSIS STUDIES

In an attempt to study the input-output relationship of banana plantation in Kanyakumari district of Tamil Nadu, Peter (1974) made use of Cobb-Douglas model of production function and reported that 91 per cent of the variation in gross income of banana was explained by labour cost. It was also observed that material cost and plant population were important variables affecting the gross income.

Manivannan (1979) conducted an economic analysis of production and marketing of Poovan banana in Trichy district of Tamil Nadu and reported the cost of cultivation as Rs.3467 per acre. Manures and manuring formed the single major item which accounted for 38.85 per cent of total cost. The cost of production per bunch was reported as Rs. 6.23 and the benefit-cost ratio worked out to 1.9.

In an attempt to study the economics of production and marketing of hill banana in Kodaikanal Taluk of Tamil Nadu, Prathaban (1981) observed that of the total cost of production, the cost of land preparation constituted a major share of 53.8 per cent followed by cost of suckers and planting (20.5 per cent). The cost of after cultivation, plant protection and cost of manures and manuring had a share of 15.75 per cent, 7.08 per cent and 3.59 per cent respectively. The benefit-cost ratio worked to 1.8.

Bastine (1982) in her study on the cost of cultivation of banana in Irinjalakuda block in Thrissur district reported that out of the total cost of Rs.36249 per hectare, manures and manuring accounted for 23 per cent, which was the most important item of expenditure. On an average the benefit-cost ratio at cost C worked out to 1.24.

Devi (1983) in her study on the economics of banana cultivation in Thrissur district observed that manures and manuring operation demanded the highest investment and formed 42.5 per cent of the total cost. Propping, planting, after cultivation and irrigation, harvesting and handling and preparatory cultivation in that order were the other operations which needed investment. Plant protection operations accounted for only 0.92 per cent of total cost. The net income from banana cultivation worked to Rs. 23,196 per hectare with a benefit-cost ratio of 1.55.

Thomas and Gupta (1987) studied the resource productivity of banana in Kottayam district of Kerala using Cobb Douglas type of production function. It was found that more than 91 per cent of the variation in total income from banana was explained by the independent variables labour, manure, fertilizers and working capital. They concluded that by the reallocation of these independent variables, the net income can be increased by 390 per cent.

Bastine and Radhakrishnan (1988) studied the economics of banana cultivation in Irinjalakuda block in Thrissur district. The returns worked out to Rs.45,068 and the net income was reported as Rs.8819 on cost C basis. The main items of expenditure were found to be human labour (27 per cent) and manures (25 per cent). Farm business income, family labour income and farm investment income accounted to Rs.20,439, Rs. 11,011 and Rs.18,197 per hectare respectively.

Thomas *et al.* (1989) studied the relative economics of Nendran and Robusta varieties of banana in Kalliyoor Panchayat of Trivandrum district. The

study revealed that of the total cost of cultivation, material cost accounted for 61.27 per cent and 60.5 per cent, and labour costs 38.7 per cent 48.0 per cent in the case of Nendran and Robusta respectively. Again manures and fertilizers occupied the major share i.e. 43 per cent and 48 per cent of the total cost of cultivation in Nendran and Robusta respectively.

A study conducted by Chennarayudu *et al.* (1990) on the land use efficiency of banana is Guntur district of Andhra Pradesh revealed that the operational costs contributed to the extent of 69.0 per cent of the total cost of cultivation of banana. Among the various items under operational costs, manures and fertilizers contributed larger share (27.0 per cent) followed by human labour (22.0 per cent). The benefit cost ratio worked to 1.1 and the net income to Rs.8917 per hectare.

In a study conducted in Vaishali district of Bihar to assess the comparative costs and profitability of tall and dwarf varieties of banana, Singh and Singh (1990) observed that profitability of dwarf varieties was much higher than that of tall varieties.

An attempt was made by Devi *et al.* (1992) to study the growth and performance of co-operative agricultural credit in Kerala based on crop-wise and source wise data on agricultural loan for a period of 11 years from 1976-77 to 1987-88. The study revealed that in case of banana, the total credit increased by 17 per cent per hectare and credit supply by 837.9 per cent during the period. Correlation analysis emphasized the significant positive relation between credit supply and productivity (r=0.679). Banana being a highly profitable crop with a benefit cost ratio of 1.55, it was very likely that the loan amount availed was fully utilized for its cultivation expenses rather than for other consumption needs.

Senthilnathan and Srinivasan (1992) studied the economics of substitution between Poovan banana and paddy in wet lands of Tiruchirappally

district of Tamil Nadu. The study revealed that a total of 6720 Poovan bunches were harvested in the whole three years (planted crop, first ratoon and second ratoon) and with a mean price received per bunch of Rs.41.65, the total returns received after three years worked out to Rs.286914.00. The mean cost of cultivation for the three years came to Rs.124678.0 per hectare and the net income received was Rs.162236.00. per hectare

In a study on the profitability of banana plantation in Hajipur district of Bihar, Maurya *et al.* (1996) reported that the per hectare production of banana was 42.5 tonnes which was less than the expected yield of 55 tonnes with recommended package of practices. The profit from banana cultivation worked out to Rs.29798.0 per hectare while the cost of production per tonne was calculated as Rs.474.0. The price received by the producers came to Rs.1176 per tonne, thus leaving a substantial margin of profit to the producers.

Patel *et al.* (1998) studied the economics of banana crop in Kheda district of Gujarat and reported that fertilizer was the most important input accounting for about 22 per cent share in the total expense of Rs.20658.0 per hectare. Farmyard manures and oil cakes accounted for 15.34 per cent and 8.3 per cent share respectively. Among other inputs, pesticides, irrigation and tractor charges constituted 1.66 per cent, 8.69 per cent and 6.57 per cent share respectively in the total expenses.

Sangeetha and Motilal (1998) made an attempt to enhance banana production in Thiruvananthapuram district of Kerala, based on the constraints as perceived by the banana growers. The study revealed that incidence of pests and diseases was the most important production constraint in banana followed by labour scarcity and non-availability of inputs. Among the economic constraints high cost of material inputs ranked first followed by high labour charges and price fluctuations of produce in that order

Thomas *et al.* (1998) conducted an economic analysis of crop loan for banana in Thrissur district based on the data collected from the loanees of primary agricultural credit society in the district. The cost structure of banana revealed a total cost of Rs.24.0 per plant against a scale of finance fixed at Rs.17 (Rs.10 as A component and Rs.7 as B component), which was found to be insufficient to meet various expenses in connection with the cultivation of Nendran banana. It was seen that though 66 per cent of the total cost of banana was accounted for by material cost, the loan amount utilized by farmers as component in kind was very limited. The excess expense incurred on B component (given as fertilizers and plant protection chemical) worked to Rs.4.96 (Rs.4.72 for fertilizers and Rs.0.24 for plant protection chemicals).

In a study conducted at College of Agriculture, Vellayani to find out the most appropriate dose of nutrient application for exploiting the maximum yield potential of Nendran banana, Peter and Hameed (1999) observed that the application of 380:115:600 gm NPK per plant resulted in highest bunch yield (10.42 kg). Maximum benefit cost ratio (2.04) was recorded by lowest doses of N and K, applied in six splits, followed by double the recommended dose of N and K applied in six splits (benefit cost ratio 2.45). The highest net profit per hectare was revealed in double the recommended dose of fertilizers in six splits (Rs.189460) and lowest in farmers practice (Rs.69160).

Sheela *et al.* (1999) conducted a study at Chenkal village in Thiruvananthapuram district of Kerala, to identify the constraints in adoption of fertilizer recommendation and to evolve suitable location specific integrated nutrient management system for banana through farmers participatory trials in KHDP. The results revealed that in all the four varieties under study i.e. Nendran, Kappa, Palayankodan and Robusta, the number of hands per bunch were maximum per treatment with 'cowpea + ½ N and full P_2O_5 and K_20'. Increase in yield for the integrated nutrient management practice was found to be 28.57 per cent, 25.00 per

cent, 25.00 per cent and 20.00 per cent over the farmers practice for the varieties Nendran, Kappa, Palayankodan and Robusta respectively.

STUDIES ON MARKETING

Ramasubramanian (1979) studied the problems of banana marketing in Uthampalayam taluk of Madurai district and reported the absence of grading as an important problem. Transportation was reported as the second main problem, followed by fluctuating prices and too many middlemen in banana trade.

In a techno-socio economic survey conducted by TNAU (Anon, 1986) at Coimbatore district, the price spread of banana produced at Mettupalayam and sold at Coimbatore was worked out. The study revealed that out of the price paid by the consumer at the tail end of distribution channel, 46 per cent went to the producer, 20.0 per cent to the pre-harvest contractor, 11 per cent to the wholesaler and 14 per cent to the retailer.

Raju (1989) identified three channels for marketing of banana in Guntur district of Andhra Pradesh, of which the producer – pre-harvest contractor channel was most widely adopted by the farmers (65 per cent). But the low share of producers in consumers rupee (45 per cent) indicated inefficient marketing through this channel. However the marketing efficiency was reported to be higher in direct sale of banana.

Norman and Radhakrishnan (1990) attempted to study the marketing of banana in Kerala to identify the marketing practices and marketing efficiency particularly at the level of farmers. Six channels for the disposal of produce were identified and the net margin of the middlemen were found to be very high indicating in efficiency in marketing.

An attempt was made by Raj *et al.* (1991) to study the export perspective of fresh fruits and vegetables in India. The study was based on

secondary data collected from various issues of FAO publications and Trade year book. India's export of vegetables and fruits as a percentage of total production showed erratic and static trend during the period under study. India's share as a percentage of total export of potato, orange, lemon and banana during the period under review was negligible.

In a study on the functioning of both successful and not so successful co-operative marketing societies in Tamil Nadu dealing with fruits and vegetables Gajanan and Subrahmanyam (1993) observed that not only overhead costs need to be minimized but trading should also be improved by making majority of the cultivators to participate in their activities.

Devi (1996) in her study on the marketing of fruits and vegetables in Kerala estimated the producer's share in consumer's rupee to vary between 51-57 per cent in vegetables and 49-53 per cent in fruits. The share of marketing margin in consumers rupee was observed to be much higher than the share of cost incurred by them in case of vegetables. However the situation was reverse in the case of fruits, where the costs were high for the intermediaries compared to the margins. This may the due to the perishability and bulkiness of fruits when compared to vegetables.

Murthy and Reddy (1996) made some observations about the changing environment of agricultural marketing in India. They suggested various measures for improving the market system, which included suitable pricing policies, active participation of public procurement agencies, strengthening of co-operatives, scientific grading, credit linked storage and storage facilities at reasonable cost, improvement of market intelligence and systematic and continuous estimation of demand for various agricultural products.

Singh *et al.* (1996) conducted an economic analysis of banana marketing in unorganised sector in middle Gujarat. The results revealed that on an

average the total marketing costs worked out to Rs.28.00 per quintal of which the commission of the local middleman accounted for about 69-70 per cent. It was observed that the grower-seller had to provide an excess quantity to the buyer at the rate of 10.15 kg for each 100 kg of fruit sold. The value of such excess weights and labour charges accounted for 16.0 per cent and 11 per cent of the total cost respectively, while the transportation and weighting costs accounted for 3.0 per cent of the marketing cost.

Sivanandan and Jaganmohan (1999) identified wide fluctuations in the price of bananas as the prime constraint in banana marketing in the Cauvery Delta zone of Tamil Nadu. Non institutional agencies and their market prices was ranked as the second major constraint. Other constraints included the deduction of two bunches for every 100 harvested bunches as profit bunches, combining two small bunches as one bunch during price fixation, non harvest of small sized bunches and delay in the repayment of the balance amount after harvest by pre-harvest contractors.

Area of study

3. AREA OF STUDY

The present study is the economics of production and marketing of banana in Thrissur district. The study is confined to Mukundapuram Taluk of Thrissur district which forms one of the major banana growing areas of the district. It consists of 5 blocks and 27 Panchayats. The major farming systems in the taluk are rice based, banana based and integrated system. Chalakudy and Kodakara blocks of the district were randomly selected for undertaking the present study. This chapter deals with Thrissur district in general and Chalakudy and Kodakara blocks in particular.

AREA

Total geographical area of the district is 299390.0 hectares, which is 7.8 per cent of the total area of the state. Land utilisation pattern in Thrissur district is given in Table 3.1.

Table 3.1. Land utilisation pattern in Thrissur district for the year 1999

Description	Area (in hectares)
Geographical area	299390
Forest	103619
Land put to nonagricultural uses	25787
Barren and uncultivable land	710
Permanent pastures and either grazing land	46
Land under miscellaneous tree crops not included in net area sown	749
Cultivable waste land	2292
Fallow other than current fallow	3053
Current fallow	6041
Net area sown	157093
Area sown more than once	103858
Total cropped area	260951

Source: Farm Guide, 2000.

The district is divided into five Taluks viz., Kodungallur, Chavakkad, Thalappilly, Mukundapuram and Thrissur Taluks. There are seven Municipalities, 17 community development blocks spread over 98 Panchayats, 251 revenue villages and 1074 wards in the district.

The district can be divided into high land, mid land and low land based on its natural physiography.

POPULATION

According to 1991 census reports, Thrissur district supports a total population of 27.34 lakhs of which 13.09 lakhs are males and 14.25 lakhs females. Growth rate in population during the last decade was 12.00 per cent in the district. Density of population is 902 persons per square kilometer. Sex ratio shows that there are 1088 females for every 1000 males. Literacy rate is 79.3 per cent. Educational status of males and female showed that literacy was more among males (81.7 per cent) than females (77.09 per cent)

Agriculture provides employment to 45.7 per cent of the total working force and contributes 42.0 per cent of the total income of the district. Total working population of the district is 804738 of which 74064 are cultivators and 183588 are agricultural labourers. Household industries workers and other workers are 35898 and 511188 respectively. Occupational distribution of population in Thrissur district is given in Table 3.2.

Table 3.2. Occupational distribution of population in Thrissur district (1991 census)

Particulars	No. of persons
Total main workers	804738
Cultivators	74064
Agricultural labourers	183588
Household industry workers	35898
Other workers	511188

Source: Farm Guide, 2000

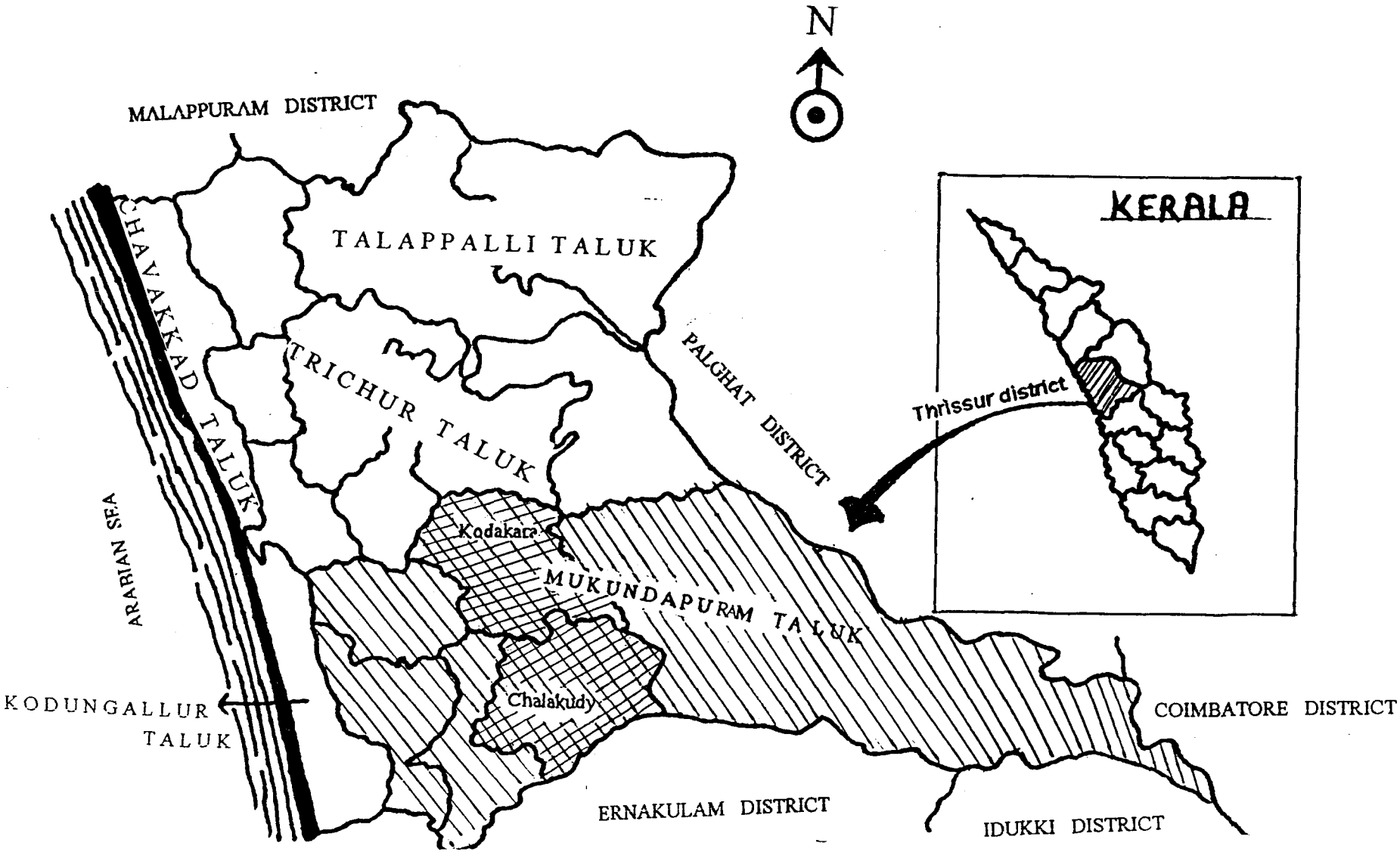


Fig. 1 Map of Thrissur district showing the study area

CLIMATE AND RAINFALL

Thrissur district experiences a tropical humid climate. Annual rainfall of 3358.7 mm was received during 1999. Most of the annual precipitation is received during the south west monsoon from June to September. The monthly average distribution of rainfall for the district during 1999 is given in Table 3.3. Average daily maximum temperature is 31-32°C in the coastal regions and 36°C to 37°C in the interiors.

Table 3.3. Monthly average rainfall distribution (mm) in Thrissur district for the year 1999

Months	Rainfall (in mm)
January	0.0
February	1.6
March	2.0
April	17.7
May	175.7
June	815.7
July	649.0
August	413.2
September	662.3
October	505.9
November	57.8
December	57.8
Total	3358.7

Source: Farm Guide, 2000

SOIL

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

WATER RESOURCES

The district has many water resources such as canals, tanks, wells, major and minor lift irrigation projects. Canoli canal, Shanmugan canal and Puthenthode canal are the three main canals in the district. Important rivers flowing through the districts are Chalakudy, Karuvannur and Kecheri rivers. Bharathapuzha flows westwards at the northern boundary and Periyar flows westwards at the southern boundary. Major irrigation projects operating in the district are Peechi dam, Mangalam dam, Chalakudy Diversion Scheme, Vazhani scheme and Chalakudy irrigation project. Source wise irrigated area in the district is given in Table 3.4.

Table 3.4. Area under irrigation in Thrissur district (source wise)

Particulars	Irrigated area (in hectares)
Government canals	20733
Private canals	616
Government tanks	376
Private tanks	10997
Government wells	146
Minor and lift irrigation	21761
Other sources	4341
	14630
Total	73600

Source: Farm Guide, 2000

CROPPING PATTERN

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

Seasonal crops like tapioca, banana and vegetables are grown in the mid land regions where laterite soil is present. Chalakudy and Kodakara are the major banana growing areas in the district. Different varieties of plantains are available there. Since banana cultivation requires intensive watering, it is intensively cultivated in areas having irrigation facilities. Plantation crops like tea, coffee and rubber are grown in the highland regions. The cropping pattern for the district is given in Table 3.5.

Table 3.5. Cropping pattern in Thrissur district for the year 1999

Crop	Area (ha)	Percentage to total cropping area
Paddy	40977	15.70
Other cereals	-	-
Pulses	626	0.24
Sugarcane/ palmyrah	298	0.15
Spice and condiments	13370	5.13
Fruits	21006	8.05
Vegetables	86101	32.95
Coconut	76656	29.38
Oil seed crops	447	0.17
Drugs and narcotics	72	0.03
Tea	529	0.20
Coffee	-	-
Rubber	13105	5.02
Cocoa	164	0.06
Fodder crops	17	0.007
Green manure crops	905	0.35
Other non food crops	6678	2.56
Total	260951	100.00

Source: Farm Guide, 2000

The district is well connected by roads and rail. The National Highway 17 and 47 pass through the district.

Chalakudy and Kodakara blocks have been selected for the study as they are the major banana growing areas in the district.

Chalakudy block consists of six panchayats and one Municipal area, while Kodakara block consists of seven panchayats. Names of panchayats of the above mentioned blocks have been given in Table 3.6.

Table 3.6 List of panchayats in Chalakudy and Kodakara blocks

LIST OF PANCHAYATS	
Chalakudy block	Kodakara block
Kodassery	Alagappanagar
Pariyaram*	Kodakara
Mellur*	Mattathur*
Koratty	Nenmanikkara
Kallur Vadakummuri	Pudukad
Vettilappara	Trikkur*
	Varantharappilly

Source:Janakiyasuthranam Vikasanarekhakal. Planning Board, 1998, Thiruvananthapuram
* indicates panchayats selected for the study

The Municipal area of Chalakudy comprises of Perambra, Potta and Padinjare Chalakudy.

Pariyaram and Mellur panchayats were selected from Chalakudy block, while Mattathur and Trikkur panchayats were selected from Kodakara block.

A brief note on chalakudy and Kodakara blocks is given in Tables 3.7 and 3.9. respectively.

Table 3.7 Details of Chalakudy block

CHALAKUDY BLOCK		
Particulars	Pariyaram panchayat	Mellur panchayat
No. of wards	10	10
Area	16.08 sq. Km	23.06 sq. km.
Population	20931	24854

Source:Janakiyasuthranam Vikasanarekhakal. Planning Board, 1998, Thiruvananthapuram

The cropping pattern in the above said panchayats is given in Table 3.8.

Table 3.8. Cropping pattern of Pariyaram and Mellur panchayat for the year 1996

Crop	Chalakudy block			
	Pariyaram panchayat		Mellur panchayat	
	Area (ha)	Percentage to gross cropped area	Area (ha)	Percentage to gross cropped
Paddy	360	2.52	1250	21.88
Pulses	25	0.17	80	1.40
Sesamum	-	-	30	0.52
Vegetables	50	0.35	30	0.52
Coconut	13000	90.85	1920	33.60
Banana	225	1.57	1415	24.70
Tapioca	45	0.31	710	12.42
Pepper	15	0.11	95	1.66
Jack	5	0.03	-	-
Cashew	20	0.14	18	0.31
Mango	10	0.07	-	-
Rubber	180	1.26	95	1.66
Arecanut	300	2.10	35	0.61
Nutmeg	50	0.35	34	0.59
Pineapple	5	0.03	-	-
Ginger	20	0.14	-	-
Gross cropped area	14310	100	5712	100

Source: Janakiyasuthranam Vikasanarekhakal. Planning Board, 1998, Thiruvananthapuram

The major problems faced by banana growers of Pariyaram and Mellur panchayats are unexpected heavy winds,nonavailability of propping materials, high labour cost, incidence of pests and diseases. Major pests included Redpalm weevil, Pseudostem weevil, Rhizome weevil etc. Major disease was in the form of leaf blight.

Table 3.9. Details of Kodakara block

KODAKARA BLOCK		
Particulars	Mattathur panchayat	Trikkur panchayat
No. of wards	10	11
Area	103.11 sq km	25.38 sq km
Population	42043	24520
Literacy rate	87 per cent	84.8 per cent

Source : Janakiyasuthranam Vikasanarekhakal. Planning Board, 1998, Thiruvananthapuram

Cropping pattern of Mattathur and Trikkur panchayats is given in Table 3.10.

Table 3.10. Cropping pattern in Mattathur and Trikkur panchayats for the year 1996

Crop	Kodakara block			
	Mattathur panchayat		Trikkur panchayat	
	Area (ha)	Percentage to gross cropped area	Area (ha)	Percentage to gross cropped
Paddy	1437	27.11	410	21.8
Rubber	1950	36.79	350	18.6
Coconut	808	15.20	730	38.8
Arecanut	17.0	0.32	65	3.46
Banana	216	4.07	160	8.51
Pepper	218	4.11	50	2.66
Pulses	132	2.49	14	0.77
Ginger	52	0.98	5	0.26
Tapioca	56	1.05	30	1.59
Cashew	215	4.05	22	1.17
Nutmeg	35	0.66	-	-
Sweet potato	5	0.09	-	-
Mango	40	0.75	-	-
Fruits	90	1.69	-	-
Vegetables	84	1.58	25	1.33
Turmeric	-	-	5	0.26
Cocoa	-	-	3	0.15
Sesamum	-	-	9	0.47
Gross cropped area	5299	100	1878	100

Source: **Janakivasuthranam Vikasanarekhakal. Planning Board, 1998, Thiruvananthapuram**

The major problems faced by the banana growers of Mattathur panchayat are lack of irrigation facilities, high cost of chemical fertilisers, nonavailability of propping materials, incidence of pests and diseases, lack of proper marketing facilities etc.

The major problems faced by the banana growers of Trikkur panchayat are failure of crop due to high incidence of pests and disease, unexpected heavy winds which causes heavy crop loss to farmers, negligible amount as compensation from Government and high labour cost.

Methodology

4. METHODOLOGY

Mukundapuram Taluk of Thrissur district was purposively selected for conducting the study on the economics of banana cultivation as it has the largest area under banana in the district. The study is based on the data collected from a sample of farmers in Chalakudy and Kodakara blocks in the district. Three major varieties of banana viz., Nendran, Poovan and Palayankodan were covered in the study.

SAMPLING PROCEDURE

Three stage random sampling procedure was adopted for the study with block as the primary unit, panchayat as the secondary unit and farmer as the ultimate unit. Two blocks namely Chalakudy and Kodakara of the district were randomly selected. From each block, two panchayats were selected at random, thus making a total of four panchayats. The selected panchayats are Meloor and Pariyaram from Chalakudy block and Muttathur and Trikkur from Kodakara block.

List of commercial growers (having a minimum of 25 plants) cultivating atleast one of the varieties viz. Nendran, Poovan and Palayankodan were collected from Krishi Bhavans and KHDP of the respective panchayats. From each Panchayat, fifteen farmers each for Nendran, Poovan and Palayankodan were selected thus making a sample size of 180(15x3x2x2) farmers, with 60(15x4) farmers for each variety. The sample growers of each variety were further classified into three classes, namely class I, class II and class III based on the number of plants cultivated by them and is given in Table 4.1.

Table 4.1. Sample distribution of various varieties of banana

Class	Size group (number of plants)	Number of growers
NENDRAN		
1. Class I	≤450	28
2. Class II	451-900	20
3. Class III	above 900	12
POOVAN		
1. Class I	≤150	29
2. Class II	151-300	16
3. Class III	above 300	15
PALAYANKODAN		
1. Class I	≤100	35
2. Class II	101-200	15
3. Class III	above 200	10

COLLECTION OF DATA

The data were collected through personal interview method using well structured and pre-tested schedule.

For each variety data on marketing aspects were collected from a sample of 4 wholesalers, 3 retailers and 2 commission agents, besides the farmers. A separate schedule was developed for collecting data on marketing aspects such as marketing costs, marketing margins etc. The data were collected from April to June 2000 and the reference period for the study was the year 1998-99.

The main items of observations made in the study were

a) Source of planting materials - varieties used and cost involved
b) Labour use - family and hired
c) Irrigation, source and cost involved
d) Fertilisers - types, time of application, cost involved

e) Organic manures - types, time of application and cost

f) Cropping materials and their cost

g) Plant protection chemicals - types and cost

h) Financial assistance - its source

i) Output - quantity, price and income

j) Cost of cultivation

k) Marketing - mode of marketing, marketing cost, marketing margin

l) Cost of production

m) Constraints in banana cultivation

ANALYTICAL FRAMEWORK

COSTS AND RETURNS

The profitability of a crop enterprise can be estimated by finding the relationship between the costs incurred and the returns realized from crop production.

Cost concepts

In farm management studies various cost concepts have been used viz., Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2.

1. Cost A_1: Approximatesthe actual expenditure incurred in cash and kind which includes the following items of costs:

a) Value of hired human labour

Human labour employed for various cultural practices like land preparation, planting, interculture, propping, manuring, plant protection, irrigation and harvesting were included in determining the value of hired human labour. The actual wages paid for labour was considered as the value of hired labour.

b) Value of planting material (suckers)

The purchased suckers were evaluated on the basis of their purchase price.

c) Value of manures and fertilizers

Expenditure on purchased quantities of manures and fertilisers has been evaluated by multiplying the physical quantities of different manure and fertilisers used with their respective prices. Farm produced items were valued at their market price.

d) Value of plant protection chemicals

Expenditure on fungicides and insecticides have been calculated by multiplying the physical quantities of different fungicides and insecticides used by their respective market price.

e) Cost of supports

Cost of supports was apportioned on the basis of the average number of years for which they were used. Bamboo poles could generally be used for three years, while arecanut poles could be used only for a year.

e) Depreciation on farm implements

Depreciation at the rate of 10 per cent per annum was used for the computation of depreciation on farm implements.

f) Interest on working capital

Interest on working capital was charged at the rate of 11.25 per cent per annum. This was the rate of interest charged by Canara Bank (recommended by KHDP) for short term agricultural loans. Interest was charged for only half the duration of the crop, as all the costs are not incurred at the beginning itself.

g) Land revenue

This was taken as the actual rate paid to the revenue department which was Rs.36 per acre in the area.

h) Miscellaneous expenses

This includes items such as water charges, electricity charges etc.

2. Cost A_2

Cost A_2 = Cost A_1 + rent paid for leased in land. Rent paid for leased in land is the actual rent paid by those farmers who had leased in land for banana cultivation. On an average this came to Rs.10/- per plant.

3. Cost B_1

Cost B_1 = Cost A_1 + interest on own fixed capital. The fixed capital items included iron and wooden implements, machineries such as diesel and electric motors etc. and interest for this was charged at the rate of 16.5 per cent.

4. Cost B_2

Cost B_2 = Cost B_1 + imputed rental value of own land. Rental value of owned land was imputed on the basis of the rate which was prevalent in the region. This as stated above was Rs.10/- per plant.

5. Cost C_1

Cost C_1 = Cost B_1 + imputed value of family labour. The actual work done by the members of the family on crop production was taken as family labour. This was evaluated on the basis of wage rates prevailing in the locality.

6. Cost C_2

Cost C_2 = Cost B_2 + imputed value of family labour. The cost of family labour was imputed based on the prevailing wage rates paid to hired labour in the study area.

7. Cost of cultivation

Cost of cultivation refers to the total expenses incurred in cultivating one hectare of banana. Cost of cultivation, input-wise and operation-wise and their percentages to total were worked out.

8. Cost of production

Cost of production is the cost of producing one quintal of banana. The return from the byproduct was also accounted for while calculating the cost of production.

EFFICIENCY MEASURES

In order to study the efficiency of banana cultivation in the area, the following income measures associated with different cost concepts were used.

1. Farm business income: it is gross income minus cost A_1
2. Own farm business income: it is gross income minus cost A_2
3. Family labour income: it is gross income minus cost B_1
4. Net income: it is gross income minus cost C_2
5. Farm investment income: this is farm business income minus imputed value of family labour
6. Benefit cost ratio: is the ratio of benefits to the costs. This ratio will serve as a measure which would indicate as the whether the costs incurred commensurate with the returns obtained. This has been worked out at Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2.

RESOURCE USE EFFICIENCY

Cobb Douglas production function has been fitted to the collected data in order to describe the relationship between the output and various inputs used for the production of banana. From the production function, elasticities of production of inputs were worked out, which in turn, have been used to calculate their marginal value products at their geometric means. Marginal productivity is the measure of the increase in total product, 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. A significant difference between marginal value product and market price of individual inputs would indicate whether farmers are using on an average, their factors of production inefficiently or efficiently.

SPECIFICATION OF THE MODEL

The model has been fitted separately for each of the three varieties for sample as a whole. on per farm basis

The specification of the model fitted for the crop is

$Y = aX_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5}$, which can be expressed in the log form as

$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + + u$

where Y represents the value of output in rupees, `a' is the intercept, `u' is the error term and b_1, b_2, b_3, b_4, b_5 are the regression coefficients or elasticities of production corresponding to each variable input.

The explanatory variables used in the function are as follows:

X_1 - value of human labour (Rs.)

X_2 - cost of fertilisers (Rs.)

X_3 - cost of organic manures (Rs.)

X_4 – expenditure on plant protection chemicals (Rs.)

X_5 – cost of supports (Rs.)

In the case of Poovan and Palayankodan varieties, no use of supports is made, hence the independent variable X_5 is excluded in the case of production function fitted for these two varieties.

The dependent variable Y is the output in rupees, which is the income from the main product and byproduct.

The function has been estimated by the ordinary least square technique. Coefficient of multiple determination (R^2) was tested for significance by applying `F' test where

$$F_{(k, n-k)} = \frac{R^2}{1-R^2} \times \frac{n-k}{k}$$

Where k and (n-k) are degrees of freedom.

Units of measurement of variables

The choice of units for measuring the inputs and outputs is as crucial as the selection of variable and mathematical model for analysis. Ideally inputs and outputs should be measured in physical unit of a homogeneous nature.

Measurement of inputs and outputs in physical units is possible in experimental studies. But in actual farming situation these differ from farm to farm. Moreover heterogeneous capital forms have no common physical measurement. Consequently monetary units are commonly used to measure input categories of considerable heterogeneity. Similarly there are various qualities of physical output which can aggregate feasibly only in value terms.

Returns to scale

The sum of the regression coefficients (Σbi) of all inputs included in the function indicates returns to scale.

Marginal productivity analysis

Marginal productivity is the measures of the increase in total product, for the addition of one unit of a particular resources above its mean level while other resources are held constant at their respective mean levels (Mahesh and Krishnamurthy, 1999). Marginal value product is the marginal physical product represented in its value terms. Marginal value products of all inputs were worked out at their geometric mean levels. In general, given the Cobb-Douglas type of production function, the marginal value product at geometric mean levels of inputs and output can be worked out as follows:

$$MVP_{Xi} \text{ at geometric mean} = \frac{Bi\ \bar{Y}j}{\bar{X}ij}$$

Where MVP_{Xi} = marginal value product of input Xi in product yj

i= 1,2,3……n, refers to number of inputs

j=1,2,3……m, refers to number of crops

MARKETING COSTS AND MARGINS

Marketing connotes a series of activities involved in moving the goods from the point of production to the point of consumption (Acharya and Agarwal,

1992). In the present study important marketing channels in the marketing of banana were identified.

Marketing efficiency was measured in terms of marketing costs and margins. Marketing margin is the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of farm produce (Chahal and Gill, 1991). The method of `concurrent margin' refers to the difference between the prices prevailing at successive stages of marketing at a given point of time.

Marketing efficiency is measured as follows:

$$ME = \frac{V}{I} - 1$$

where `ME' is the marketing efficiency,

`V' is the total value of goods marketed in rupees and

`I' is the marketing cost including the marketing margins in rupees

Results

5. RESULTS

In this chapter the results obtained from the study are presented and an attempt has been made to interpret the results. As stated in chapter 4, the data for the present study on the economics of production and marketing of three varieties of banana, viz., Nendran, Poovan and Palayankodan were collected from banana growers in Chalakudy and Kodakara blocks during the period from April-May 2000. The results are discussed under the following headings.

5.1 General economic and social conditions of the sample

5.2 Cultural practices.

5.3 Labour use pattern.

5.4 Input wise cost of cultivation.

5.5 Operation wise cost of cultivation.

5.6 Production and value of output.

5.7 Benefit cost ratio.

5.8 Farm efficiency Measures.

5.9 Resource use efficiency

5.10 Marketing.

5.11 Constraints in banana cultivation.

5.1 General economic and social conditions of the sample

This section contains a brief description of general economic and social conditions of the sample farmers. An idea about the factors like family size, age and sex, educational status and occupation of the respondents will serve as background information for the present study.

5.1.1 Land holding

Distribution of respondents according to size of operational holding is given in Table 5.1.1

Table 5.1.1. Distribution of respondents according to size of operational holding

Growers	Holding size				
	Below 0.4 ha	0.41-0.8 ha	081-1.6 ha	Above 1.6 ha	Total
Nendran	16 (26.6)	18 (30)	17 (28.4)	9 (15)	60 (100)
Poovan	12 (20)	18 (30)	16 (26.67)	14 (23.33)	60 (100)
Palayankodan	25 (41.67)	15 (25)	10 (16.67)	10 (16.67)	60 (100)
Total	53 (29.4)	51 (28.3)	43 (23.89)	33 (18.3)	180 (100)

*Figures in parentheses are percentage to the total

Of the total respondents 29.4 per cent had less than 0.4 ha under cultivation, 28.3 per cent had 0.41-0.8 hectare area, 23.89 per cent had 0.81-1.6 hectares and remaining 18.3 per cent had more than 1.6 hectare under cultivation.

Thirty per cent of the Nendran and Poovan growers had 0.41-0.8 hectares under cultivation while 41.67 per cent of the Palayankodan growers had below 0.4 hectares under cultivation

5.1.2 Family size

Distribution of respondents according to their family size is given in Table 5.1.2. Analysis showed that 48.3 per cent of the total sample farmers came under the family size group of up to four members. This family size group was also predominant among all the three kind of growers. Only 8.8 per cent of the total growers had family size above six members.

Table 5.1.2. Distribution of respondents based on family size

Growers	Family size			
	Up to 4 members	5-6 members	Above 6 members	Total
Nendran	30 (50)	24 (40)	6 (10)	60 (100)
Poovan	32 (53.3)	23 (38.4)	5 (8.3)	60 (100)
Palayankodan	25 (41.7)	30 (50)	5 (8.3)	60 (100)
Total	87 (48.3)	77 (42.8)	16 (8.90)	180 (100)

*Figures in parentheses are percentage to the total

5.1.3 Age and sex

Classification of respondents family on the basis of age and sex is given in Table 5.1.3. As much as 38.5 per cent of the total members came under the age group of 15-30 years and 6.37 per cent, 10.9 per cent and 4.4 per cent of the total members, belonged to age group of 0-6 years, 6-14 years and above 60 years respectively. Of the total members 53.20 per cent were males and 46.8 per cent females. The sex ratio was found to be 1:1.

5.1.4 Literacy

Classification of respondents according to their educational status is given in Table 5.1.4. Analysis of the educational status of the respondents showed that 96.5 per cent of sample farmers were literate. Out of the total respondents 19.4 per cent was educated up to primary school level, 33.3 per cent up to middle school level, 27.2 per cent up to high school level and 16.6 per cent up to pre-degree level and above.

Table 5.1.3. Classification of respondents family based on age and sex

Growers	AGE AND SEX																	
	0-6 years			6-14 years			15-30 years			31-60 years			Above 60 years			Total		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Nendran	8 (2.69)	9 (3.03)	17	14 (4.71)	13 (4.37)	27	60	54	114	60	55	115	15 (5.50)	9 (3.03)	24	157 (52.8)	140 (13.5)	297
Poovan	9 (3.22)	7 (2.50)	16	21 (7.52)	12 (4.30)	33	55	54	109	55	55	105	4 (1.43)	2 (0.71)	6	149 (53.4)	130 (46.6)	279
Palayan-Kodan	13 (4.30)	10 (3.31)	23	18 (5.46)	18 (5.46)	36	60	55	115	65	54	119	5 (1.65)	4 (1.32)	9	161 (53.3)	141 (46.7)	302
	30 (3.41)	26 (2.96)	56 (6.37)	53 (6.03)	43 (4.89)	96 (10.9)	175 (19.9)	164 (18.6)	338 (38.5)	175 (19.9)	163 (18.5)	339 (38.6)	24 (2.73)	15 (1.7)	349 (4.4)	467 (53.2)	411 (46.8)	878 (100)

* Figures in parentheses are percentage to the total

M = male; F = female; T = total

Table 5.1.4 . Classification of respondents according to educational status

Growers	Illiterate	Primary school	Middle school	High school	Pre-degree	Total
Nendran	2 (3.3)	10 (16.67)	25 (41.6)	15 (25)	8 (13.3)	60 (100)
Poovan	3 (5)	11 (18.3)	20 (33.3)	14 (23.3)	12 (20)	60 (100)
Palayankodan	1 (1.6)	14 (23.3)	15 (25)	20 (33.3)	10 (16.6)	60 (100)
Total	6 (3.3)	35 (19.5)	60 (33.3)	49 (27.2)	30 (16.7)	180 (100)

*Figures in parentheses are percentage to the total

5.1.5 Occupation

Distribution of respondents according to their occupation is shown in Table 5.1.5. Agriculture was the sole occupation for 68.89 per cent of the sample farmers, while it was the main occupation of 20.56 per cent for respondents and it served as sub occupation for another 10.55 per cent of the total respondents.

Table 5.1.5. Classification of respondents according to their occupation

Growers	Agriculture as only occupation	Agriculture as main occupation	Agriculture as sub occupation	Total
Nendran	40 (32.25)	15 (40.54)	5 (26.31)	60 (100)
Poovan	42 (38.87)	13 (35.13)	5 (26.31)	60 (100)
Palayankodan	42 (38.87)	9 (24.32)	9 (47.36)	60 (100)
Total	124 (68.89)	37 (20.56)	19 (10.55)	180 (100)

*Figures in parentheses are percentage to the total

5.1.6 Family income

Distribution of respondents based on family income per annum is given in Table 5.1.6. Analysis showed that of the total 180 respondents, 92 had family income below Rs.35,000 per annum, 51 had family income between Rs.35,000 and Rs.70,000 per annum and 37 respondents had family income above Rs.70,000 per annum.

Among the Palayankodan growers,58.30 per cent had family income up to Rs.35,000 per annum while 33.3 per cent of the Nendran growers had family income between Rs.35,000 and Rs.70,000 per annum and 25 per cent of the Poovan growers had family income above Rs.70,000 per annum.

Table 5.1.6. Distribution of respondents based on level of family income

Growers	Family income (Rs.)			
	Up to 35,000 per annum	35,000 to 70,000 per annum	Above 70,000 per annum	Total
Nendran	28 (46.6)	20 (33.3)	12 (20.0)	60 (100)
Poovan	29 (48.3)	16 (26.6)	15 (25)	60 (100)
Palayankodan	35 (58.3)	15 (25.0)	10 (16.7)	60 (100)
Total	92 (51.1)	51 (28.3)	37 (20.6)	180 (100)

*Figures in parentheses are percentage to the total

5.1.7 Source of finance

The distribution of sample respondents on the basis of source of finance is given in Table 5.1.7. Analysis of source of finance revealed that 25 per cent of the Nendran growers used owned capital, 36.6 per cent took loan from Canara Bank and 38.3 per cent took loan from other commercial banks. Among the

Poovan growers, 26.6 per cent used owned capital, 33.3 per cent took loan from Canara bank and 40 per cent took loan from other commercial banks. However, in the case of Palayankodan growers, all of them used owned source of capital. While the lending rate offered by Canara bank was 11.25 per cent, it was 12.5 per cent in the case of other commercial banks.

Table 5.1.7. Distribution of respondents based on the source of finance

Growers	Source			
	Owned	Canara bank (through KHDP)	Other commercial banks	Total
Nendran	15 (25)	22 (36.6)	23 (38.3)	60 (100)
Poovan	16 (26.6)	20 (33.3)	24 (40)	60 (100)
Palayankodan	60 (100)	-	-	60 (100)
Total	91	42	47	180 (100)

*Figures in parentheses are percentage to the total

The data on cost of production and returns are of special interest to farmers since they reveal the input – output relation ship of their enterprises and bring out the difference in unit cost between the less efficient and more efficient farms and enterprises.

A brief account of the cultivation practices of banana will be helpful while studying the costs and returns incurred in cultivation of this crop.

5.2. Cultural practices

The land is prepared by taking trenches in case of Nendran. The practice of taking pits was observed in Poovan and Palayankodan which were mainly cultivated in garden lands while Nendran was cultivated mainly in wet lands.

Hence cost of preparatory cultivation was more in case of Poovan and Palayankodan as compared to Nendran.

5.2.1 Planting

The selected rhizomes of Nendran were sun dried for two-three days after smearing with cowdung paste and ash before planting. However this practice was not adopted in case of Poovan and Palayankodan varieties. The planting time, spacing and plant density of Nendran, Poovan and Palayankodan is given 5.2.1.

Table 5.2.1. Planting time, spacing & plant population of Nendran, Poovan and Palayankodan.

Variety	Planting time	Spacing (m x m)	Plant population per hectare
Nendran	August to November	2.0 x 2.0	2500
Poovan	August to November	2.13 x 2.13	2150
Palayankodan	January to March	2.13 x 2.13	2150

The planting season for Nendran and Poovan ranged from August to November. Nedran was widely planted in September, so that its harvest coincides with the Onam festival fetching high prices. Palayankodan was mainly taken as rain fed crop and its planting season ranged from January to March.

The most widely followed spacing was that of 2m x 2m for Nendran and 2.13m x 2.13m for both Poovan and Palayankodan, which is also the recommendation by Kerala Agricultural University for the three varieties. Thus it was observed that there were 2500 plants of Nendran and 2150 plants of Poovan and Palayankodan in one hectare.

5.2.2 Planting material

Majority of the Nendran growers bought planting material from Manjeri as they were of the opinion that these planting materials were of better quality, in the sense that they were less susceptible to pests and disease attack and thus gave

better yield as compared to the local variety. Others bought it either from local markets or from their neighbours. However the Poovan and Palayankodan growers used the locally available suckers as planting material. On an average the cost of Nendran, Poovan and Palayankodan suckers came to Rs.4.20, 8.46 and 4.16 respectively including transportation changes. The cost of farm produced suckers was imputed @ Rs.4.0 per sucker of Nendran, Rs.8.25 per sucker of Poovan and Rs. 4.0 per sucker of Palayankodan. The general practice in the study area in case of Nendran was that suckers obtained from first crop was used as planting material for the second crop and the subsequent suckers will not be used as they gave poor yield, and fresh suckers were bought again for the next crop. In case of Poovan and Palayankodan suckers from the mother plants were used upto the third crop stage.

5.2.3 Manures and fertilisers

Generally organic manures such as green manure, cow dung and ash was given as basal dose by the sample farmers. This was followed by the application of chemical fertilizers in the form of urea, single super phosphate/ Mussoriephos and Murate of potash, and mixtures like 17:17:17 and 10:26:26. In Nendran the straight fertilisers were applied in 4-5 equal splits, first about two months after planting, second after three months, third after four months and forth after five months of planting. In Poovan and Palayankodan fertilizers were applied in two equal split doses, first, two months after planting and second four months after planting.

The recommended N, P_2O_5 and K_2O level and their application through chemical fertilizers for Nendran, Poovan and Palayankodan are given in Table 5.2.2, Table 5.2.3. and Table 5.2.4. respectively.

In case of Nendran for sample as a whole, nitrogen was used above the recommended level, phosphorous was used in right quantity and potassium below the level. Nitrogen was used above the recommended level in class I and class III,

phosphorous was used above the recommended level in class I and class II, while the use of potassium was deficient in all the three classes.

Table 5.2.2. Class wise nutrient use in Nendran (gms/plant)

Nutrients	Recommended dose	Actual quantities used by sample farmers			
		Class I	Class II	Class III	Sample average
N	190.0	215.0	154.10	224.0	99.7
P	115.0	123.20	119.52	102.24	112.60
K	300.0	259.80	242.40	250.2	249.8

In case of Poovan the fertilizers were applied within the recommended level of 160-200gms per plant of N and P_2O_5 and 320-400gms per plant of K_2O. Except in class III for K_2O, the sample farmers were using the recommended level N, P & K.

Table 5.2.3. Classwise nutrient use in Poovan (gms/plant)

Nutrients	Recommended dose	Actual quantities used by sample farmers			
		Class I	Class II	Class III	Sample average
N	160-200	166.0	171.58	188.14	180.62
P	160-200	170.88	175.52	210.56	195.83
K	320-400	350.40	394.80	368.40	371.55

As far as Palayankodan was concerned, the fertilizers were in deficient use in all the three classes, except in class II, where nitrogen was used above the recommended level. For sample as a whole, use of phosphorous and potassium was deficient, while use of nitrogen was slightly above the recommended level.

Table 5.2.4. Classwise nutrient use in Palayankodan (gms/plant)

Nutrients	Recommended dose	Actual quantities used by sample farmers			
		Class I	Class II	Class III	Sample average
N	100	83.07	141.12	100.28	108.5
P	200	105.6	144.0	124.80	125.54
K	400	306.00	338.40	353.76	335.33

5.2.4 Irrigation

Banana is a crop which is highly responsive to irrigation. It is irrigated during the months from December to April-May. The main source of irrigation in the sample farms was the canal water. More than 70 per cent of the sample farms depended upon canal water. The rest 30 per cent depended on open wells often hiring pumpsets.

Nendran was irrigated twice a week, Poovan once a week, while Palayankodan was basically taken as rain fed crop, but some farmers irrigated Palayankodan once in a fort night. Mostly family labour was employed for irrigation. De-suckering was also done while diverting water. No separate labour was employed for that purpose.

5.2.5 Weeding

Generally weeding was done as and when the weeds emerged. None of the sample farmers used weedicide. Hand weeding was found to be the most common practice.

5.2.6 Plant protection

Furadan was the most widely used plant protection chemical by the sample farmers. The cultivators adopted plant protection measure mostly as a curative rather than preventive measure. The other plant protection chemicals used by the sample farms were ekalux, Bordeux mixture etc.

5.2.7 Propping

After the emergence of inflorescence and start of fruit setting, banana plants were given support with bamboo or arecanut poles. This was practiced only in case of Nendran variety which bear heavy bunches and are prone to heavy winds just before harvesting time (i.e. during June-July). Bamboo poles were reported to

very scarce hence costly. Some of the sample farmers bought the poles all the way from Palakkad district incurring high transportation charges. But the bamboo poles have an additional advantage i.e. they can be used for around three years, hence only one third of the total cost of poles was accounted in the first year. On the other hand arecanut poles are less costly and can be used only once.

The distribution of respondents based on type of support used is given in Table 5.2.5.

Table 5.2.5. Distribution of sample respondents based on the type of propping material used.

Nendran	Type of support		Total
	Bamboo poles	Arecanut poles	
Class I	28	7	35
	(80)	(20)	(100)
Class II	10	5	15
	(66.70)	(33.3)	(100)
Class III	8	2	10
	(80)	(20)	(100)
Total	46	14	60
	(76.7)	(23.3)	(100)

* Figures in parentheses show percentages to the total

Of the total 60 Nendran cultivators, 76.70 per cent used bamboo poles and the remaining 23.3 per cent used arecanut poles. Eighty per cent of the respondents in class I and class III used bamboo poles, while this was 66.7 per cent in class II.

5.2.8 Harvesting

All the bunches are not harvested at the same time as all of them do not come to maturity uniformly. Everyday bunches are harvested which have developed fully. Mostly family labour was employed for harvesting the bunches. After harvesting, suckers were removed from the field, cleaned and this was used as seed material for the next season. However one cannot expect a harvest from every sucker planted. There was loss of crop to an extent of 16.6 per cent, 26.43

per cent and 12.43 per cent in case of Nendran, Poovan and Palayankodan respectively. This was either on account of pests and disease attack or due to natural calamities in the form of sudden heavy winds.

Before going into the actual cost of cultivation, an attempt has been made to examine the labour use pattern for the three varieties.

5.3 Labour Use Pattern

Banana cultivation is highly labour intensive. However there was no practice of use of bullock labour and machine labour for preparatory cultivation in the study area. Only human labour was used for all the operations. On an average 24 per cent, 27.7 per cent and 33.4 per cent of the total cost of cultivation was accounted by labour (including hired and family labour) in case of Nendran, Poovan and Palayankodan respectively. The operation wise labour use in mandays for Nendran, Poovan and Palayankodan is given in Tables 5.3.1, 5.3.2 and 5.3.3 respectively. The mandays were worked out on the basis of two female labour days as equivalent to one male labour day as this was approximately the wage rate ratio. Eight hours of work was taken as equivalent to one manday.

The analysis revealed that in case of Nendran, manuring demanded the highest quantum of labour to an extent of 154.30 and 102.7 mandays per hectare for class I and class II respectively. Irrigation and inter cultivation accounted for highest labour use i.e. 93.32 mandays per hectare in class III.

Labour use for propping operation steadily decreased from class I to class III. However the labour use for preparatory cultivation was almost the same for all the three classes.

In case of Poovan also manuring demanded the highest quantum of labour being 118.35, 83.37 and 96.98 mandays per hectare in class I, class II and class III respectively. Labour use for preparatory cultivation decreased steadily

from class I to class III. Labour use for irrigation and inter cultivation was the same in class I and class II while is was higher in class III. However the quantum of labour demanded for harvesting and handling operation was almost the same in all the three classes of Poovan.

Preparatory cultivation demanded highest quantum of labour in the case of Palayankodan, being 78.02, 72.44 and 66.61 mandays per hectare for class I, class II and class III respectively. Labour use for irrigation and inter cultivation was almost the same for all the three classes. This was true in the case of labour requirement for plant protection operation also.

While the highest labour use in the case of Nendran and Poovan was accounted by manuring operation (to an extent of 32 per cent and 26.90 per cent of the total labour use respectively) preparatory cultivation accounted for the highest labour use in the case of Palayankodan. (i.e. 36.68 per cent of the total labour use)

Analysis of the family labour use pattern revealed that in case of Nendran, the family labour use for preparatory cultivation, planting, manuring and propping decreased from class I to class III. The same trend was observed for preparatory cultivation and plant protection in case of Poovan. In Palayankodan this trend was observed for all operations with the exception of plant protection. Such a family labour use pattern can be attributed to the inverse relationship between family labour use and farm size.

At the aggregate level, highest family labour use was for irrigation and inter cultivation, to an extent of 36.94 per cent of the total family labour use in Nendran. In Poovan and Palayankodan highest family labour use was for preparatory cultivation to an extent of 29.07 per cent and 27.5 per cent respectively of the total family labour use.

The total family labour and hired labour contribution for various operations were 198.88 and 93.19 mandays per hectare for Nendran (Table 5.3.4)

Table. 5.3.1. Operationwise labour use in Nendran (mandays/hectare)

Operations	Class I			Class II			Class III			Aggregate		
	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total
Preparatory cultivation	16.72 (10.06)	37.45 (14.6)	54.17 (12.84)	27.09 (15.66)	26.6 (18.11)	53.69 (16.78)	39.9 (16.78)	23.43 (13.72)	63.3 (20.76)	27.9 (29.9)	29.16 (14.66)	57.06 (15.99)
Planting	7.68 (4.62)	18.38 (7.19)	26.06 (6.18)	6.04 (3.49)	8.6 (5.85)	14.64 (4.57)	5.9 (4.39)	7.37 (4.31)	13.27 (4.35)	6.54 (7.01)	11.45 (5.75)	17.99 (5.04)
Manuring	78.41 (47.20)	75.88 (29.69)	154.29 (36.59)	65.7 (37.98)	36.96 (25.16)	102.66 (32)	49.51 (36.8)	36.71 (21.50)	86.22 (28.28)	64.54 (69.2)	49.85 (25.06)	114.39 (32.0)
Irrigation and inter cultivation	35.11 (21.13)	89.29 (34.94)	124.4 (29.50)	50.7 (29.31)	43.10 (29.34)	93.8 (29.3)	5.20 (3.8)	88.02 (51.56)	93.22 (30.58)	30.33 (32.54)	73.47 (36.94)	103.8 (29.10)
Plant protection	2.5 (1.50)	2.34 (0.91)	4.84 (1.14)	4.8 (2.77)	0.24 (0.16)	5.04 (1.57)	3.47 (2.58)	0.52 (0.30)	3.99 (1.30)	3.59 (3.85)	1.03 (0.51)	4.62 (1.29)
Propping	23.0 (13.8)	17.0 (6.65)	40 (9.48)	16.9 (9.77)	13.0 (8.85)	29.9 (9.34)	23.61 (17.5)	4.16 (2.43)	27.7 (9.08)	21.17 (22.7)	19.2 (9.65)	40.4 (11.32)
Harvesting/handling	2.67 (1.60)	15.21 (5.95)	17.88 (4.24)	1.72 (0.99)	18.47 (12.57)	20.19 (6.31)	6.59 (4.91)	10.5 (6.15)	17.09 (5.60)	3.66 (3.92)	14.72 (7.40)	18.38 (5.15)
Total	166.09 (100)	255.5 (100)	421.64 (100)	172.95 (100)	146.87 (100)	319.92 (100)	134.18 (100)	170.71 (100)	304.79 (100)	93.19 (100)	198.88 (100)	356.64 (100)

* Figures in parentheses are percentages to the total

Table 5.3.2. Operationwise labour use in Poovan (mandays/hectare)

Operations	Class I			Class II			Class III			Aggregate		
	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total
Preparatory cultivation	-	64.47 (27.23)	64.47 (27.23)	10 (32.5)	48.12 (26.59)	58.12 (27.45)	11.3 (13.2)	40.55 (29.80)	41.85 (5.68)	10.65 (20.29)	37.71 (29.07)	47.96 (26.36)
Planting	1.75 (7.00)	24.53 (10.36)	26.28 (11.10)	6.70 (21.78)	10.46 (5.78)	17.16 (8.10)	2.16 (2.54)	16.4 (13.27)	18.56 (8.90)	6.18 (11.74)	17.13 (13.20)	23.3 (12.81)
Manuring	20.15 (80.69)	98.2 (41.48)	118.35 (49.99)	11.25 (36.57)	72.12 (39.86)	83.37 (39.38)	39.55 (46.53)	57.43 (46.5)	96.98 (46.5)	23.65 (44.95)	25.3 (19.50)	48.95 (26.90)
Irrigation and inter cultivation	3.07 (12.29)	33.42 (14.11)	36.49 (15.41)	-	36.49 (20.16)	36.49 (17.23)	28.00 (32.94)	36.7 (29.7)	64.7 (31.03)	10.35 (19.6)	35.53 (27.39)	45.88 (25.22)
Propping	-	-	-	-	-	-	-	-	-	-	-	-
Plant protection	-	2.6 (1.09)	2.6 (5.07)	1.56 (1.03)	1.87 (1.62)	3.43 (0.14)	0.12 (10.14)	0.12 (0.097)	0.24 (0.11)	0.08 (0.15)	1.53 (1.17)	1.61 (7.80)
Harvesting/handling	-	13.5 (5.70)	13.5 (5.70)	1.25 (4.06)	11.87 (6.56)	13.12 (6.19)	3.86 (4.54)	12.3 (9.95)	16.16 (7.75)	1.70 (3.23)	12.5 (9.63)	14.2 (7.80)
Total	24.97 (100)	236.72 (100)	261.69 (100)	30.76 (100)	180.93 (100)	211.69 (100)	84.99 (100)	163.5 (100)	208.49 (100)	52.61 (100)	129.7 (100)	181.91 (100)

* Figures in parentheses are percentage to the total

Table 5.3.3. Operationwise labour use in Palayankodan (mandays/hectare)

Operations	Class I			Class II			Class III			Aggregate		
	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total	Hired	Family	Total
Preparatory cultivation	27.52 (44.27)	50.5 (29.28)	78.02 (33.2)	40.32 (45.28)	32.2 (28.6)	72.44 (35.99)	64 (57.21)	2.61 (7.2)	66.61 (43.02)	43.94 (50.13)	28.43 (27.5)	72.37 (36.68)
Planting	18.9 (30.40)	21.55 (12.49)	40.45 (17.2)	14.12 (15.85)	7.25 (6.45)	21.37 (10.61)	19.52 (17.45)	1.30 (3.6)	20.82 (13.44)	17.5 (19.96)	9.60 (9.31)	27.1 (13.7)
Manuring	12.83 (20.64)	48.11 (27.90)	60.94 (25.97)	21.32 (23.94)	30.2 (26.89)	51.52 (25.60)	18.54 (16.57)	21.30 (59.16)	39.84 (24.15)	11.38 (12.98)	33.00 (32.00)	44.38 (22.49)
Irrigation and inter cultivation	1.61 (2.59)	35.77 (20.74)	37.38 (15.93)	8.87 (9.96)	26.12 (23.26)	34.99 (17.38)	18.54 (16.57)	11.76 (32.6)	30.3 (19.57)	9.67 (11.03)	24.55 (23.7)	34.22 (17.3)
Propping	-	-	-	-	-	-	-	-	-	-	-	-
Plant protection	-	0.5 (0.28)	0.5 (0.21)	-	0.8 (0.71)	0.8 (0.39)	-	0.6 (1.66)	0.6 (0.38)	-	0.63 (0.6)	0.63 (0.31)
Harvesting/handling	1.3 (2.09)	16.0 (9.27)	17.3 (7.37)	4.4 (4.94)	15.72 (13.99)	20.12 (9.99)	9.8 (8.76)	8.49 (23.5)	18.29 (11.81)	5.16 (5.88)	13.40 (12.99)	18.56 (9.4)
Total	62.16 (100)	172.43 (100)	234.59 (100)	89.03 (100)	112.29 (100)	201.24 (100)	111.86 (100)	26.06 (100)	154.80 (100)	87.65 (100)	109.61 (100)	197.26 (100)

* Figures in parentheses are percentages to the total

and the corresponding figures for Poovan (Table 5.3.4) and Palayankodan (Table 5.3.4) were 129.7 and 52.61 mandays per hectare and 109.61 and 87.65 mandays per hectare. Thus on the whole the family labour contributed to more than 53 per cent of the total labour use in each of the three varieties of banana.

Table 5.3.4. Family and hired labour utilization in Nendran, Poovan and Palayankodan. (mandays/hectare)

Particulars	Nendran	Poovan	Palayankodan
Hired	93.19	52.61	87.65
	(31.90)	(28.85)	(44.43)
Family	198.88	129.7	109.61
	(68.09)	(71.14)	(55.57)
Total	292.07	182.31	197.26
	(100)	(100)	(100)

* Figures in parentheses are percentages to total

5.4 Input wise cost of cultivation.

Cost of cultivation have been worked out on per hectare basis separately for each of the crops and for three size classes. However only the results obtained at the aggregate level have been used for making comparisions of costs.

5.4.1 Inputwise cost of cultivation of Nendran.

Input wise cost of cultivation per hectare of Nendran based on different cost concepts were worked out and is given in Table 5.4.1.

The analysis showed that costs A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 were Rs.142605.3, Rs.155314.3, Rs.143480.3, Rs.168479.3, Rs.166948.9 and Rs.191947.9 respectively for class I. For class II, the costs were Rs.146056.1, Rs.155661.1, Rs.147181.1, Rs.172180.1, Rs.164112.3 and Rs.189789.71 respectively in the same order and for class III the corresponding costs were Rs.142652.61, Rs.156368.61, Rs.143902.61, Rs.168902.6, Rs.163661.61 and Rs.188661.6.

Table 5.4.1. Inputwise cost of cultivation of Nendran (Rs./hectare)

Sl. No.	Particulars	Class I		Class II		Class III		Aggregate	
		Rs.	Per cent	Rs.	Per cent	Rs.	Per cent	Rs.	Per cent
1	Hired human labour	20860.00	10.80	27174.5	14.12	24427.00	12.89	24465.20	12.67
2	Planting material	10478.00	5.40	10500.0	5.55	10359.00	5.49	10431.46	5.50
3	Manures	35112.00	18.24	34487.0	17.92	34585.00	18.33	34676.90	18.29
4	Fertilizers	30000.00	15.59	27714.0	14.40	28838.00	15.21	28752.98	15.16
5	Plant protection chemicals	3043.00	1.58	3658.0	1.90	2936.00	1.54	3189.80	1.68
6	Propping materials	24983.00	13.08	25500.0	13.48	25750.00	13.64	25491.70	13.37
7	Irrigation charges	6865.00	3.56	6945.0	3.60	6753.00	3.56	6839.99	3.59
8	Interest on working capital								
	a) borrowed	6271.00	3.25	4156.0	2.15	2767.00	1.46	4025.10	2.30
	(b) own	4200.00	2.18	5610.0	2.91	5974.00	3.15	5444.56	2.76
9	Land revenue	90.00	0.046	90.0	0.046	90.00	0.046	90.00	0.046
10	Depreciation	234.10	0.36	221.6	0.46	173.61	0.52	202.90	0.419
11	Interest on borrowed fixed capital	469.00	0.24	-	-	-	469.00	156.30	0.08
	Cost A1	142605.30	74.35	146056.1	76.25	142652.61	75.71	143720.26	75.81
12	Rent paid for leased in land	12709.00	6.60	9605.0	4.99	13716.00	7.23	12178.00	6.30
	Cost A2	155314.30	80.96	155661.1	81.25	156368.61	82.90	155898.20	82.09
13	Interest on own fixed capital	875.00	0.45	1125.0	0.58	1250.00	0.65	1122.80	0.56
	Cost B1	143480.30	74.81	147181.1	76.84	143902.61	76.30	144842.70	76.35
14	Rental value of own land	12290.00	6.38	15394.0	8.00	11284.00	5.95	12821.43	6.81
	Cost B2	168479.30	87.80	172180.1	89.8	168902.60	8.82	169842.50	89.40
15	Imputed value of family labour	23468.60	12.19	16931.2	8.79	19759.00	10.42	19728.60	10.50
	Cost C1	166948.90	87.00	164112.3	85.64	163661.61	86.80	164571.50	86.88
	Cost C2	191947.90	100	189789.7	100	188661.60	100	189571.18	100

In class I the most important item of expenditure was labour which constituted 23.0 per cent of the total cost. This was followed by manures, fertilizers and propping material, constituting 18.24 per cent, 15.59 per cent and 13.08 per cent of the total cost respectively. Planting material, irrigation charges, plant protection chemicals and land revenue accounted for 5.44 per cent, 3.56 per cent, 1.58 per cent and 0.046 per cent of the total cost respectively. The rental value of land accounted for 6.38 per cent of the total cost.

The same trend was noticed in class II and class III. Labour constituted an important item of expenditure accounting for 23 per cent and 23.31 per cent of the total cost in class II and class III respectively.

This was followed by manures constituting 17.92 per cent and 18.33 per cent, fertilizers constituting 14.40 and 15.21, and propping material constituting 13.48 per cent and 13.64 per cent in class II and class III respectively. The rest of the costs were shared by irrigation charges accounting for 3.6 per cent and 3.56 per cent and rental value of land accounting for 8.0 per cent and 5.95 per cent in class II and class III respectively. Planting material accounted for 5.95 per cent of the total cost in class II and class III.

At the aggregate level the total cost of cultivation came to Rs.189571.18 per hectare of which Rs.143720.3 was cost A_1, Rs.155898.2 cost A_2, Rs.144842.7 cost B_1, Rs.169842.50 cost B_2 and Rs.164571.5 cost C_1. The major inputs of expenditure were labour, manures, fertilizers and propping material constituting Rs.441938.8 (23.17 per cents), Rs.34676.9 (8.29 per cent) Rs.28752.98 (15.16 per cent) and Rs.25491.7 (13.37 per cent) respectively. Expenditure on plant protection was only a negligible portion of the total cost (i.e. 1.68 per cent).

On the whole, proportion of expenditure on seed material, manures, plant protection chemicals, irrigation charges etc. remained more or less the same

in all the three classes. However the slight variation in the total costs could be due to the variation in the labour cost contribution between the three classes.

5.4.2 Input wise cost of cultivation of Poovan

The input wise cost of cultivation of Poovan based on different cost concepts in given in Table 5.4.2.

Costs A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 per hectare were Rs.80385.31, Rs.860431.11, Rs.81114.47, Rs.102614.27, Rs. 105742.34 and Rs.127242.14 respectively for class I. For class II the costs were Rs.84825.39, Rs.91543.37, Rs.85762.87, Rs.107262.07, Rs.107557.99 and Rs.129056.99 respectively in the same order and for class III the costs were Rs.74813.77, Rs.80006.97, Rs.75855.37, Rs.97355.33, Rs.94220.29 and Rs.115720.20 respectively.

In all the three classes the most important input was labour constituting 26.55 per cent, 24.27 per cent and 27.98 per cent respectively in class I, class II and class III. The next important item of expenditure in all the three classes was manures constituting 16.27 per cent, 19.37 per cent and 14.76 per cent of the total costs in class I, class II and class III respectively. This was followed by cost of fertilizers, planting material and rental value of land in class I, which constituted 15.77 per cent, 14.26 per cent and 12.45 per cent respectively. The second important item of expenditure in class II was planting material, followed by fertilizers and rental value of land constituting 15.25 per cent, 15.06 per cent and 11.45 per cent of the total cost respectively.

In class III also the second important input of expenditure was planting material, followed by rental value of land and fertilizers constituting 14.71 per cent, 13.6 per cent and 10.6 per cent respectively.

Table 5.4.2. Inputwise cost of cultivation of Poovan . (Rs./hectare)

Sl. No.	Particulars	Class I		Class II		Class III		Aggregate	
		Rs.	Per cent	Rs.	Per cent	Rs.	Per cent	Rs.	Per cent
1	Hired human labour	9171.43	7.20	9545.98	7.39	15184.61	12.66	12876.93	10.61
2	Planting material	18153.50	14.26	19687.50	15.25	17644.92	14.71	18203.60	15.07
3	Manures	20703.50	16.27	25007.50	19.37	17694.40	14.76	19893.28	16.50
4	Fertilizers	20077.66	15.77	19448.12	15.06	12733.11	10.60	15511.67	12.89
5	Plant protection chemicals	3289.47	2.58	2515.00	1.94	2680.00	2.23	2742.60	2.27
6	Propping materials	-	-	-	-	-	-	-	-
7	Irrigation charges	3947.73	0.31	1051.25	0.81	2983.09	2.48	2104.90	1.74
8	Interest on working capital								
	(a) borrowed	4396.20	3.45	5859.37	4.54	3396.73	2.83	4135.00	3.42
	(b) own	3788.32	2.97	1371.13	1.06	2068.44	1.72	2191.22	1.82
9	Land revenue	90.00	0.07	90.00	0.06	90.00	0.08	90.00	0.07
10	Depreciation	320.50	0.25	250.00	0.19	338.00	0.28	314.63	0.26
11	Interest on borrowed fixed capital	-	-	-	-	-	-	-	-
	Cost A1	80385.31	63.17	84825.39	65.72	74813.77	62.41	78065.20	64.66
12	Rent paid for leased in land	5657.80	4.44	6718.00	5.20	5193.20	4.32	5624.78	4.67
	Cost A2	86043.11	67.62	91543.37	70.90	80006.97	66.70	83689.96	69.37
13	Interest on own fixed capital	729.16	0.57	937.50	0.72	1041.60	0.86	965.25	0.79
	Cost B1	81114.47	63.74	85762.87	66.45	75855.37	66.74	79030.86	65.46
14	Rental value of own land	15842.00	12.45	14781.20	11.45	16306.76	13.60	15874.96	13.15
	Cost B2	102614.27	80.64	107262.07	83.11	97355.33	84.67	100530.50	83.27
15	Imputed value of family labour	24627.87	19.35	21794.92	16.88	18364.92	15.32	20200.33	16.73
	Cost C1	105742.34	83.10	107557.90	83.34	94220.29	82.06	99231.18	82.19
	Cost C2	127242.14	100	129056.99	100	115720.20	100	120719.81	100

At the aggregate level the total cost of cultivation of Poovan worked to Rs.120719.8 per hectare of which 64.66 per cent was accounted by cost A_1, 69.37 per cent by cost A_2, 65.46 per cent by cost B_1, 83.27 per cent by cost B_2 and 82.19 per cent by cost C_1. The major inputs of expenditure were labour, manures, planting material, fertilizers and rental value of land constituting 27.57 per cent, 16.5 per cent, 15.07 per cent, 12.89 per cent and 13.15 per cent of the total cost respectively.

5.4.3 Input wise of cultivation of Palayankodan

Input wise cost of cultivation of Palayankodan based on different cost concepts is given in Table 5.4.3.

Costs A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 per hectare were Rs. 38922.9, Rs. 38922.9, Rs.39228.9, Rs.60728.9, Rs.56214.9 and Rs.77714.9 respectively for class I. For class II, the costs were Rs.40019.2, Rs.40019.2, Rs.40355.2, Rs.61855.2, Rs.56679.2 and Rs.78179.2 respectively in the same order and for class III the costs were Rs.45465.15, Rs.45465.15, Rs.45791.15, Rs.67291.15, Rs.53667.15 and Rs.75167.15 respectively.

In all the three classes, labour cost constituted the most important input of expenditure accounting for 33.2 per cent, 33.99 per cent and 33.07 per cent of the total cost respectively.

The next important item of expenditure in all the three classes was rental value of own land constituting 27.66 per cent, 27.5 per cent and 28.6 per cent in class I, class II and class III respectively.

The other important inputs of expenditure in class I were manures followed by planting material and fertilizers which constituted 13.44 per cent,

Table 5.4.3. Inputwise Cost of cultivation of Palayankodan. (Rs./hectare)

Sl. No.	Particulars	Class I		Class II		Class III		Aggregate	
		Rs.	Per cent	Rs.	Per cent	Rs.	Per cent	Rs.	Per cent
1	Hired human labour	8862.00	11.40	10312.50	13.19	17041.00	22.60	12569.89	16.35
2	Planting material	9211.00	11.85	8935.00	11.42	8768.00	11.66	8946.74	11.60
3	Manures	10446.00	13.44	9439.00	12.07	9163.00	12.19	9613.96	12.50
4	Fertilizers	6788.00	8.73	7471.00	9.55	6456.00	8.58	6875.80	8.96
5	Plant protection chemicals	1417.00	1.81	1352.00	1.72	1312.00	1.74	1354.50	1.76
6	Propping materials	-	-	-	-	-	-	-	-
7	Irrigation charges	200.00	0.25	312.00	0.39	360.00	0.47	299.39	0.38
8	Interest on working capital								
	(a) borrowed	-	-	-	-	-	-	-	-
	(b) own	1542.00	1.98	1705.00	2.18	1883.00	2.50	1729.52	2.22
9	Land revenue	90.00	0.11	90.00	0.11	90.00	0.11	90.00	0.11
10	Depreciation	366.90	0.47	403.20	0.51	392.15	0.52	388.56	0.50
	Interest on borrowed fixed capital	-	-	-	-	-	-	-	-
	Cost A1	38922.90	50.08	40019.20	51.18	45465.15	60.48	41868.20	54.47
11	Rent paid for leased in land	-	-	-	-	-	-	-	-
	Cost A2	38922.90	50.08	40019.20	51.18	45465.15	60.48	41868.20	54.47
12	Interest on own fixed capital	306.00	0.39	336.00	0.42	326.00	0.43	323.56	0.42
	Cost B1	39228.90	50.40	40355.20	51.60	45791.15	60.90	42191.80	54.89
13	Rental value of own land	21500.00	27.66	21500.00	27.50	21500.00	28.60	21500.00	27.90
	Cost B2	60728.90	78.14	61855.20	79.11	67291.15	89.50	63691.81	82.87
14	Imputed value of family labour	16986.00	21.80	16324.00	20.80	7876.00	10.47	13162.37	17.12
	Cost C1	56214.90	72.30	56679.20	72.49	53667.15	71.30	55353.90	72.08
	Cost C2	77714.90	100	78179.20	100	75167.15	100	76854.19	100

11.85 per cent and 8.73 per cent of the total cost respectively. A similar trend was observed in class II and class III with manures constituting 12.07 and 12.19 per cent, planting material constituting 11.42 per cent and 11.66 per cent and fertilizers constituting 9.55 per cent and 8.58 per cent of the total cost in class I and class II respectively. At the aggregate level the total cost of cultivation worked to Rs.76854.19 per hectare of which 54.47 per cent was accounted by cost A_1 and the same by cost A_2, 54.8 per cent by cost B_1, 82.87 per cent by cost B_2 and 72.08 per cent by cost C_1. The major items of expenditure were labour, rental value of land, manures, planting material and fertilizers constituting 28.7 per cent, 27.9 per cent, 12.5 per cent and 11.6 per cent of the total cost respectively.

5.5 Operationwise cost of cultivation.

5.5.1 Operationwise cost of cultivation of Nendran

Operationwise cost of cultivation of Nendran for different classes and at the aggregate level is given is Table 5.5.1. Of the different operations manures and manuring had the largest share of total cost in all the three classes i.e. Rs.81599.0 (42.51 per cent) in class I, Rs.77075.0 (40.75 per cent) in class II and Rs.78030 (41.30 per cent) in class III. This was followed by expenditure on propping of Rs.29229.0 (15.2 per cent) in class I, Rs.29416.0 (15.56 per cent) in class II and Rs.29162.5 (15.45 per cent) in class III.

The third important item of expenditure in all the three classes was irrigation and inter cultivation which amounted to Rs.18373.0(9.57 per cent) in class I, Rs.19366.0 (10.2 per cent) is class II and Rs.20012.0 re (10.6 per cent) in class III, but its proportion to the total cost was less in class I, compared to class II and class III.

Cost of planting material and planting, rent on leased in land, rental value of own land and cost on preparatory cultivation amounted to Rs.11997.30 (6.25 per cent), Rs.12709 (6.62 per cent), Rs.12290 (6.4 per cent) and Rs.7517.00 (3.91 per cent) respectively in class I. The rest of the costs were shared by interest

on working capital (5.48 per cent), plant protection expenses (1.91 per cent) and land revenue (0.04 per cent).

In class II, expenditures on planting material and planting, rent on leased in land, rental value of own land and cost of preparatory cultivation amounted to Rs.12311.0 (6.5 per cent), Rs.9605 (5.07 per cent) Rs.15394.0 (8.14 per cent) and Rs.7783.00 (4.11 per cent) respectively. The corresponding figures for class III in the same order were Rs.11787.00 (6.24 per cent), Rs.13716.0 (7.27 per cent), Rs.11284.0 (5.98 per cent), Rs.8616.00 (4.56 per cent).

The rent on leased in land in proportion to the total cost was less for class II (5.07) as compared to class I (6.62 per cent) and class III (7.27 per cent).

Interest on working capital, land revenue and plant protection accounted for 5.15 per cent, 0.04 per cent and 2.32 per cent of the total cost, respectively in class II. The corresponding figures in class III were 4.66 per cent, 0.04 per cent and 1.97 per cent. The harvesting and handling costs in class I, class II and class III accounted for 1.25 per cent, 1.35 per cent and 1.10 per cent of the total cost respectively.

The total cost of cultivation in class I was comparatively higher than that of class II and class III. This was on account of higher cost incurred on manures and manuring in this class.

For the sample as a whole, manures and manuring was the single largest item of cost which worked to Rs.78560.36 (41.4 per cent) per hectare. The figures for propping, irrigation and inter cultivation, rent on leased in land, interest on working capital and rental value of owned land were Rs.29258.0 (15.4 per cent), Rs.19424.5 (10.24 per cent), Rs.12178.0 (6.4 per cent), Rs.19469.66 (4.48 per cent) and Rs.12821.43 (6.76 per cent) respectively. Rest of the costs were shared by interest on working capital (5.06 per cent), preparatory cultivation (4.27 per cent), plant protection (2.07 per cent) and harvesting & handling charges (1.20 per

Table 5.5.1. Operation wise cost of cultivation of Nendran (Rs./hectare)

Sl. No.	Particulars	Class I		Class II		Class III		Aggregate	
		Rs.	Per cent	Rs.	Per cent	Rs.	Per cent	Rs.	Per cent
1	Preparatory cultivation	7517.00	3.91	7783.00	4.11	8616.00	4.56	8095.46	4.27
2	Planting material and planting	11997.30	6.25	12311.00	6.50	11787.00	6.24	12002.00	6.37
3	Manures and manuring	81599.00	42.51	77075.00	40.75	78030.00	41.30	78560.36	41.40
4	Propping	29229.00	15.20	29416.00	15.56	29162.50	15.45	29258.36	15.40
5	Plant protection	3683.60	1.91	4398.00	2.32	3723.00	1.97	3927.70	2.07
6	Irrigation and intercultivat-ion	18373.00	9.57	19366.00	10.20	20012.00	10.60	19424.60	10.24
7	Harvesting and handling	2411.00	1.25	2561.00	1.35	2076.00	1.10	2307.90	1.21
8	Interest on working capital								
	a) Own	4200.00	2.18	5610.00	2.96	5974.00	3.16	5444.56	2.76
	b) borrowed	6271.00	3.26	4156.00	2.19	2767.00	1.46	4025.10	2.30
9	Rent paid for leased inland	12709.00	6.62	9605.00	5.07	13716.00	7.27	12178.00	6.30
10	Rental value of own land	12290.00	6.40	15394.00	8.14	11284.00	5.98	12821.43	6.81
11	Land taxes	90.00	0.04	90.00	0.04	90.00	0.04	90.00	0.04
12	Depreciation	234.10	0.12	221.60	0.11	173.61	0.09	202.90	0.10
13	Interest on borrowed fixed capital	469.00	0.24	-	-	-	-	156.3	0.08
14	Interest on own fixed capital	875.00	0.45	1125.00	0.59	1250.00	0.66	1122.80	0.56
	Total	191948.00	100	189111.30	100	188661.60	100	189571.18	100

cent). Land taxes and interest on fixed capital accounted for only 0.68 per cent of the total cost of cultivation. For the sample as a whole, the total cost of cultivation amounted to Rs.189571.2 per hectare.

5.5.2 Operation wise cost of cultivation of Poovan

The operation wise cost of cultivation of Poovan for different classes and at the aggregate level is given in Table 5.5.2.

Class wise analysis showed that the total cost of cultivation in class I was Rs.127621.04, Rs.128373.7 in class II and Rs.115720.87 in class III. Manures and manuring was the major item of expenditure in all the three classes. This amounted to Rs.54994.28 (43.09 per cent) per hectare in class I, Rs.56500.93 (44 per cent) per hectare in class II and Rs.49827.49 (43.00) in class III. The second important item of expenditure in all the three classes was planting material and planting which amounted to Rs. 22144.71 (17.3 per cent) per hectare in class I, Rs.22812.5 (17.7 per cent) per hectare in class II and Rs.18758.0 (16.20 per cent) per hectare in class III. Rental value of land formed yet another important item of expenditure, which amounted to Rs.15842.0 (12.4 per cent) in class I, Rs.14781.2 (11.5 per cent) in class II and Rs.16306.76 (14.10 per cent) in class III. Majority of sample farmers in class III and class I cultivated on own land, as compared to the farmers in class II.

The fourth important item of expenditure in class I was preparatory cultivation which amounted to Rs.7776.3 (6.09 per cent) per hectare, followed by irrigation and inter cultivation, rent on leased in land and plant protection which constituted 4.74 per cent, 4.43 per cent and 3.45 per cent respectively.

In class II, however, the fourth important item of expenditure was rent on leased in land which amounted to Rs.6718 (5.23 per cent) per hectare. This was followed by expenditure on irrigation and inter cultivation, preparatory cultivation

Table 5.5.2.Operationwise cost of cultivation of Poovan (Rs./hectare)

Sl. No.	Particulars	Class I		Class II		Class III		Aggregate	
		Rs.	Per cent	Rs.	Per cent	Rs.	Per cent	Rs.	Per cent
1	Preparatory cultivation	7776.30	6.09	6182.75	4.81	5433.00	4.69	5995.63	4.90
2	Planting material and planting	22144.71	17.30	22812.50	17.70	18758.00	16.20	21204.19	17.56
3	Manures and manuring	544994.28	43.09	56500.93	44.00	49827.49	43.00	52235.30	43.39
4	Propping	-	-	-	-	-	-	-	-
5	Plant protection	4405.17	3.45	5375.00	4.18	4335.20	3.74	4588.45	3.79
6	Irrigation and intercultivat-ion	6056.11	4.74	6615.62	5.15	6421.30	5.50	6405.80	5.31
7	Harvesting and handling	1041.00	0.81	1563.50	1.21	946.68	0.81	1105.22	0.90
8	Interest on working capital								
	a) Own	3788.32	2.96	1371.13	10.6	2068.40	1.78	2191.22	1.81
	b) borrowed	4396.20	3.44	5859.57	4.56	3396.73	2.93	4135.00	3.42
9	Rent on leased in land	5657.80	4.43	6718.00	5.23	5193.20	4.48	5624.78	4.66
10	Rental value of own land	15842.00	12.40	14781.20	11.50	16306.76	14.10	15874.96	13.15
11	Land taxes	90.00	0.07	90.00	0.07	90.00	0.10	90.00	0.07
12	Depreciation	320.50	0.25	250.00	0.19	338.00	0.28	314.63	0.26
13	Interest on borrowed fixed capital	-	-	-	-	-	-	-	-
14	Interest on own fixed capital	729.16	0.57	937.50	0.73	1041.60	0.89	965.25	0.80
	Total	127621.04	100	128373.70	100	115720.87	100	120634.68	100

and plant protection which accounted for 5.15, 4.81 and 4.18 per cent of the total cost respectively.

In class III, irrigation and inter cultivation accounted for 5.50 per cent of the total cost which was high in comparison with the irrigation and inter cultivation costs for class I and class III. Preparatory cultivation and harvesting and handing costs accounted for 4.69 and 0.91 per cent of the total cost respectively in this class.

The cost of cultivation of Poovan at the aggregate level amounted to Rs.120634.68 per hectare and manures and manuring formed the most important operation accounting for 43.39 per cent of the total cost.

5.5.3 Operation wise cost of cultivation of Palayankodan

Operation wise cost of cultivation of Palayankodan for three classes and at the aggregate level is given in Table 5.5.3.

Total cost of cultivation in class I was Rs.77714.9 per hectare, Rs.78179.2 per hectare in class II and Rs.75167.15 per hectare in class III. Manures and manuring formed the most important item of expenditure accounting for Rs.22854.6 (29.4 per cent) and Rs.22898.0 (29.2 per cent) in class I and class II respectively. The most important item of expenditure in class III was rental value of owned land which amounted to Rs.21500 (28.6 per cent) per hectare.

Second important item of expenditure in class I and II was rental value of land which accounted for 27.6 and 27.5 per cent respectively of the total cost, while in class III, the second important item of expenditure was manures and manuring which amounted to Rs.19952.0 (26.54 per cent) per hectare.

Preparatory cultivation amounted to Rs.8128.2 (10.45 per cent) in class I, Rs.7786.0 (9.95 per cent) in class II and Rs.7972.60 (10.66 per cent) in class III. Irrigation and inter cultivation amounted to Rs.3582.7 (4.6 per cent) in class I,

Table 5.5.3. Operation wise cost of cultivation of Palayankodan (Rs./hectare)

Sl. No.	Particulars	Class I		Class II		Class III		Aggregate	
		Rs.	Per cent	Rs.	Per cent	Rs.	Per cent	Rs.	Per cent
1	Preparatory cultivation	8128.20	10.45	7786.00	9.95	8013.00	10.66	7972.60	10.35
2	Planting material and planting	13545.70	17.42	12696.40	16.20	13131.00	17.46	13108.49	17.04
3	Manures and manuring	22854.60	29.40	22898.00	29.20	19952.00	26.54	21718.02	28.43
4	Propping	-	-	-	-	-	-	-	-
5	Plant protection	2378.70	3.06	2574.00	3.29	2162.00	2.87	2355.50	3.07
6	Irrigation and intercultivat-ion	3582.70	4.60	5244.00	6.70	5032.00	6.69	4690.64	5.99
7	Harvesting and handling	3420.00	4.40	2947.10	3.76	2686.00	3.57	2977.11	3.91
8	Interest on working capital								
	a) Own	1542.00	1.98	1705.00	2.18	1883.00	2.50	1729.52	2.22
	b) borrowed	-	-	-	-	-	-	-	-
9	Rent paid for land in land	-	-	-	-	-	-	-	-
10	Rental value of land	21500.00	27.60	21500.00	27.50	21500.00	28.60	21500.00	27.90
11	Land taxes	90.00	0.11	90.00	0.11	90.00	0.11	90.00	0.11
12	Depreciation	366.90	0.47	403.20	0.51	392.15	0.52	388.44	0.50
13	Interest on borrowed fixed capital	-	-	-	-	-	-	-	-
14	Interest on own fixed capital	306.00	0.39	336.00	0.42	326.00	0.43	323.56	0.42
	Total	77714.90	100	78179.20	100	75167.15	100	76854.19	100

Rs.5244.0 (6.7 per cent) in class II and Rs.5032.0 (6.69 per cent) in class III. However the irrigation charges alone were quite low as revealed from input wise cost of cultivation (Table 5.4.3.).

The rest of the costs were shared by harvesting and handling, plant protection, interest on working capital, interest on own final capital, land taxes etc.

A brief comparison of operation wise cost of cultivation of the three varieties revealed that manures and manuring formed the most important item of expenditure in all the three varieties, accounting for 41.4 per cent, 43.39 per cent and 28.43 per cent of the total cost in Nendran, Poovan and Palayankodan respectively. Second important item of expenditure in Nendran was propping, which accounted for 15.4 per cent of the total cost while in the case of Poovan and Palayankodan, it was planting material and planting which accounted for 17.56 per cent and 17.04 per cent of the total cost respectively. Preparatory cultivation accounted for 4.27 per cent of total cost in Nendran, 4.90 per cent in Poovan, while this constituted 10.35 per cent of total cost in Palayankodan. Plant protection accounted for the highest cost in Poovan, because this crop is more prone to pests and diseases as compared to Nendran and Palayankodan.

Interest on working capital accounted for 5.06 per cent of total cost in Nendran and 5.49 per cent of total cost in Poovan. Since Palayankodan was not taken as sole crop, but was taken mostly taken in combination with Nendran and Poovan, loan was not taken particularly for cultivation of Palayankodan crop.

Comparison of aggregate inputwise cost of cultivation per hectare of Nendran, Poovan and Palayankodan showed that the most important input of cultivation in Nendran was manures which accounted for 18.2 per cent of the total cost. In Poovan and Palayankodan, most important input was family labour which accounted for 18.73 per cent, and 17.8 per cent of the total cost respectively. Fertilisers was the second important input of expenditure in Nendran accounting

for 15.13 per cent of total cost. Manures formed the second important input of expenditure in Poovan accounting for 16.5 per cent of the total cost while for Palayankodan,hired human labour was the next important item accounting for 15.6 per cent of the total cost. Irrigation charges were the highest is Nendran followed by Poovan and Palayankodan.

Rent on leased in land was also higher in Nendran as number of farmers cultivated on leased in land, and was nil in Palayankodan. Cost of plant protection chemicals in proportion to the total cost was highest in Poovan, as this crop was more prone to pests and diseases.

Cost of hired human labour in proportion to total cost of cultivation was the least in Poovan followed by Nendran and Palayankodan. Cost of manures and fertilizers was the highest in Nendran. All the Nendran growers made use of organic manures and fertilizers, while it's use was comparatively low for Poovan and still lower for Palayankodan. Rent on leased in land was also the highest in case of Nendran, as a number of cultivators cultivated on leased in land.

A comparison of aggregate per hectare(input wise)cost of cultivation of Nendran, Poovan and Palayankodan based on labour cost, material cost and other costs is given in Table 5.5.4.

Table 5.5.4. Inputwise cost of cultivation of Nendran, Poovan and Palayankodan (Rs.per hectare)

Input wise cost	Nendran	Poovan	Palayankodan
Labour cost	44193.80	33077.26	25732.26
	(23.3)	(27.34)	(33.49)
Material cost	109382.77	58456.05	27090.39
	(54.0)	(47.97)	(35.32)
Other costs	35994.61	29186.57	24031.54
	(22.7)	(24.69)	(31.19)
Total	189571.18	120719.88	76854.19
	(100)	(100)	(100)

* Figures in parentheses are percentage to the total

Although labour cost in Nendran (Rs.44193.89) was higher as compared to Poovan (Rs.33077.26) and Palayankodan (Rs.25732.26), its proportion to the total cost was less (23.3 per cent) as compared to that of Poovan (27.34 per cent) and Palayankodan (33.49 per cent).

Material costs accounted for the highest share in Nendran which accounted for 54.0 per cent of the total cost while in Poovan and Palayankodan material costs accounted for 47.97 per cent and 35.32 per cent of the total cost respectively.

Other costs accounted for 22.7 per cent, 24.69 per cent and 31.19 per cent in Nendran, Poovan and Palayankodan respectively.

Total cost of cultivation was the highest in Nendran which accounted to Rs.189571.18 per hectare followed by Poovan i.e. Rs.120719.88 per hectare and Palayankodan i.e. Rs.76854.19 per hectare.

Analysis of per plant input wise cost of cultivation of Nendran, Poovan and Palayankodan (Table 5.5.5) revealed that cost of planting material accounted for the highest share in Poovan (15.0 per cent) followed by Palayankodan (11.65 per cent) and Nendran (5.51 per cent). This was inclusive of the transportation charges.

Cost of manures and fertilizers was the highest in Nendran, followed by Poovan and Palayankodan. These two together amounted to Rs.25.37 (33.52 per cent), Rs.16.46 (29.34 per cent) and Rs.7.66 (21.44 per cent) in Nendran, Poovan and Palayankodan respectively. Cost of plant protection chemicals accounted for 1.67 per cent, 2.26 per cent and 1.76 per cent in Nendran, Poovan and Palayankodan respectively.

Cost of props came to around Rs.10.19 (13.46 per cent) in Nendran, while this was nil in the other two varieties. Irrigation charges was the highest in

Table 5.5.5. Per plant input wise cost of cultivation of Nendran, Poovan and Palayankodan at the aggregate level (Rs./plant)

Particulars	Nendran	Per cent	Poovan	Per cent	Palayan-kodan	Per cent
Material cost						
i) Planting material	4.17	5.51	8.46	15.08	4.16	11.65
ii) Manure	13.87	18.33	9.25	16.49	4.47	12.52
iii) Fertilizer	11.50	15.19	7.21	12.85	3.19	8.93
iv) Plant protection chemicals	1.27	1.67	1.27	2.26	0.63	1.76
v) Propping	10.19	13.46	-	-	-	-
vi) Irrigation charges	2.73	3.60	0.98	1.75	0.13	0.36
Sub total	43.73	57.76	27.17	48.43	12.58	35.22
Labour cost						
i) Family labour	7.89	10.42	9.39	16.74	6.12	17.14
ii) Hired labour	9.78	12.92	5.98	10.66	5.84	16.35
Sub total	17.60	23.34	15.37	27.4	11.96	33.49
Other costs						
i) Interest on working capital						
a) Own	1.61	2.12	1.01	1.80	0.80	2.24
b) Borrowed	2.17	2.86	1.92	3.42	-	-
ii) Interest on fixed capital						
a) Own	0.45	0.59	0.45	0.80	0.15	0.42
b) Borrowed	0.06	0.08	-	-	-	-
iii) Land revenue	0.04	0.05	0.04	0.07	0.04	0.11
iv) Depreciation	0.81	1.07	0.14	0.25	0.18	0.50
v) Rent on leased in land	4.80	6.30	2.61	4.66	-	-
vi) Rental value of own land	5.12	6.76	7.38	13.16	10.00	28.00
Sub total	14.33	19.83	13.55	24.16	11.17	31.27
Total	75.66	100	56.09	100	35.71	100

Nendran ie Rs.2.73 (3.6 per cent), followed by Poovan Rs.0.98 (1.74 per cent) and Palayankodan Rs.0.13 (0.36 per cent).

Cost of hired labour accounted for highest share in Palayankodan (17.13 per cent), followed by Nendran (12.92 per cent) and Poovan (10.66 per cent). Cost of family labour also accounted for highest share in Palayankodan (17.13 per cent), followed by Poovan (16.74 per cent) and Nendran (10.42 per cent). The other costs amounted to Rs. 14.33 (6.76 per cent), Rs.13.15 (10 per cent) and Rs.11.17 (31.27 per cent) in Nendran, Poovan and Palayankodan respectively. The total cost of cultivation per plant worked to Rs.75.66 for Nendran, Rs.56.09 for Poovan and Rs.35.71 for Palayankodan.

5.6 Production and value of output

The per hectare output for three classes of Nendran and at the aggregate level is given in Table 5.6.1.

The output of main product was represented in terms of number of bunches obtained and the price of each bunch was fixed on the basis of actual weight. This holds true for all the three varieties. The total number of bunches obtained from a hectare were 2093, 2007 and 1997 in class I, class II and class III respectively. Total number of suckers obtained as by product numbered 5007 in class I, 5216 in class II and 4098 in class III.

The number of suckers used again as planting material for the next crop numbered 2600 in class I, 1500 in class II and 1700 in class III. Since significant number of farmers in class I had used fresh suckers as planting material for their crop, the suckers obtained from this crop were used as planting material for the second crop. While in class II and class III a number of farmers used suckers obtained from the first crop as planting material, hence number of suckers used again in these two classes was comparatively low. Number of suckers sold in class

Table 5.6.1. Output per hectare in different classes of Nendran

Particulars	Class I	Class II	Class III	Aggregate
Bunches (No.)	2093	2007	1997	2022.50
Total weight (kg)	20930	20070	19970	20225.00
Total no. of suckers obtained	5007	5216	4098	4664.50
Suckers sold (No.)	506	264	305	338.92
Suckers used (No)	2600	1500	1700	1846.68

Table 5.6.2. Total receipts from main product and by product in Nendran (Rs.)

Particulars	Class I	Class II	Class III	Aggregate
Main product	219817.50	210735.00	215676.00	215076.00
	(94.6)	(96.76)	(96.4)	(96.00)
By product	12423.00	7056.00	8020.00	8742.18
	(5.4)	(3.24)	(3.6)	(4.00)
Total	232240.50	217791.00	223696.00	223818.00

I, class II and class III were 506, 264 and 305 respectively. The rest of the suckers went waste in all the classes.

In calculating the returns from byproduct, receipts from suckers sold and number of suckers used again, were taken into account. This holds good for all three varieties. The value of suckers used again was imputed @ Rs.4 per sucker of Nendran and Rs.8 per sucker of Poovan and Rs.4 per sucker of Palayankodan.

The per hectare total returns from Nendran is given in Table 5.6.2. This includes the income from main product and by product.

The total returns was the highest in class I, followed by class II and class III and this amounted to Rs.2322490.5, Rs.217791.0 and Rs. 223696.0 in class I, class II and class III respectively and this was Rs.223818.0 at the aggregate level.

The per hectare output of Poovan for three classes and at the aggregate level is given in Table 5.6.3.

The total number of bunches obtained by cultivating a hectare of Poovan was 1511.0 in class I, 1714.0 in class II and 1424 in class III. Total number of suckers obtained were 6404, 6564 and 6149 in class I, class II and class III respectively. The total number of suckers used as planting material in class I was 2150, while this was 1900 and 1870 in class II and class III respectively. The number of suckers sold in class I, II and III were 2154, 2464 and 2149 respectively. The rest went waste in all the three classes. The per hectare total receipts from Poovan is given in Table 5.6.4.

The total receipts was the highest in class II (Rs. 175351.50), followed by class III (Rs. 170412.49) and class I (Rs. 165832.75). At the aggregate level the total receipts worked to Rs. 170802.24.

Table 5.6.3.Output per hectare in different classes of Poovan

Particulars	Class I	Class II	Class III	Aggregate
Bunches (No.)	1511.00	1714.00	1424.00	1505.85
Total weight (kg)	11332.50	12105.00	11392.00	11547.95
Total no. of suckers obtained	6404.00	6564.00	6149.00	6287.76
Suckers sold (No.)	2154.00	2464.00	2149.00	2223.08
Suckers used (No)	2150.00	1900.00	1870.00	1923.37

Table 5.6.4. Total receipts from main product and by product in Poovan (Rs.)

Particulars	Class I	Class II	Class III	Aggregate
Main product	130323.75	139207.50	137185.99	136519.05
By product	35509.00	36144.00	33226.50	34283.19
Total	165832.75	175351.50	170412.49	170802.24

The per hectare output for different classes of Palayankodan and at the aggregate level is given in Table 5.6.5.

The total number of bunches obtained in class I, class II and class III were 1819, 1875 and 1823 respectively. Total number of suckers obtained were 3405, 3100 and 3504 in class I, class II and class III respectively. Number of suckers used as planting material and the number of suckers sold, in class I, class II and class III were 450 and 600, 700 and 2050, and 2100 and 1804 respectively. The rest of the suckers went waste. The per hectare total receipts from Palayankodan is given in Table 5.6.6.

Total receipts was the highest in class I (Rs. 90048.0), followed by class II (Rs. 89175.0) and class III (88427.0). At the aggregate level the total receipts worked to Rs. 89124.90.

The per quintal cost of production of Nendran, Poovan and Palayankodan for different classes and at the aggregate level is given in Tables 5.6.7, 5.6.8. and 5.6.9. respectively.

Per quintal cost of production of Nendran on cost C_2 basis was highest in class III, which amounted to Rs.944.72. This was followed by class II and class I, which amounted to Rs.942.25 and Rs.917.09 respectively. The aggregate cost of production at costs A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 were Rs.710.87, Rs.771.10, Rs.716.43, Rs.840.09, Rs.813.63 and Rs.937.48 respectively.

Table 5.6.7. Per quintal cost of production of Nendran at various costs (Rs.)

Particulars	Class I	Class II	Class III	Aggregate
Cost A_1	681.34	727.73	714.33	710.87
Cost A_2	742.06	775.59	783.01	771.10
Cost B_1	685.52	733.33	720.59	716.43
Cost B_2	804.96	857.89	845.78	840.09
Cost C_1	797.60	817.69	819.53	813.83
Cost C_2	917.09	942.25	944.72	937.48

Table 5.6.5. Output per hectare in different classes of Palayankodan

Particulars	Class I	Class II	Class III	Aggregate
Bunches (No.)	1819.00	1875.00	1823.00	1838.50
Total weight (kg)	18190.00	18750.00	18230.00	18385.00
Total no. of suckers obtained	3405.00	3100.00	3504.00	3346.26
Suckers sold (No.)	450.00	600.00	700.00	597.27
Suckers used (No)	2050.00	2100.00	1804.00	1968.55

Table 5.6.6. Total receipts from main product and by product in Palayankodan (Rs.)

Particulars	Class I	Class II	Class III	Aggregate
Main product	80048.00	78375.00	78411.00	78861.60 (88.48)
By product	10000.00	10800.00	10016.00	10263.30
Total	90048.00	89175.00	88427.00	89124.90

The per quintal cost of production of Poovan on cost C_2 basis was highest in class I, followed by class II and class III and these amounted to Rs.1122.8, Rs.1066.13 and Rs.1015.80 respectively. At the aggregate level, the per quintal cost of production at costs A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 were Rs.675.67 Rs.724.2, Rs.684.0, Rs.870.34 Rs.858.92 and Rs.1045.22 respectively.

Table 5.6.8. Per quintal cost of production of Poovan at various costs (Rs.)

Particulars	Class I	Class II	Class III	Aggregate
Cost A_1	709.33	700.74	656.72	675.67
Cost A_2	759.25	756.24	702.30	724.20
Cost B_1	715.76	708.49	665.86	684.00
Cost B_2	905.48	886.09	854.59	870.34
Cost C_1	933.08	888.53	827.07	858.92
Cost C_2	1122.80	1066.13	1015.80	1045.22

The per quintal cost of production of Palayankodan on cost C_2 basis was highest in class I, followed by class II, and class III, and these amounted to Rs.427.23, Rs.416.95 and Rs.412.32 respectively. The per quintal cost of production of Palayankodan at cost A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 were Rs.227.83 Rs.227.83 Rs.229.59, Rs.346.55 Rs.337.8 Rs.418.80 respectively.

Table 5.6.9. Per quintal cost of production of Palayankodan at various costs (Rs.)

Particulars	Class I	Class II	Class III	Aggregate
Cost A_1	213.97	213.43	249.39	227.83
Cost A_2	213.97	213.43	249.39	227.83
Cost B_1	215.66	215.22	251.18	229.59
Cost B_2	333.85	329.89	369.12	346.55
Cost C_1	309.04	416.95	294.38	337.89
Cost C_2	427.23	416.95	412.32	418.00

5.7 Benefit cost ratio

The benefit cost ratio indicates value of output per rupee of input cost. This ratio will serve as a measure which would indicate as to whether the costs

incurred commensurate with returns obtained. The benefit cost ratios of Nendran, Poovan and Palayankodan were estimated separately for various cost concepts and results are presented in Tables 5.7.1, 5.7.2. and 5.7.3. respectively.

The analysis revealed that the ratios were greater than one for all the three varieties. The ratios based on costs A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 for the sample as a whole, in Nendran (Table 5.7.1.) were 1.55, 1.42, 1.52, 1.32 1.35 and 1.17 respectively. The ratios were found to be greater than one in all the three classes.

Table 5.7.1. Benefit cost ratio of Nendran based on different cost concepts

Cost	benefit cost ratio			
	Class I	Class II	Class III	Aggregate
Cost A_1	1.62	1.49	1.56	1.55
Cost A_2	1.43	1.40	1.43	1.42
Cost B_1	1.62	1.47	1.55	1.52
Cost B_2	1.38	1.26	1.32	1.32
Cost C_1	1.39	1.32	1.36	1.35
Cost C_2	1.20	1.15	1.18	1.17

For Poovan the study revealed that returns generated from a rupee were greater than one for all the three classes, and the ratios were found to be highest for class III (Table 5.7.2.) At the aggregate level they were 2.12, 1.97, 2.09, 1.65, 1.66 and 1.37 on cost A_1, cost A_2, cost B_1, cost B_2, cost C_1, and cost C_2 basis respectively.

Table 5.7.2. Benefit cost ratio of Poovan based on different cost concepts

Cost	benefit cost ratio			
	Class I	Class II	Class III	Aggregate
Cost A_1	2.06	2.06	2.24	2.12
Cost A_2	1.92	1.91	2.01	1.97
Cost B_1	2.04	2.04	2.20	2.09
Cost B_2	1.62	1.63	1.72	1.65
Cost C_1	1.57	1.63	1.78	1.66
Cost C_2	1.30	1.35	1.45	1.37

Benefit cost ratios for Palayankodan as given in (Table 5.7.3.) revealed that the ratio were the highest in class III.At the aggregate level the ratios based on costs A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 were 2.17, 2.16, 2.14, 1.41, 1.61, and 1.16 respectively.

Table 5.7.3. Benefit cost ratio of Palayankodan based on different cost concepts

Cost	benefit cost ratio			
	Class I	Class II	Class III	Aggregate
Cost A_1	2.31	2.23	1.96	2.17
Cost A_2	2.31	2.23	1.96	2.16
Cost B_1	2.29	2.02	1.95	2.14
Cost B_2	1.48	1.44	1.32	1.41
Cost C_1	1.60	1.57	1.66	1.61
Cost C_2	1.15	1.14	1.18	1.16

Comparison of benefit cost ratio of Nendran, Poovan and Palayankodan showed that returns generated from a rupee invested was higher for Poovan followed by Nendran and Palayankodan. For Poovan, at the aggregate level a rupee invested returned Rs.1.37 on cost C_2 basis while a rupee invested returned only Rs.1.17 and Rs.1.16 in Nendran and Palayankodan respectively.

5.8 Measures of efficiency

The various income measures such as farm business income, own farm business income, family labour income, net income and farm investment income in relation to various cost concepts were worked out for Nendran, Poovan and Palayankodan and are given in Tables 5.8.1, 5.8.2 and 5.8.3 respectively.

The farm business income, own farm business income, family labour income and farm investment incomes at the aggregate level in case of Nendran were Rs.80098.2, Rs.68920.56, Rs.53976.28 and Rs.60369.96 respectively. Class wise analysis revealed that these measures were the highest for class I, followed by class III and class II. The net income for class I, class II and class III worked to

Rs.40292.6, Rs.28679.7 and Rs.35034.4 respectively, and at the aggregate level the net income was Rs. 34247.66.

Table 5.8.1. Income measures in relation to different cost concepts for Nendran (Rs. per hectare)

Particulars	Class I	Class II	Class III	Aggregate
Farm business income	89635.20	71734.90	81043.39	80098.20
Own farm business income	76926.20	62129.90	67327.39	68920.56
Family labour income	63761.20	45610.90	54793.40	53976.28
Net income	40292.60	28679.70	35034.40	34247.66
Farm investment income	66166.60	54803.70	61284.39	60369.96

Income measures in relation to various cost concepts for Poovan showed the farm business income, own farm business income, family labour income and farm investment income for the sample as a whole were Rs.92737.00, Rs.87112.23, Rs.70271.6, and Rs.72702.36 respectively. Class wise analysis revealed a direct relation between size group and various income measures. The net income for class I, class II and class III were Rs.38590.6, Rs.46294.50 and Rs.54692.24 respectively. At the aggregate level the net income worked to Rs.50071.27.

Table 5.8.2. Income measures in relation to different cost concepts for Poovan (Rs. per hectare)

Sl.No.	Particulars	Class I	Class II	Class III	Aggregate
1	Farm business income	85447.44	90526.13	95598.72	92737.00
2	Own farm business income	79789.65	83808.20	90405.52	87112.23
3	Family labour income	63218.55	68089.43	73057.16	70271.60
4	Net income	38590.60	46294.50	54692.24	50071.27
5	Farm investment income	61819.64	68731.23	77233.80	72702.36

The farm business income, own farm business income, family labour income and farm investment income for the sample as a whole from Palayankodan worked to Rs.48840.7, 48840.7, Rs.27018.47, and Rs.35678.33 respectively. The class wise analysis revealed an inverse relation between size group and various incomes. The net income for class I, class II and class III worked to Rs.12333.10,

Rs.10995.80 and Rs.11496.60 respectively and at the aggregate level this was worked to Rs.11536.26.

Table 5.8.3. Income measures in relation to different cost concepts for Palayankodan (Rs. per hectare)

Sl.No.	Particulars	Class I	Class II	Class III	Aggregate
1	Farm business income	51125.10	49155.80	46957.92	48840.70
2	Own farm business income	51125.10	49155.80	46957.92	48840.70
3	Family labour income	29319.10	27319.80	25135.25	27018.47
4	Net income	12333.10	10995.80	11496.60	11536.26
5	Farm investment income	34139.10	32831.80	39081.92	35678.33

A comparison of income measures of three varieties revealed that the net income derived from Poovan cultivation was the highest, followed by Nendran and Palayankodan cultivation. Hence Poovan cultivation was found to be more profitable than Nendran and Palayankodan cultivation.

Input – output relationship of banana cultivation

The explicit and implicit costs per plant were worked out for all three varieties and is given in Table 5.8.4.

The explicit cost (which includes all paid out costs) for Nendran, Poovan and Palayankodan were Rs.59.82, Rs.37.71 and Rs.18.46 respectively. The total cost per plant in the same order were Rs.75.54, Rs.56.07 and Rs.35.71 respectively. The rest was accounted by implicit cost.

The returns from main product were Rs.86.16, Rs.63.49 and Rs.36.67 for Nendran, Poovan and Palayankodan respectively. The returns from by product of Poovan was much higher than that obtained from the by products of other two varieties.

The net returns per plants at total cost level, was the highest for Poovan (Rs.23.36) followed by Nendran (Rs.14.11) and Palayankodan (Rs.5.73). At the

Table 5.8.4. Input - output relationship in Nendran, Poovan and Palayankodan

Particulars		Nendran	Poovan	Palayankodan
Costs per plant (Rs.)				
i)	Explicit cost	59.82	37.71	18.46
ii)	Implicit cost	15.72	18.36	17.25
iii)	Total cost	75.54	56.07	35.71
Returns per plant (Rs.)				
i)	Main product	86.16	63.49	36.67
ii)	Byproduct	3.49	15.94	4.77
iii)	Total returns	89.65	79.43	41.44
Net returns per plant (Rs.)				
i)	Explicit cost level	29.83	41.72	22.98
ii)	Total cost level	14.11	23.36	5.73
B:C ratio at				
i)	Explicit cost level	1.50	2.00	2.23
ii)	Total cost level	1.19	1.41	1.15

explicit cost level the net returns for Nendran, Poovan and Palayankodan were Rs.29.38, Rs.41.72 and Rs.22.98 respectively.

The benefit cost ratio was also worked out at explicit cost level and total cost level. Analysis showed that at the total cost level the ratio was the highest for Poovan (1.41) followed by Nendran (1.19) and Palayankodan (1.15), while at the explicit cost level, the ratio was the ratio was the highest for Palayankodan (2.23) followed by Poovan (2.10) and Nendran (1.50).

5.9 Resource use efficiency

A scientific study of input – output relationship based on production function analysis would provide a sound basis for crop production on a pattern that would guide the farmers to operate at the least cost and highest profit combinations (Dhondyal, 1989). In the present study Cobb Douglas production function has been used as an analytical tool to estimate the productivities of various inputs used in the production of Nendran, Poovan and Palayankodan varieties of banana. The model has been fitted separately for all the three varieties for the sample as a whole. The estimated production functions are given below.

Nendran

$$Y_1 = 1.21\ X_{1.1}^{0.0854}\ X_{2.1}^{0.1139}\ X_{3.1}^{-0.0071}\ X_{4.1}^{0.3083*}\ X_{5.1}^{0.7176*}$$

(0.8014) (0.0731) (0.0688) (0.1060) (0.0893)

$R^2 = 0.9241$

$R^{-2} = 0.9171$

Poovan

$$Y_2 = 1.25\ X_{1.2}^{0.4099**}\ X_{2.2}^{0.0023}\ X_{3.2}^{0.1948*}\ X_{4.2}^{0.5988**}$$

(0.1997) (0.1207) (0.1194) (0.2381)

$R^2 = 0.9074$

$R^{-2} = 0.8105$

Palayankodan

$Y_3 = 2.79 \quad X_{1.3}^{0.2360**} \quad X_{2.3}^{0.0725} \quad X_{3.3}^{0.2676*} \quad X_{4.3}^{0.4175*}$

(0.3965) (0.0942) (0.0496) (0.1062)

$R^2 = 0.9308$

$R^{-2} = 0.8568$

( ) figures in parentheses are standard errors

* significant at 1 per cent level of probability

** significant at 5 per cent level of probability

The coefficient of determination (R^2) explains the proportion of variation in the dependent variable as explained by the independent variables included in the model. The explanatory variables included in the functions explained 92 per cent of the variation in the output in case of Nendran, 91 per cent in the case of Poovan and 86 per cent of variation in case of Palayankodan.

The estimated regression coefficients (bi) of the explanatory variables are the production elasticities of the respective factors (xi). The production elasticities indicate the percentage by which the output 'Y' would change if input xi changes by one unit. The regression coefficients (RC), marginal value products (MVP) and the marginal productivity at factor costs (FC) for Nendran, Poovan and Palayankodan is given in Table 5.9.1

In case of Nendran,elasticity coefficient of input manure was found to be negative though insignificant. The rest of the coefficients had positive sign indicating positive effect on total output. Sum of the regression coefficients (Σbi) was found to be greater than one, indicating increasing returns to scale.

The resource use efficiency has been judged on the criterion that each factor of production is paid according to its marginal productivity. A significant difference between the marginal value products and price of individual inputs would indicate whether the farmers are using on an average, their factors of production efficiently or inefficiently. For efficient use of any input, marginal

value productivity to factor cost ratio should be equal to one. When resources are used inefficiently, a reallocation of resources in the existing situation would increase the efficiency of production. In case of Nendran the negative marginal value product for manures indicated that this input was used in excess quantity. Though the marginal value products of human labour and fertilizers were positive they were inefficient in the sense that an investment of additional rupee in these inputs would yield an additional returns worth less than a rupee, since their marginal value products were less than unity. A positive and significant marginal value product for plant protection chemical and supports indicated that any additional expenditure on these inputs, would increase the total returns (Y), and one rupee of additional expenditure of plant protection chemicals and supports would increase the total returns by Rs.1.85 and Rs.2.58 respectively, when all the other inputs were held constant at their geometric mean levels.

In case of Poovan, elasticity coefficients for all the inputs had positive sign indicating positive effect on total output. Sum of regression coefficients was found to be greater than one indicating increasing returns to scale. Marginal value products for all the inputs except fertilizers was found to be greater than one. Value of marginal value products for the inputs human labour, manures and plant protection chemicals indicated that one rupee additional expenditure on these inputs would increase the total returns by Rs.1.57, Rs.1.37 and Rs.2.3 respectively.

Regression coefficients for all the inputs in case of Palayankodan had positive sign indicating positive effect on total output. Sum of the regression coefficients was found to be one indicating constant returns to scale. The marginal value products of inputs human labour and fertilizers though positive were in efficient in the sense that an additional one rupee investment on these inputs would yield an additional return worth less than a rupee. However the marginal value products of inputs viz. manures and plant protection chemicals were positive as well as significant, since their values exceeded unity.

Table 5.9.1. Regression coefficients, marginal value product and factor cost ratios of various inputs in Nendran, Poovan and Palayankodan

Variables	Nendran			Poovan			Palayankodan		
	RC (bi)	MVP	FC	RC (bi)	MVP	FC	RC (bi)	MVP	FC
X_1	0.0854	0.361	0.361	0.4099	1.578	1.578	0.2360	0.576	0.576
X_2	0.1138	0.770	0.770	0.0023	0.015	0.015	0.0725	0.712	0.712
X_3	-0.0071	-0.022	-0.022	0.1949	1.370	1.370	0.2676	2.582	2.582
X_4	0.3083	1.850	1.850	0.5988	2.395	2.395	0.4175	27.21	27.21
X_5	0.7176	2.583	2.583	-	-	-	-	-	-
	$\Sigma bi = 1.22$			$\Sigma bi = 1.20$			$\Sigma bi = 0.99$		

5.10 Marketing

Marketing of fruits and vegetables is of great importance requiring a special status as an integral part of production, not only because of the highly perishable nature of fruits and vegetables, but also because it decides the net realisable income of the cultivators (Sudha and Subrhamanyam, 1996). It assumes a very important role in maintaining an equilibrium between production and consumption.

Marketing activity includes the functioning of various agencies mainly classified as producer, middlemen and consumer who have an individualistic view towards marketing and are concerned with profit alone. Besides unnecessary attachment of large number of intermediaries results in producers smaller share in consumers rupee (Lepcha *et al.*, 1993). Next, being perishable in nature, they have to be sold at the earliest opportunity. A majority of the growers are small farmers, hence do not possess withholding capacity till a favourable price emerges in the market. Besides, they also do not have any bargaining power to derive the best of their revenue. This particular situation obviously offers the traders an opportunity to exploit the petty growers (Pawar, 1991).

An efficient marketing system always pays dividend to the producers and safeguards interests of the consumers and is by all means, a pre-requisite for the well being of the community in general and farmers in particular.

In the present study an attempt has been made to identify the important marketing channels and also to analyse the marketing efficiency of banana, as indicated by marketing costs and margins.

Banana bunches are cut at different stages of maturity depending on the distance of haulage and time of consumption. Since the sample farmers marketed their produce locally, they were harvested at full maturity. Banana bunches are carefully cut with sharp knives, to avoid cuts and bruises. The harvesting of the

crop in a particular field is not done at one time, since bunches produced by all the plants do not attain uniform maturity. Every day, bunches are harvested which have developed fully.

Usually bananas are not given any special post-harvest treatments such as dipping in fungicidal solutions etc. Since the quality awareness has not been sufficiently developed to admit higher price differential for treated banana, it may not be worthwhile to adopt expensive post-harvest treatment technique in all cases of internal marketing (Shanmugavelu, 1989). So the bunches immediately after harvest are transported either to wholesale market or to retail shops. Those sample farmers who gave their produce to KHDP markets, kept their produce harvested and ready for the KHDP market days, which is usually on Monday and Friday of every week. Transportation of banana is generally done in bus, jeep, tempovan or lorry. When only small quantities of banana are to be transported, transportation is done in bus, whenever large quantities are to be transported, the sample farmers hired jeep or tempovan. Transportation cost varied according to the mode of transportation and distance from the farm gate.

5.10.1 Market structure

The term market structure refers to those organisational characteristics of the market which influence the nature of competition and pricing and effect the conduct of business firms (George and Singh, 1970). It also includes the manner of operations of the market (Acharya and Agarwal, 1992).

Banana growers of Pariyaram panchayat of Chalakudy block and Muttathoor panchayat of Kodakara block in general took their produce to KHDP markets. Advantage of selling off their produce at KHDP markets is that the growers do not have to pay any market entry fee, loading and unloading charges and weighing charges. However, the KHDP retains 5 per cent of the entire value of the produce of each grower as commission, and hands over the grower, the remaining amount after deducing this commission. In Meloor, owing to the

absence of KHDP market, the sample growers generally took their produce to Chalakudy/Irinjalakuda wholesale markets, or sold them to the retail shops in the locality.

5.10.2 Marketing channels

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

1. Producer - Retailer - Consumer
2. Producer - Wholesaler - Consumer
3. Producer - Itinerant Commission agents - Wholesaler - Retailer - Consumer
4. Producer - Wholesaler - Retailer - Consumer
5. Producer-Processing units

The fourth channel had specifically three routes. They were

a) Producer - KHDP market - Retailer - Consumer

b) Producer - Irinjalakuda market - Retailer - Consumer

c) Producer - Chalakudy market - Retailer - Consumer

Chalakudy and Irinjalakuda markets are the traditional centres of banana marketing in the study area. But with the advent of KHDP, most of the growers have started taking their produce to KHDP market, reason being fair trading, promixity to the production centres and low commission charges as compared to the local markets.

The most widely adopted channel in the case of Nendran and Poovan was 'producer - KHDP market - retailer - consumer', while in case of Palayankodan, the important marketing channel identified was 'producer-itinerant commission agents - wholesaler - retailer - consumer'. Distribution of farmer respondents according to the type of buyers is given in Table 5.10.1.

Table 5.10.1. Distribution of respondents according to the type of buyers

Product sold to	Nendran	Poovan	Palayankodan	Total
KHDP market	28 (46.6)	34 (56.7)	19 (31.67)	81 (45)
Commission agent	9 (15)	1 (1.67)	24 (40)	34 (18.89)
Wholesaler	2 (3.3)	4 (6.67)	8 (13.3)	14 (7.78)
Retailer	2 (3.3)	9 (15)	5 (8.3)	16 (8.89)
Processing units	2 (3.3)	-	-	2 (1.1)
Chalakudy market	8 (13.3)	6 (10)	2 (3.3)	16 (8.89)
Irinjalakuda market	9 (15)	6 (10)	2 (3.3)	17 (9.4)
Total	60 (100)	60 (100)	60 (100)	180 (100)

* Figures in parentheses are percentage to the total

Of the total 60 Nendran growers, 28 (46.6 per cent) sold their produce to KHDP market, 9 (15 per cent) to commission agents, 2 (3.3 per cent) to wholesalers, 2 (3.3 per cent) to retailers, 2 (3.3 per cent) to processing units, 8 (13.3 per cent) to Chalakudy market and 9 (15 per cent) growers sold their produce to Irinjalakuda market.

In case of Poovan out of the 60 growers, 34 (56.7 per cent) sold their produce to KHDP market, 1 (1.67 per cent) to commission agents, 4 (6.67 per cent) to wholesalers, 9 (15 per cent) to retailers, 6 (10 per cent) to Chalakudy market and 6 (10 per cent) to Irinjalakuda market.

Among the 60 Palayankodan growers, 24 (40 per cent) sold their produce to commission agents, 19 (31.67 per cent) to KHDP market, 8 (13.3 per cent) to wholesalers, 5 (8.3 per cent) to retailers, 2 (3.3 per cent) to Chalakudy market and 2 (3.3 per cent) sold their produce to Irinjalakuda market.

Considering sample as a whole, of the total 180 growers, 81 (45 per cent) sold their produce to KHDP market, 34 (18.89 per cent) to commission agents, 14 (7.78 per cent) to wholesalers, 16 (8.89 per cent) to retailers, 2 (1.1 per cent) to processing units (16 (8.89 per cent) to Chalakudy market and 17 (9.4 per cent) growers sold their produce to Irinjalakuda market.

5.10.3 Marketing efficiency

There are two aspects of marketing efficiency namely technical efficiency and economic efficiency. The latter can be assessed by different methods such as marketing costs and marketing margins, degree of market integration and temporal and spatial price differences. In the present study marketing efficiency is assessed on the basis of marketing costs and margins. In the marketing of agricultural commodities, the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of farm produce is often known as price spread (Acharya and Agarwal, 1992).

There are two concepts of marketing margins such as concurrent margin and lagged margin. The concept of concurrent margin is used in the present study in which the price prevailing at different stages of marketing are compared with reference to a given point of time. In this study the average prices received by the banana growers were compared with the prices which prevailed in the Chalakudy wholesale and Thrissur wholesale markets.

The marketing costs and margins for Nendran, Poovan and Palayankodan are given in Table 5.10.2. and Table 5.10.3.

From Table 5.10.2. it is clear that the net price received by the Nendran grower was Rs.10.10 per kg, while the average price paid by the consumer was Rs.14.43 per kg. Farmers share was 70.00 per cent and price spread was Rs. 4.33 per kg

In the case of Poovan, the net price received by the farmer, average price paid by the consumer, farmers share and price spread were Rs.11.30 per kg, 16.14 per kg, 70.00 per cent and Rs.4.84 per kg, respectively.

The figures for Palayankodan in the same order were Rs.3.29 per kg, Rs.5.98 per kg, 55.00 per cent and Rs.2.69 per kg, respectively.

In all the three cases, the net margin of the wholesaler was higher than that of other intermediaries involved.

Table 5.10.3. shows that the net price received by Nendran, Poovan and Palayankodan growers were Rs.9.33 per kg, Rs.10.69 per and Rs.3.90 per kg respectively and price paid by the consumers Rs.14.43 per kg, Rs.16.14 per kg and Rs.5.98 per kg respectively. Producers share in consumers rupee was 64.65 per cent in Nendran and 66.23 per cent and 65.21 per cent in case of Poovan and Palayankodan respectively. The figures for price spread in the same order were

Table 5.10.2. Marketing costs and margins (in price per kg) for Nendran, Poovan and Palayankodan

Particulars	Nendran	Poovan	Palayankodan
	Share (Rs./kg)	Share (Rs./kg)	Share (Rs./kg)
Price received by farmer	10.6	11.80	3.79
	(73.46)	(73.11)	(63.37)
Marketing cost of farmer	0.5	0.5	0.5
(i.e., transportation cost)	(3.46)	(3.09)	(8.36)
Net price received by farmer	10.10	11.30	3.29
	(70.00)	(70.00)	(55.0)
Price received by KHDP	11.18	12.39	3.98
	(77.47)	(76.76)	(66.55)
Marketing cost of KHDP	0.15-	0.15	0.15
	(1.04)	(0.93)	(2.50)
Net margin of KHDP	0.43	0.44	0.04
(by way of commission)	(2.97)	(2.72)	(0.66)
Marketing cost of wholesaler	0.5	0.50	0.50
	(3.46)	(3.09)	(8.36)
Price paid by retailer	13.18	14.64	5.38
	(91.33)	(90.70)	(89.96)
Net margin of wholesaler	1.50	1.75	0.90
	(10.39)	(10.84)	(15.05)
Marketing cost of retailer	0.10	0.08	0.10
	(0.69)	(0.49)	(1.67)
Net margin of retailer	1.15	1.42	0.50
	(8.02)	(8.79)	(8.36)
Price paid by consumer	14.43	16.14	5.98
	(100)	(100)	(100)

* Figures in parentheses are percentage to the total

Table 5.10.3. Marketing costs and margins (in price per kg) for Nendran, Poovan and Palayankodan

Particulars	Nendran	Poovan	Palayankodan
	Share (Rs./kg)	Share (Rs./kg)	Share (Rs./kg)
Price received by the farmer	9.33 (64.65)	10.69 (66.23)	3.90 (65.21)
Marketing cost of commission agent	0.60 (4.15)	0.60 (3.72)	0.30 (5.01)
Cost of banana to wholesaler	11.68 (80.94)	13.19 (81.72)	4.90 (81.93)
Net margin of commission agent	1.75 (12.12)	1.90 (11.77)	0.70 (11.70)
Marketing cost of wholesaler	0.5 (3.46)	0.50 (3.09)	0.28 (4.68)
Price paid by retailer	13.43 (93.06)	14.99 (92.87)	5.68 (94.98)
Net margin of wholesaler	1.25 (8.66)	1.30 (8.05)	0.50 (8.36)
Marketing cost of retailer	0.10 (0.69)	0.08 (0.49)	0.10 (1.67)
Net margin of retailer	0.90 (6.23)	1.07 (7.12)	0.20 (3.34)
Price paid by consumer	14.43 (100)	16.14 (100)	5.98 (100)

* Figures in parentheses are percentage to the total

Rs.5.1 per kg (35.35 per cent), Rs.5.45 per kg (33.77 per cent) and Rs.2.08 (34.79 per cent).

In case of Nendran and Poovan, producer share was greater when produce was marketed through the channel as indicated by Table 5.10.2. rather than the channel as indicated by Table 5.10.3. This must be one of the reasons that majority of the Nendran and Poovan growers sold their produce through the former channel. However, the reverse holds true in case of Palayankodan.

When producer sold at local market i.e., Irinjalakuda and Chalakudy markets, the producers share was even less on account of additional marketing costs incurred by way of market entry fee, loading and unloading and weighing charges. In KHDP markets no such costs were incurred as the farmers themselves performed the above said activities. Not many took their produce to the processing units on account of the high transportation costs involved in taking the produce to these units.

The economic efficiency of marketing system can be measured as the ratio of the total value of goods marketed (V) to marketing cost (I). The efficiency is expressed as index of marketing efficiency (ME).

$$ME = \frac{V}{I} - 1$$

Marketing efficiency of Nendran, Poovan and Palayankodan for Table 5.10.2. were 2.37, 2.33 and 1.23 while figures in the same order for Table 5.10.3. were 1.83, 1.96 and 1.87. The higher the ratio, higher is the efficiency of marketing system. For Nendran and Poovan ratios for Table 5.10.2. were greater indicating greater efficiency in marketing through the channel indicated by Table 5.10.2. However, for Palayankodan ratio was greater for Table 5.10.3. indicating greater efficiency in marketing through channel indicated by Table 5.10.3. Since ratio was

the highest for Poovan, the economic efficiency of marketing Poovan was more when compared to Nendran and Palayankodan.

5.11 Constraints in banana cultivation

The constraints in banana cultivation as perceived by the sample growers were identified through the pilot study and seven major constraints faced by them were included in the final interview schedule. The constraints were ranked in the order of their importance to the respondents and obtained frequency distribution is given in Table 5.11.1.

High cost of material input was the most important problem faced by 33.3 per cent of the growers, while it was the second important problem for 32.2 per cent of the growers. High labour cost was the most important problem for 32.2 per cent of the growers while it ranked second in importance to 24.4 per cent of the growers. Incidence of pests and diseases was the major problem for 16.6 per cent of the growers and was the second major problem for only 11.1 per cent of the growers. Low price of produce ranked first in importance among the constraints to 17.7 per cent of the growers, while it ranked second in importance to only 10 per cent of the growers. None of the growers faced unavailability of propping material as the first or second important problem, as this was a problem exclusively of the Nendran growers. Destruction due to natural calamities also did not figure as the most important problem to any of the growers. High transportation cost did not figure amongst the first four ranks to any of the growers.

Table 5.11.1. Constraints in Nendran, Poovan and Palayankodan cultivation

Sl. No.	Constraints	Ranking of constraints							Total no. of growers
		I	II	III	IV	V	VI	VII	
1	Low price of produce	32 (17.7)	19 (10)	38 (21.1)	30 (16.6)	20 (11.1)	22 (12.2)	20 (11.1)	180 (100)
2	Incidence of pests and diseases	30 (16.6)	20 (11.1)	50 (27.7)	60 (33.3)	20 (11.1)	-	-	180 (100)
3	Natural calamities	-	40 (22.2)	-	35 (19.4)	35 (19.4)	53 (29.4)	17 (9.4)	180 (100)
4	High labour cost	58 (32.2)	44 (24.4)	20 (11.1)	10 (5.5)	-	-	48 (26.6)	180 (100)
5	High cost of material inputs (manures, fertilizers and pesticides)	60 (33.3)	58 (32.2)	20 (11.1)	-	32 (17.7)	-	-	180 (100)
6	Non-availability of props	-	-	52 (28.8)	45 (25)	23 (12.7)	25 (13.8)	45 (25)	180 (100)
7	High transportation cost	-	-	-	-	50 (27.7)	80 (44.4)	50 (27.7)	180 (100)
Total no. of growers		180 (100)	180 (100)	180 (100)	180 (100)	180 (100)	180 (100)	180 (100)	180 (100)

* Figures in parentheses are percentage to the total

Discussion

6. DISCUSSION

Banana cultivation was generally carried out on commercial basis by the respondents who under took agriculture as the main occupation. Among the three varieties Nendran was being cultivated on a larger scale in the study area, followed by Poovan and Palayankodan, because of their preference by the people of Kerala in the same order. The results based on the present study have already been mentioned in chapter five, and are being discussed in this chapter under the following headings.

6.1. Inputwise cost of cultivation

6.2. Operation wise cost of cultivation

6.3. Production and value of output

6.4. Benefit cost ratio

6.5. Farm efficiency measures

6.6. Resource use efficiency

6.7. Marketing

6.8. Constraints in banana cultivation

6.1 Input wise cost of cultivation

Input wise cost of cultivation of Nendran revealed that human labour was the most important input expenditure accounting for 23.17 per cent of the total cost at the aggregate level. The fact that banana is a highly labour intensive crop could be the major reason for this significant share of labour cost in the total cost of cultivation of the crop. Chennarayudu *et al.* (1998) reported that the cost of labour accounted for 22.0 per cent of the total cost which is comparable with the result of the present study.

Manures was the second most important item of expenditure in all three classes and this accounted for 18.24 per cent, 17.92 per cent and 18.33 per cent in class I, class II and class III respectively, and this was 18.16 per cent at the aggregate level. Since high cost of chemical fertilizers was not very affordable to

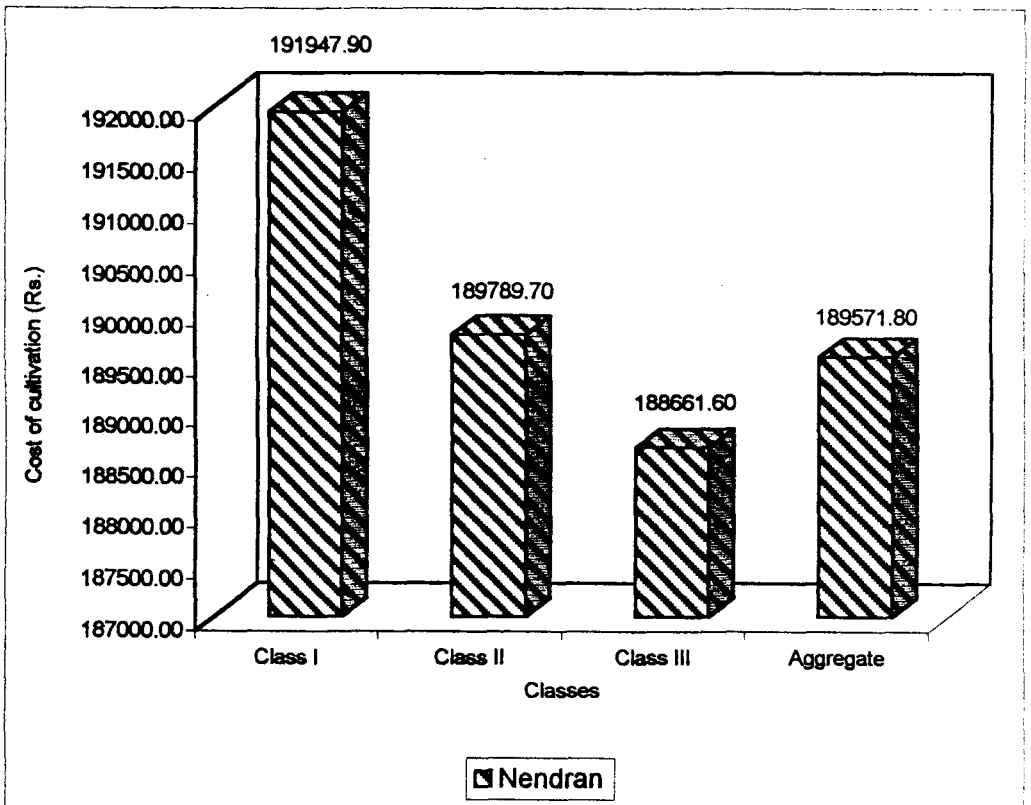


Fig. 2. Total cost of cultivation of Nendran for three classes and at aggregate level

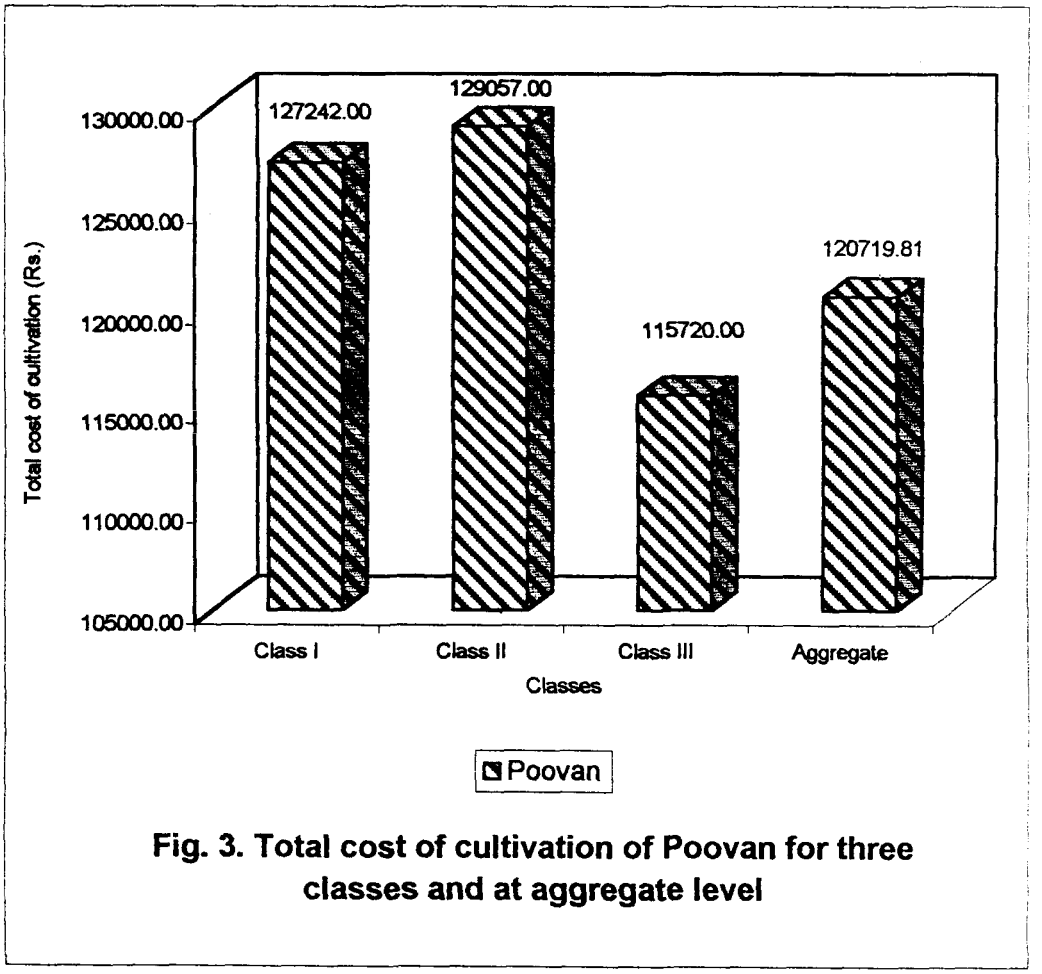


Fig. 3. Total cost of cultivation of Poovan for three classes and at aggregate level

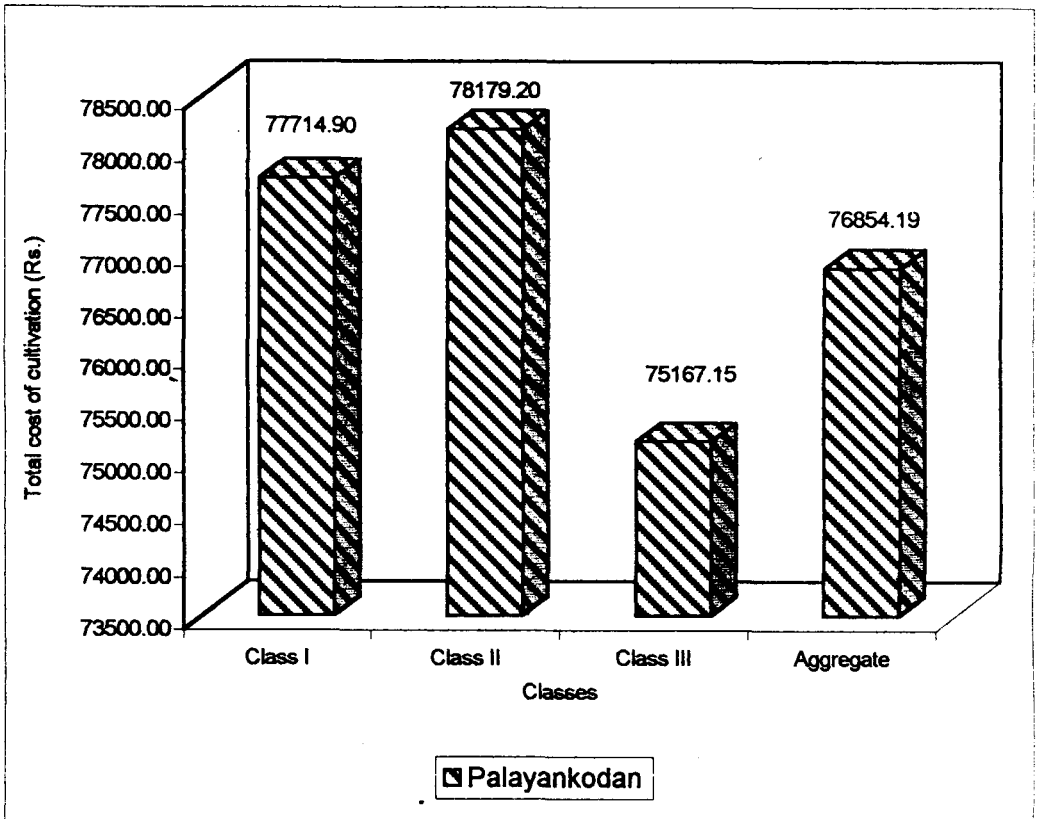


Fig. 4. Total cost of cultivation of Palayankodan for three classes and at aggregate level

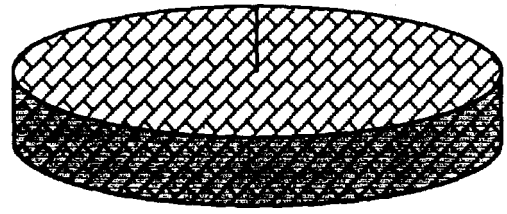
the sample farmers, many of them used manures as substitute for chemical fertilizers, and this resulted in manures acquiring a place as one amongst the important inputs of expenditure in the total cost of cultivation. Patel *et al.* (1998) estimated the cost of manures as 15.34 per cent of the total cost which is 2.82 per cent lower than the results of present study. Devi (1983) also reported cost of manures as the most important item of expenditure accounting for 18.24 per cent of the total cost. This is in conformity with the result of present study. The cost of fertilizers accounted for 15.18 per cent of the total cost and was the third important input of expenditure. Being a heavy feeder, banana requires adequate amount of fertilizers throughout its growth phases for satisfactory yield.

The cost of planting material remained almost the same in all the three classes and this was 5.49 per cent at the aggregate level. Thomas *et al.* (1989) estimated that cost of seed material accounted for 5.8 per cent of the total cost which is comparable with the result of present study. Propping charges accounted for 13.37 per cent of the total cost at the aggregate level. Propping materials were not very accessible in the study area and some of the farmers bought them all the way from Palakkad district & this added to the cost. This is supported by the finding of Thomas *et al.* (1998) who estimated it to be 13.81 per cent of the total cost.

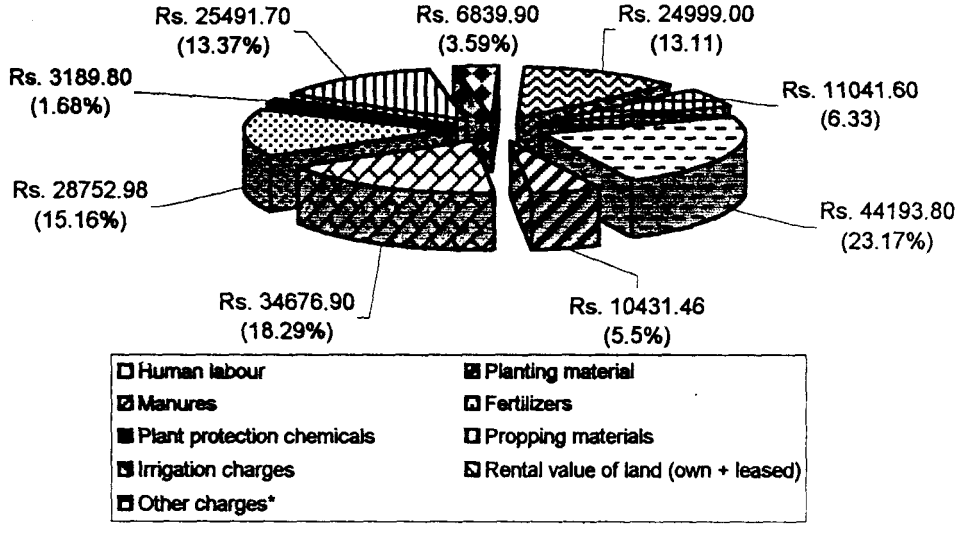
Input wise cost of cultivation of Poovan revealed that labour was the most important item of expenditure accounting for 26.26 per cent of the total cost. The cost of hired human labour showed an increasing trend from class I to class III, while cost of family labour showed an inverse trend. Senthinathan and Srinivasan (1994) estimated the labour cost as 24.64 per cent of the total cost.

Cost of fertilizers was seen declining from class I to class III and at the aggregate level this accounted for 13.09 per cent of the total cost. Senthinathan and Srinivasan (1994) reported that cost of fertilizers as accounting for 14.65 per cent of the total cost which is comparable with the result of present study.

Total cost of cultivation of Nendran (Aggregate)



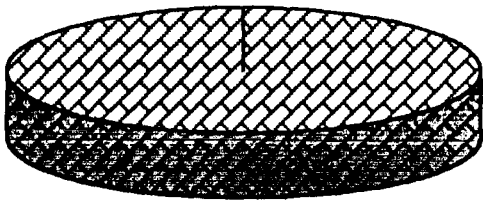
(Rs. 189571.80)



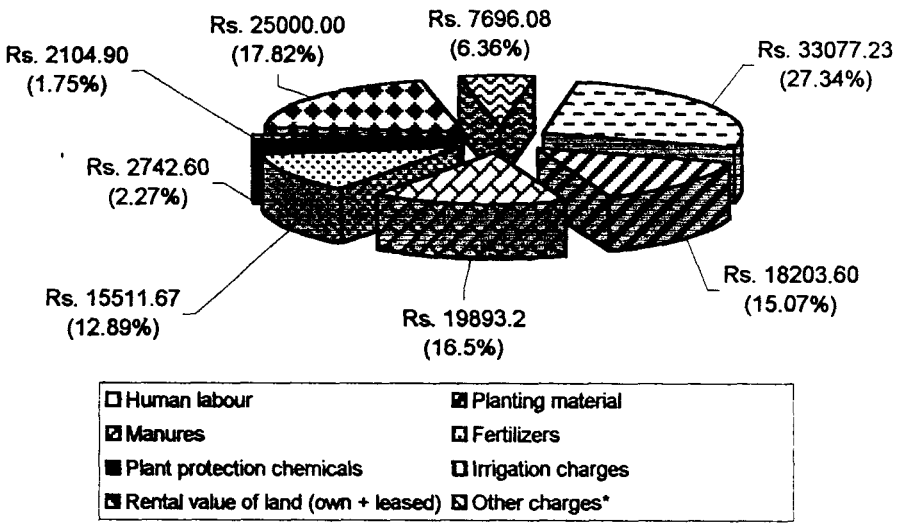
* Interest on working capital (own + borrowed) + land revenue + depreciation + interest on fixed capital (own + borrowed)

Fig. 5. Inputwise breakdown of total cost of cultivation of Nendran (Aggregate)

Total cost of cultivation of Poovan (Aggregate)



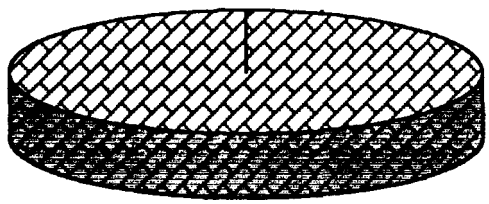
(Rs. 120719.81)



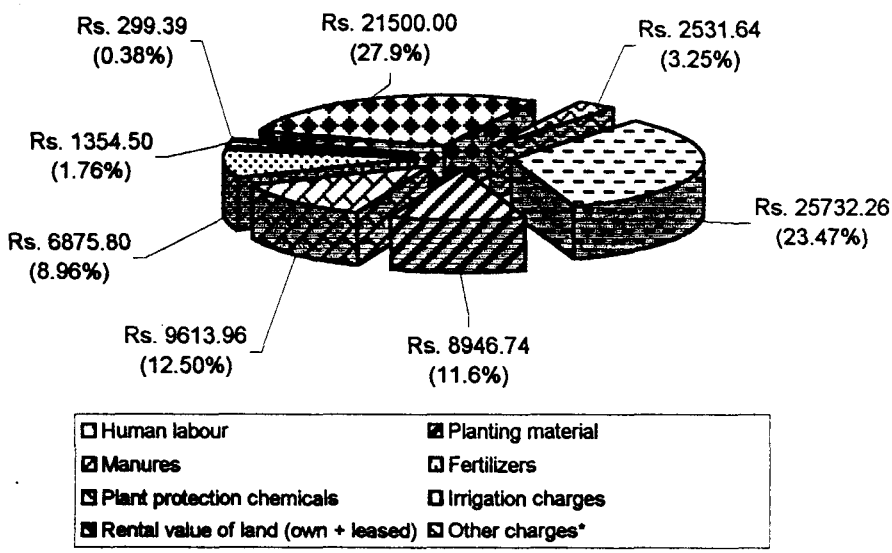
* Interest on working capital (own + borrowed) + land revenue + depreciation + interest on fixed capital (own + borrowed)

Fig. 6 Inputwise breakdown of total cost of cultivation of Poovan (Aggregate)

Total cost of cultivation of Palayankodan (Aggregate)



(Rs. 76854.19)



* Interest on working capital (own + borrowed) + land revenue + depreciation + interest on fixed capital (own + borrowed)

Fig. 7. Inputwise breakdown of total cost of cultivation of Palayankodan (Aggregate)

Irrigation charges were found to be increasing from class I to class III. The irrigation charges was found to be the highest in class III as the number of farmers using pumpset for irrigation was higher in this class, as compared to the other two classes.

The cost of planting material in Poovan accounted for 9.01 per cent of the total cost at the aggregate level, while Senthilnathan *et al.* (1992) reported it to be only 2.27 per cent of the total cost in his study in Trichy district of Tamil Nadu. This variation could be on account of the difference in the cost of suckers in the two regions.

Input wise cost of cultivation of Palayankodan revealed that human labour was the most important input expenditure accounting for 33.4 per cent of the total cost. The cost of hired human labour was found to be increasing from class I to class III, while reverse was the trend in case of family labour. Cost of manures also showed a declining trend from class I to class III. This could be as a result of its less intensive use with increase in farm size. Since none of the growers leased in land for Palayankodan cultivation, cost A_1 and cost A_2, within the class remained the same for all the classes. Interest on borrowed working capital had no contribution towards the total cost as none of the growers used borrowed source of fund. Irrigation charges also showed an increasing trend from class I to class III as the frequency of irrigations increased in the same order.

6.2 Operation wise cost of cultivation of banana

Operation wise cost of cultivation of Nendran revealed that manures and manuring was the most important operation of expenditure accounting for 41.4 per cent of the total cost at the aggregate level.

The above obtained result is in conformation with finding of Devi (1983) who reported the cost of manures and manuring as accounting for 42.5 per cent of the total cost.

Thomas *et al.* (1998) reported that cost of manures and manuring accounted for 46.64 per cent of the total cost which is 5.24 per cent higher than the results of the present study. Propping was the second important operation accounting for 15.3 per cent of the total cost. Thomas *et al.* (1998) reported that cost of propping accounted for 13.81 per cent of the total cost which is 1.49 per cent lower than the result of present study.

Cost of irrigation and inter cultivation showed an increasing trend from class I to class III.

Cost of plant protection at the aggregate level accounted for 2.07 per cent of the total cost. Maurya *et al.* (1996) reported that cost of plant protection accounted for 2.80 per cent of the total cost which is comparable with the result of present study.

Operation wise cost of cultivation of Poovan revealed that manures and manuring was the most important operation accounting for 43.39 per cent of the total cost at the aggregate level.

Manivannan (1979) reported manures and manuring as the single major item in banana cultivation which accounted for 38.85 per cent of the total cost.

Cost of planting material and planting as well as preparatory cultivation showed a declining trend from class I to class III. This could be on account of less intensive labour use with increase in farm size. All the other operations had an almost equal share in all the three classes. However harvesting and handling charges were comparatively higher in class II as the number of bunches obtained in this class was comparatively higher.

Operation wise cost of cultivation of Palayankodan revealed that manures and manuring was the most important operation accounting for 28.43 per cent of the total cost at the aggregate level. However this showed a declining trend

from class I to class III. Rental value of own land remained the same in all the three classes as none of growers cultivated on leased in land. Irrigation and intercultivation charges showed an increasing trend from class I to class III.

When the input wise cost of cultivation was split into three components as labour cost material cost and other costs, it was seen that material and labour costs accounted for 54.0 per cent and 23.3 per cent of the total cost respectively. Thomas *et al.* (1989) reported that material costs accounted for 61.27 per cent of the total cost of Nendran cultivation which was 7.27 per cent higher than the result of present study.

Chennarayudu *et al.* (1980) reported cost of human labour as 22 per cent of total cost which is on par with the result of present study.

In case of Poovan, labour costs and material costs accounted for 27.34 per cent and 47.97 per cent of the total cost respectively. Senthinathan and Srinivasan (1994) reported that labour cost accounted for 25.75 per cent of total cost in first ratoon of Poovan crop, which is comparable with the result of the present study.

In Palayankodan, labour cost and material cost accounted for 33.49 per cent and 35.32 per cent of the total cost respectively.

It was observed that the labour cost accounted for the lowest share in Nendran cultivation, followed by Poovan and Palayankodan cultivation, while reverse was the trend as far as material costs was concerned.

Cost of cultivation of Nendran, Poovan and Palayankodan at the aggregate level worked out to Rs.1189571.18, Rs.120719.88 and Rs.7685419 per hectare respectively. The comparatively higher cost of cultivation of Nendran was on account of higher material cost, by way of higher expenditure on manures, fertilizers, plant protection chemicals and irrigation charges. In case of

Palayankodan share of labour costs and material costs in the total cost was almost the same.

6.3 Production and value of output

It was observed that the number of bunches obtained per hectare decreased from class I to class III in the case of Nendran. Number of suckers obtained per hectare was the highest in class II followed by class I and class III. Number of suckers used again was the highest in class I, as a number of farmers of this class had used fresh planting material. Number of suckers sold was also the highest in this class.

The returns from main product was the highest for class I, followed by class III and class II. Receipts from by product also showed the same trend. At the aggregate level receipts from main product accounted for 96 per cent of the total returns. This was supported by the finding of Patel *et al.* (1998) who reported that value of main product accounted for 98.25 per cent of the total returns. Thomas *et al.* (1989) estimated that the returns from main product accounted for 94.62 per cent of the total returns which is comparable with the result of the present study.

In case of Poovan the number of bunches obtained was the highest in class II, followed by class I and class III. At the aggregate level this worked to eight kilograms per bunch. Number of suckers obtained as well as the number of suckers sold was the highest in class II, followed by class I and class III.

The returns from the main product and by product was the highest in class II, followed by class III and class I. At the aggregate level the gross returns worked to Rs.170802. The returns from by product accounted for 70 per cent of the gross returns at the aggregate level. Senthilnathan *et al.* (1992) reported that returns from main product accounted for 97.68 per cent of the total returns which is not in par with the result of the present study.

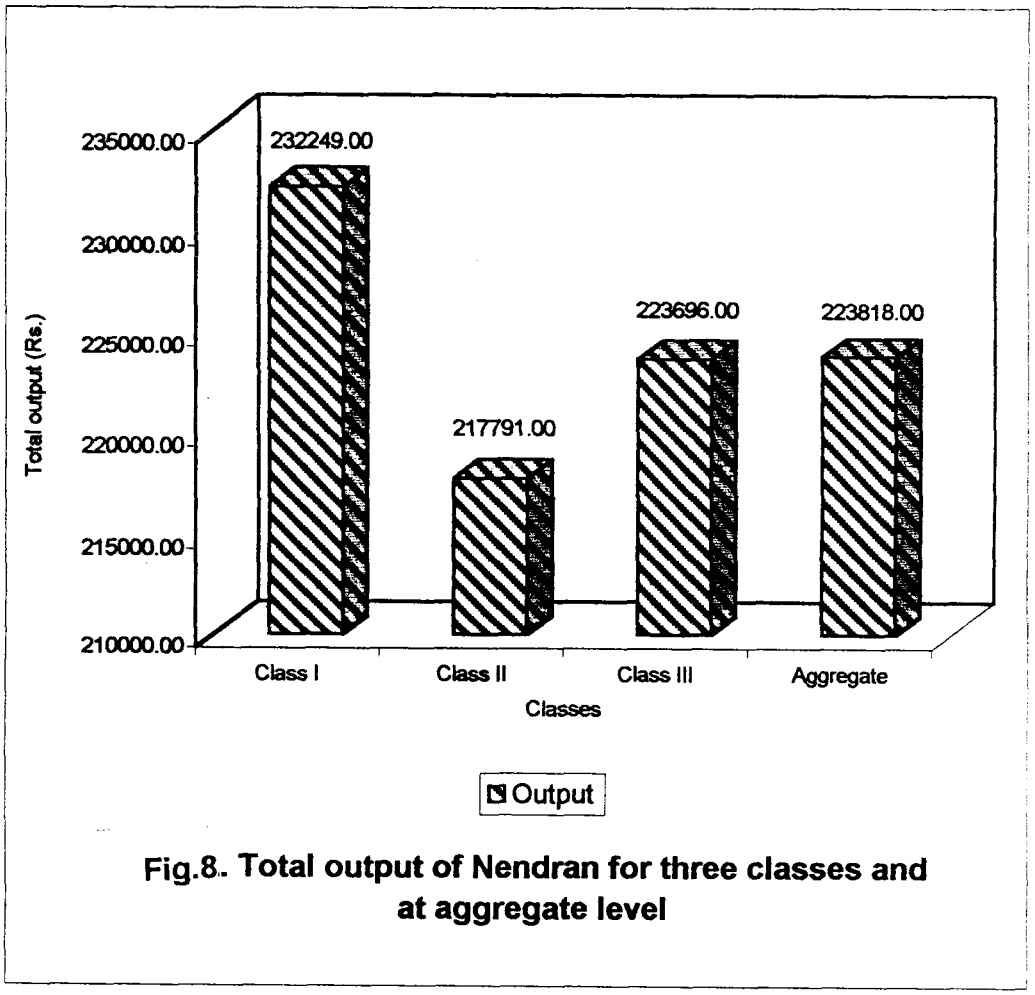


Fig.8. Total output of Nendran for three classes and at aggregate level

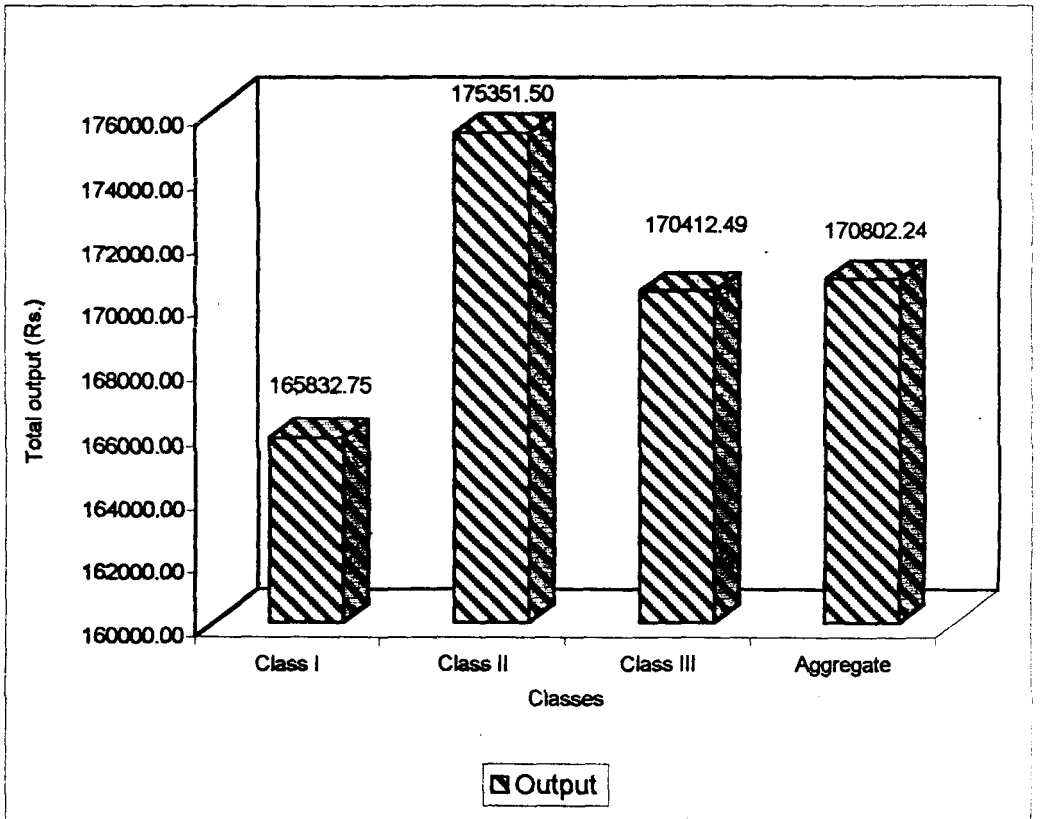


Fig. 9. Total output of Poovan for three classes and at aggregate level

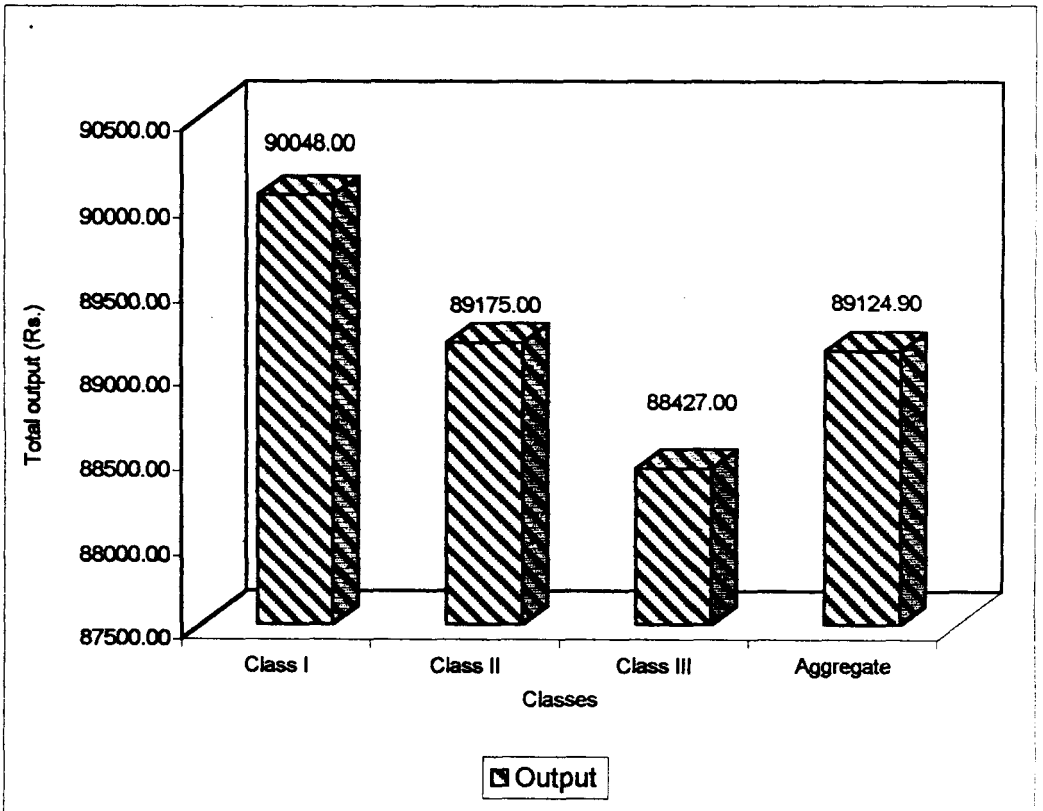


Fig. 10 Total output of Palayankodan for three classes and at aggregate level

In palayankodan the number of bunches obtained was the highest in class II, followed by class III and class I. Total number of suckers obtained was the highest in class III followed by class I and class II. At the aggregate level the total number of suckers obtained was 3346.0. While the number of suckers sold was highest in class III, the number of suckers reused was highest in class II.

Returns from the main product accounted for 88.48 per cent of the gross returns at the aggregate level. The total receipts obtained per hectare showed a declining trend from class I to class III. At the aggregate level this amounted to Rs.89124.90.

Although plant population per hectare of Poovan and Palayankodan were the same, the number of bunches obtained per hectare in Palayankodan was higher than that obtained from Poovan, reason being that Poovan was more susceptible to pest and disease attack, hence there was greater crop loss on account of this.

The cost of production per quintal of the three varieties of banana revealed that cost of production on cost C_2 basis showed an increasing trend from class I to class III, and at the aggregate level this worked to Rs.937.

In case of Poovan and Palayankodan reverse trend was noticed, and at the aggregate level the costs of production were Rs.1045 and Rs.418 respectively. Hence the per quintal cost of production was the highest in Poovan, followed by Nendran and Palayankodan.

6.4 Benefit cost ratio

Benefit cost ratio reveals the efficiency of physical production and it was calculated by dividing the total benefits by the total cost.

In the case of Nendran, the input output ratio at cost C_2 worked to 1.17 at the aggregate level. However class wise analysis revealed that the ratio on cost

C_2 basis was the highest for class I (1.20), followed by class III (1.18) and class II (1.15). Bastine (1982) reported that on an average the input output ratio at cost C worked to 1.24 which is comparable with the ratio obtained in class I of present study. Devi (1983) estimated the benefit cost ratio as 1.55 which is higher than that obtained in the present study. Chennarayudu (1990) reported that benefit cost ratio worked to 1.1, which is slightly lower than that obtained from the present study. Maurya *et al.* (1996) observed that the benefit cost ratio from banana plantation in Bihar worked to 2.48, which is not in conformity with the result of the present study.

Benefit cost ratio for Poovan at the aggregate level worked to 1.40. However class wise analysis revealed an increasing trend of this ratio at cost C_2, being 1.3 in class I, 1.35 in class II and 1.45 in class III. Manivannan (1979) observed that the benefit cost ratio of Poovan cultivation in Trichy district was 1.9, which is much higher than that for the present study. Senthilnathan *et al.* (1992) reported this ratio for the first ratooon of Poovan as 2.21, which is also not on par with the result of present study.

The benefit cost ratio for Palayankodan at the aggregate level on cost C_2 basis worked to 1.15. Class wise analysis revealed that this ratio was the highest for class III, followed by class I and class II. This ratio was comparatively low in comparison with the ratios obtained for the other two varieties, although the cost of cultivation of this crop was comparatively low. This could be attributed to the low price that it fetched in the market at the average rate of Rs.4 per kg, in comparison with average price of Rs.9.5 and Rs.11 per kg obtained for Poovan and Palayankodan respectively.

6.5 Farm efficiency measures

Various farm efficiency measures like farm business income, own farm business income, family labour income, net income and farm investment income were worked out for all the three varieties. The net income which is the most

important income measure , which denotes the profit obtained by the grower was the highest in class I of Nendran followed by class III and class II respectively and these worked to Rs.40293.0, Rs.28680.0 and Rs.35034.0 respectively in class I, class II and class III respectively. At the aggregate level net income worked to Rs.34247.0

Maurya *et al.* (1996) reported that profit obtained from banana cultivation worked to Rs.29798.0 which is in conformity with the result obtained in class II of Nendran. Patel *et al.* (1998) reported that net returns from banana cultivation worked to Rs.34476.0 at the aggregate level, which is on par with the result obtained in the present study.

Classwise analysis of net income in Poovan revealed an increasing trend from class I to class III. The figures for class I, class II and class III were Rs.3859.0, Rs.4629.0 and Rs.54692.0 respectively, while at the aggregate level this was Rs.50071.0. This is supported by the finding of Senthilnathan *et al.* (1992) who reported the net income from first ratoon of Poovan as Rs.57506.

Class wise analysis of net income in Palayankodan revealed that net income was the highest in class I, followed by class III and class II. These were Rs.12333.0, Rs.10996.0 and Rs. 11407.0 for class I, class II and class III respectively and at the aggregate level this worked to Rs.11536. Thus the net income obtained from Palayankodan cultivation was the lowest, while it was the highest from Poovan cultivation.

Input – output relationship of banana cultivation.

Costs per plant were worked out at the explicit and implicit cost level for the three varieties. In Nendran the cost per plant at the explicit cost level was almost four times the cost at the implicit cost level. In Poovan the cost per plant at explicit cost level was double the cost at implicit cost level, while in case of Palayankodan the cost per plant at the explicit and implicit cost level were almost

the same. This was because the implicit costs accounted for a very significant share in the total cost of cultivation of Palayankodan, and it was not so in the other two varieties.

The net returns per plant at the explicit cost level was double that at total cost level for Nendran, almost same was the proportion for Poovan, while in case of Palayankodan the net returns at the explicit cost level was more than four times that at total cost level.

6.6 Resource use efficiency

The results of functional analysis using Cobb Douglas model of production function revealed that 92 per cent, 90 per cent and 87 per cent of the variation in output was explained by the regression model in case of Nendran, Poovan and Palayankodan respectively.

Peter (1974) reported that 91 per cent of the variation in gross income of bananas was explained by the regression model, which is comparable with the result of the present study.

Thomas and Gupta (1987) reported that more than 91 per cent of the variation in total income from banana was explained by the explanatory variables viz. labour, manures, fertilizers and working capital which is also on par with the results of the present study.

The functional analysis revealed that in Nendran, value of output was significantly influenced by variables viz., plant protection chemicals and supports. The marginal value products of these two variables were greater than one indicating that there is still scope to use these inputs and increase the yield of banana. Elasticity coefficients of the variables human labour and fertilizers was also positive but non significant. Hence it would not be profitable to increase further the use of these two inputs. The elasticity of coefficient was negative for

the variable manure indicating over use of this input. This might be due to, with the apprehension of getting more yield, farmers might have used manures in excess.

In case of Poovan, the elasticity coefficients were positive and significant for all the variables, but was found to be insignificant for the variable fertilizers. Hence it would not be profitable to increase further the use of fertilizers. The marginal value products of the variables human labour, manures and plant protection chemicals was found to be greater than one, indicating that there is still scope for increasing these inputs for a further increase in output. The marginal value product for fertilizers was found to be less than one, indicating that the utilisation of this input was just little more than the optimum level.

In case of Palayankodan, the elasticity coefficients were positive and significant for the variables human labour, manures and plant protection chemicals. Elasticity coefficient for the variable fertiliser was found to be positive and insignificant, hence it would not be profitable to increase further the use of fertilizers. Marginal value product for the variables human labour, manures and plant protection chemicals was found to be greater than one indicating scope for further use of these inputs for increasing the output.

By returns to scale is meant the behaviour of production or returns when all the productive factors are increased or decreased simultaneously and in the same ratio. If sum of the regression coefficients is not significantly different from one, constant returns to scale is indicated. If sum of regression coefficients is less than one, decreasing returns to scale is indicated, and if it is greater than one, increasing returns to scale is indicated. Sum of the regression coefficients in case of Nendran and Poovan were 1.21 and 1.20 respectively indicating increasing returns to scale and this was 1.0 in case of Poovan indicating constant returns to scale.

6.7 Marketing

There were five channels identified through which the produce moved. They are.

1. Producer – Retailer – Consumer.
2. Producer – Wholesaler – Consumer.
3. Producer – Itinerant Commission agent – Wholesaler – Retailer – Consumer.
4. Producer – Wholesaler – Retailer – Consumer.
5. Producer – Processing units.

However the producer - KHDP market - retailer - consumer channel was identified as the most important channel. Around 45 per cent of the total growers marketed their produce through this channel.

Norman *et al.* (1990) reported that producer – Village trader (pre-harvest contractor) commission agents – retailer – consumer channel was the most important channel in banana cultivation adopted by around 73.34 per cent of the sample growers.

Variety wise analysis revealed that higher proportion of the Poovan growers (56.70 per cent) sold their produce through this channel, followed by Nendran growers (46.7 per cent) and Palayankodan growers (31.67 per cent).

However the proportion of growers selling to the commission agents was higher in Palayankodan (40 per cent) followed by Nendran (15 per cent) and Poovan (1.67 per cent).

Among the Nendran growers 3.3 per cent sold their produce to the processing units while none of the Poovan and Palayankodan growers their produce to the processing units.

Study on the marketing costs and margins of the three varieties through the most important channel revealed that net price received by the farmer accounted for the largest share in Nendran and Poovan (70.00 per cent) followed by Palayankodan (63.37 per cent). Net margin of KHDP also accounted for the largest share in Nendran (2.97 per cent) followed by Poovan (2.72 per cent) and Palayankodan (0.66 per cent). Net margin of the wholesaler accounted for the highest share in Palayankodan (15.05 per cent) followed by Poovan (10.84 per cent) and Nendran (10.39 per cent). The retailers margin was also the highest for Palayankodan (8.36 per cent) followed by Poovan (8.29 per cent) and Nendran (8.02 per cent).

Anon (1986) reported that marketing margin of wholesalers and retailers accounted for 9.81 per cent and 14.23 per cent of the total cost respectively. The former figure was lower than that reported in the present study, while the latter is comparable with the figure obtained for Palayankodan.

Norman and Radhakrishnan (1990) reported that net margin of the retailer accounted for 12.25 per cent of the total cost which is slightly higher then that obtained in the present study.

Nagaraj and Chandrakanth (1992) estimated that the retailers share accounted for 17.0 per cent of the consumer rupee which is higher than the results obtained in the present study.

Marketing costs of the intermediaries accounted for 8.65 per cent of the consumers price in case of Nendran, 7.60 per cent for Poovan, and 20.89 per cent in case of Palayankodan, through the most important channel. However when the produce was marketed through channel three (i.e. producer – itinerant commission agent – wholesaler – retailer – consumer), it was found that price received by grower accounted for the largest share in Poovan (66.23 per cent) followed by Palayankodan (65.21 per cent) and Nendran (64.65 per cent).

Net margin of the commission agent accounted for the largest share in Nendran (12.12 per cent) followed by Poovan (11.77 per cent) and Palayankodan (11.70 per cent). Anon (1986) reported that the net margin of the commission agent accounted for 10.38 per cent of the consumer price which is comparable with the result obtained in the present study.

Raju and Venkateshwarlu (1989) reported that commission agents margin accounted for 9.22 per cent of the consumers price, which is slightly lower than that obtained in the present study. Nagaraj and Chandrakanth (1992) reported than the net margin of the commission agent accounted for 19.23 per cent of the consumers price in marketing of banana. This is comparable with the share of commission agent in marketing of Nendran.

Net margin of the wholesaler was the highest in case of Nendran (8.66 per cent) followed by Palayankodan (8.35 per cent) and Poovan (8.05 per cent). Net margin of the retailer also accounted for the highest share in Poovan (7.13 per cent) followed by Nendran (6.92 per cent) and Palayankodan (5.01 per cent).

6.7.1 Marketing efficiency

Marketing through channel four proved to be most efficient for Nendran, followed by Poovan and Palayankodan as indicated by indices 2.37, 2.33 and 1.23 for Nendran, Poovan and Palayankodan respectively. Marketing through channel three was found to be most efficient for Poovan, followed by Palayankodan and Nendran as indicated by the indices 1.96, 1.37 and 1.33 respectively. Channel four was found to be more efficient for Nendran and Poovan over channel three, while channel three was found to be more efficient over channel four in case of Palayankodan, as revealed from the results of marketing efficiency.

6.8 Constraints in banana cultivation

Farmers views on some important problems related to banana cultivation revealed that high cost of material inputs was the most important problem for 33.3 per cent of the banana growers while 32.2 per cent of the growers experienced high labour cost as the most important problem. The cost of manures fertilizers and pesticides are very high and hence unaffordable by the growers. Labour charges in the study area were also unaffordable by the growers. Many of the growers were of the opinion the banana cultivation based purely on hired labour use would run into loss.

Low price of produce was also most important problem faced by 17.7 per cent of the growers. Major reason for low price of produce was competition with the produce from neighbouring states, more particularly Tamil Nadu which dominated our markets. Cost of production of banana in Tamil Nadu was comparatively low, owing to the cheap labour force available there, as well as favourable soil and climatic conditions. Their produce is sold at a cheaper rate in Kerala markets and in order to enter into the fray our farmers are also forced to bring down price of their produce, inspite of the high cost of cultivation incurred by them.

Incidence of pests and diseases was the most important problem faced by 16.6 per cent of the growers. The growth and yield of banana is effected by the incidence of pests and diseases thereby causing great loss to the farmers. The important banana pests include. Pseudostem borer, Rhizome weevil, aphids etc. Bunchy top, Kokkan, Panama wilt and leaf blight are the major diseases affecting banana.

Destruction due to natural calamities did not figure as the most important constraint to any of the growers, while it ranked second in importance to 22.2 per cent of the growers. Weather problem is a serious threat to banana cultivation. They include storms, draughts, floods etc. which often cause heavy

losses to the farmers. Last year the banana growers in the study area suffered heavy losses on account of high velocity winds, inspite of using supports.

Unavailability of props ranked only as the third important constraint to 28.8 per cent of the banana growers. This was a problem exclusively of the Nendran growers in the study area. Bamboo poles which are used as supports are becoming more and more scarce due to increasing deforestation.

Some of the farmers bought the bamboo poles all the way from Palakkad District and this added to the transportation costs. Those growers who could not afford bamboo poles were forced to use arecanut poles as the latter were comparatively cheaper. However the major advantage of using bamboo poles was that they could be used continuously for three years, while the arecanut poles could be used only once.

Sreevidya (1997) reported incidence of pest and disease as the most important problem in banana cultivation which is also the most important problem for 16.6 per cent of the banana growers in the study area. Sangeetha *et al.* (1998) reported that incidence of pests and diseases was the most important production constraint in banana cultivation followed by labour scarcity and non availability of inputs. Among the economic constraints high cost of material inputs ranked first followed by high labour charges and price fluctuations of produce. The above mentioned constraints are similar to the constraints faced by the banana growers in the study area although they differed in the order of its importance to the sample growers.

Sivanandan and Jaganmohan (1999) identified wide fluctuations in price of banana as the prime constraint in banana marketing, which was also amongst the important constrains faced by the sample growers.

Suggessions for improvement

1. Farmers ability in managing inputs plays a critical role in bridging the technical gap and reaping maximum profit through effective control of cost of cultivation. Government should provide subsidies to farmers for reducing the cost incurred in purchasing of manures, fertilisers and pesticides.
2. The only possible remedy for high labour charges is the employment of family labour as far as possible.
3. Not much can be done regarding the problem of scarcity of propping material, rather than conserving forests.
4. The problem of pests and diseases can be kept under the control by persuading the farmers to adopt plant protection chemicals as a preventive measure, especially against the bunchy top disease which is of serious concern. The problem of pest and disease management can be handled in a most effective manner by group farming. Many different innovative ideas can be put together effectively in carrying out the task.
5. As against the severe losses due to natural calamities, proper monitoring is to be done to ensure the smooth functioning of the crop insurance programme.
6. Encouraging farmer manned markets can go a long way in reducing the problem of middlemen exploitation and assuring a reasonable price to the producer.
7. The problem of transportation can be reduced by providing enough marketing centres and implementing transport services by the Government exclusively for agricultural commodities. This will help in reducing the marketing costs.

Summary and Conclusion

7. SUMMARY AND CONCLUSION

Banana and plantains constitute an integral part of food component of people of Kerala. The humid tropical climate with good rainfall distribution makes it possible to grow banana, almost in every part of Kerala. The most popularly cultivated banana varieties are Palayankodan, Poovan (Rasthali), Robusta etc. There are plenty of studies on the economics and marketing aspects of plantains (Nendran) in the state. But specific studies on other plantain varieties are limited. Hence study was proposed with the objective of conducting a comparative assessment of Nendran, Poovan and Palayankodan varieties in the state. Study also includes marketing related aspects of three varieties. Resource use productivity of the sample farm was also assessed.

The study is based on primary data collected from 60 growers of each variety selected from Kodakara and Chalakudy blocks of Thrissur district. Percentage analysis was done for analysing the data on production and marketing aspects. Cobb Douglas production function was fitted for estimating the resource use productivity. The 60 growers of each variety were classified into three classes based on the number of plants cultivated by them and this size group classification varied in all the three classes. All the costs, returns and other parameters have been discussed on per hectare basis.

7.1 Production

The total cost of cultivation of Nendran worked to Rs.164572.0. This was found to be decreasing from class I to class II, being Rs.191948.0 for class I, Rs.189790.0 for class II and Rs.188662.0 for class III.

Human labour constituted the major share (23.17 per cent) of the total cost followed by manures (18.29 per cent) and fertilizers (15.16 per cent) at the aggregate level.

The total receipts at the aggregate level worked to Rs.223818.0. This was the highest for class I (Rs.232249.0) followed by class III (Rs.223696.0) and class II (Rs.217791.0).

The per quintal cost of production of Nendran on cost C_2 basis was Rs.937.48 and this was Rs.917.00, Rs.942.25 and Rs.944.72 for class I, class II and class III respectively.

The benefit cost ratio at cost C_2 was 1.17 at the aggregate level. This varied from 1.20 in class I to 1.18 in class III and 1.15 in class II and the same at cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1 were 1.55, 1.42, 1.52, 1.32 and 1.36 respectively.

The net income at the aggregate level was Rs.34247.66 and this was the highest for class I (Rs.40292.60), followed by class III (Rs.35034.40) and class II (Rs.28679.70).

The farm business income, own farm business income, family labour income and farm investment income were Rs.80098.20, Rs.68920.05, Rs.53976.20 and Rs.60369.96 respectively at the aggregate level.

Regression analysis revealed that 92 per cent of variation in output of Nendran was explained by explanatory variables and that the contribution of two variable i.e., plant protection chemicals and supports were found to be positive and significant explaining thereby the possibility of further increase in total income by further use of these two variable inputs. One rupee additional expenditure on plant protection chemicals and supports would increase the total returns by Rs.1.35 and Rs.2.58 respectively for the sample as a whole, when all the other factors were held constant at their geometric mean level. Negative regression coefficient associated with variable manures indicated over use of this input.

The total cost of cultivation of Poovan was lower than that of Nendran and worked to Rs.120720.00 at the aggregate level. However, this was the highest for class II, followed by class I and class III and these amounted to Rs.129057.00, Rs.127242.00 and Rs.115720.00 respectively.

Here again labour constituted a major share (23.78 per cent) of the total cost followed by manures (16.50 per cent) and planting material (15.07 per cent).

The total receipts from Poovan cultivation worked to Rs.170802.00 at the aggregate level and this was the highest for class II (Rs.175352.00), followed by class III (Rs.170412.00) and class I (Rs.165833.00).

The per quintal cost of production at cost C_2 was Rs.1045.22 at the aggregate level and this was Rs.1122.80, Rs.1066.13 and Rs.1015.80 for class I, class II and class III respectively and the same at cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1 were Rs.675.67, Rs.724.20, Rs.684.00, Rs.870.34 and Rs.858.92 at the aggregate level.

The benefit cost ratio at cost C_2 was 1.37 at the aggregate level and this varied from 1.30 for class I and 1.36 for class II to 1.45 for class III. The same at cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1 were 2.12, 1.97, 2.09, 1.65 and 1.66 respectively.

The net income at the aggregate level was Rs.50071.00 and this was highest for class III (Rs.54692.24), followed by class II (Rs.46294.50) and class I (Rs.38590.60).

The farm business income, own farm business income, family labour income and farm investment income were Rs.92737.00, Rs.87112.23, Rs.70271.60 and Rs.72701.36 respectively at the aggregate level.

Regression analysis revealed that 91 per cent of the variation in output of Poovan was explained by the explanatory variables and that the contribution of

three variables namely human labour, manures and plant protection chemicals were found to be positive and significant, explaining thereby the possibility of further increase in total income by the use of these three variable inputs. Marginal value products of these inputs indicated that one rupee additional expenditure on human labour, manures and plant protection chemicals would increase the total returns by Rs.1.57, 1.37 and 2.30 respectively, when all the other inputs were held constant at their geometric mean levels.

The cost of cultivation of Palayankodan was the least among the three varieties accounting for Rs.76854.19 at the aggregate level. This was the highest for class II (Rs.78179.20) followed by class I (Rs.77714.90 and class III (Rs.75167.15).

Here again labour constituted the major share (33 per cent) of the total cost followed by rental value of own land (27.90 per cent) and manures (12.50 per cent).

The total receipts from Palayankodan cultivation worked to Rs.89124.90, and was the highest for class I (Rs.90048.00) followed by class II (Rs.89175.00) and class III (Rs.88427.00).

The per quintal cost of production at cost C_2 was Rs.418.00 at the aggregate level and this was Rs.427.23, Rs.416.95 and Rs.412.32 for class I, class II and class III respectively. The same at cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1 were Rs.227.83, Rs.227.83, Rs.229.59, Rs.346.55 and Rs.337.89 respectively at the aggregate level.

The benefit cost ratio at cost C_2 was 1.16 and it varied from 1.14 in class II and 1.15 in class I to 1.18 in class III and the same at cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1 were 2.17, 2.16, 2.14, 1.41 and 1.61 respectively at the aggregate level.

The net income at the aggregate level was Rs.11536.26 and this was the highest for class I (Rs.12333.10) followed by class III (Rs.11496.60) and class II (Rs.10995.80). Farm business income, own farm business income, family labour income and farm investment income were Rs.48840.70, Rs.48840.70, Rs.27018.47 and Rs.35678.33 respectively at the aggregate level.

Regression analysis revealed that 86 per cent of variation in output of Palayankodan was explained by the explanatory variables, and the contribution of the two variables viz. manures and plant protection chemicals were found to be positive and significant, explaining thereby the possibility of further increase in total income by the use of these two variable inputs. One rupee of additional investment on manures and plant protection chemicals would increase the total returns by Rs.2.58 and Rs.2.72 respectively for the sample as a whole, when all other factors were held constant at their geometric mean levels.

7.2 Marketing

Out of the five marketing channels identified in the study area, the most important channel was "producer - KHDP market - retailer - consumer", adopted by 45 per cent of the respondents. The next important channel was "producer - commission agent- wholesaler - retailer - consumer", adopted by 18.89 per cent of the respondents. While majority of the Nendran and Poovan growers (i.e. 46.6 per cent and 56.70 per cent respectively), marketed through the most important channel, a good proportion of the Palayankodan growers (i.e., 31.67 per cent) marketed through the second most important channel.

Producers net share in consumers rupee was 70.00 per cent for Nendran and Poovan and 55.00 per cent for Palayankodan for the most important channel. The same for the second most important channel were 64.65 per cent, 66.23 per cent and 65.21 per cent in case of Nendran, Poovan and Palayankodan respectively.

The index of marketing efficiency was the highest for Nendran (2.37) followed by Poovan (2.33) and Palayankodan (1.23) through the most important channel, while the indices for the second most important channel were 1.83, 1.96 and 1.87 for Nendran, Poovan and Palayankodan respectively. Thus it can be concluded that the channel "producer - KHDP market - retailer - consumer" was more efficient for Nendran and Poovan over the channel "producer - itinerant commission agent - wholesaler - retailer - consumer", while reverse was the trend for Palayankodan.

The most significant problem faced by the banana growers was the high cost of material input. Low price for produce was another important problem faced by a large number of banana growers. This was mainly owing to the competition from the produce from Tamil Nadu which dominated Kerala markets. The other problems faced by the banana growers were loss of crop due to incidence of pests and diseases and due to natural calamities, high labour cost, unavailability of props and high transportation cost.

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ECONOMICS OF PRODUCTION AND MARKETING OF BANANA IN THRISSUR DISTRICT

By
NAMBIAR SAJINI BALAKRISHNAN

ABSTRACT OF THE THESIS

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Kerala Agricultural University

Department of Agricultural Economics

COLLEGE OF HORTICULTURE

VELLANIKKARA, THRISSUR-680 656

KERALA, INDIA

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ABSTRACT

The present study on the economics of production and marketing of banana in Thrissur district was aimed to analyse the comparative economics of different varieties of banana viz., Nendran, Poovan and Palayankodan and to assess the marketing efficiency and constraints experienced by banana growers. The study was conducted with a sample of 60 growers for each variety. Three stage random sampling procedure was adopted for the study. Percentage analysis was used to analyse the data, and Cobb Douglas production function was fitted for analysing reosource use efficiency.

Cost A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 per hectare of Nendran were Rs.143720.26, Rs.155898.20, Rs.144842.70, Rs.169842.50, Rs.164571.50 and Rs.189571.18 respectively. The figures in the same order for Poovan were Rs.78065.20, Rs.83689.96, Rs.79030.86, Rs.100530.50, Rs.99231.18 and Rs.120719.81 respectively. The corresponding figures for Palayankodan were Rs.41868.20, Rs.41868.20, Rs.42191.80, Rs.63691.81, Rs.55353.90 and Rs.76854.19. Labour was the most important input of expenditure in all the three varieties.

The total receipts from the main product and byproducts at the aggregate level were Rs.223818.00, Rs.170802.00, Rs.89124.90 for Nendran, Poovan and Palayankodan respectively.

The cost of production per quintal of Nendran based on cost A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 were Rs.710.87, Rs.771.10, Rs.716.43, Rs.840.09, Rs.813.83 and Rs.937.48 respectively. The figures in the same order for Poovan were Rs.675.67, Rs.724.20, Rs.684.00 Rs.870.34, Rs.858.92 and Rs.1045.22. The corresponding figures for Palayankodan were Rs.227.80, Rs.227.83, Rs.229.50, Rs.346.55, Rs.337.89 and Rs.418.00.

Benefit cost ratio based on cost A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 were 1.55, 1.42, 1.52, 1.32, 1.35 and 1.20 respectively for Nendran and 2.12, 1.97, 2.09, 1.65, 1.66 and 1.37 respectively for Poovan. The corresponding figures for Palayankodan were 2.17, 2.16, 2.14, 1.41, 1.61 and 1.16.

Farm business income for Nendran, Poovan and Palayankodan were Rs.80098.20, Rs.92737.00 and Rs.48840.70 respectively. Own farm business income was Rs.68920.05 for Nendran and Rs.87112.23 and Rs.48840.70 for Poovan and Palayankodan respectively. Family labour income for Nendran, Poovan and Palayankodan were Rs.53976.20, Rs.70271.60 and Rs.27018.47 respectively. Farm investment income in the same order were Rs.60369.96, Rs.72702.36 and Rs.35678.33. The net income from Nendran worked to Rs.34247.66, while it was Rs.50071.00 and Rs.11536.26 for Poovan and Palayankodan respectively.

Cobb Douglas type of production function fitted with output as dependent variable and human labour, manures, fertilizers, plant protection chemicals and support as dependent variables revealed that additional expenditure on plant protection chemicals and support can increase the total returns in Nendran. In case of Poovan, additional expenditure on human labour, manures and plant protection chemicals would increase the total returns, while in palayankodan, additional expenditure on manures and plant protection chemicals would increase the total returns.

The most important marketing channel identified in the study area was "producer - KHDP market - retailer - consumer". The next important marketing channel was "Producer - itinerant commission agent - wholesaler - retailer - consumer". Producer's share in consumer's rupee through the most important channel was 70 per cent for Nendran and Poovan and 55 per cent for Palayankodan, while for the next important channel it was 64.65 per cent, 66.23 per cent and 65.21 per cent for Nendran, Poovan and Palayankodan, respectively.

The indices of marketing efficiency for Nendran, Poovan and Palayankodan were 2.37, 2.33 and 1.23 respectively through the most important channel, while the corresponding figures through the second most important channel were 1.83, 1.96 and 1.87. Thus the efficiency of marketing of Nendran and Poovan was higher through the most important channel while the efficiency of marketing of Palayankodan was higher through the second most important channel.