PRODUCTION, MARKETING AND SUPPLY RESPONSE OF SUGARCANE IN CHITTOOR AREA

By

R. RATHISH

THESIS

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Faculty of Agriculture
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Department of Agricultural Economics
COLLEGE OF HORTICULTURE
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D E C L A R A T I O N

I, hereby declare that this thesis entitled "Production, Marketing and Supply response of sugarcane in Chittoor Area" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

VELLANIKKARA
1.7.93

RATHISH R.

C E R T I F I C A T E

Certified that this thesis entitled "Production, Marketing and Supply response of sugarcane in Chittoor Area" is a record of research work done independently by Mr. RATHISH R., under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

VELLANIKKARA,

DR. E. K. THOMAS
CHAIRMAN
ADVISORY COMMITTEE
ASSOCIATE PROFESSOR
DEPARTMENT OF AGRICULTURAL ECONOMICS

C E R T I F I C A T E

We, the undersigned members of the advisory committee of Mr. RATHISH R., a candidate for the degree of Master of Science in Agriculture with major in Agricultural Economics, agree that the thesis entitled "Production, Marketing and Supply response of sugarcane in Chittoor Area " may be submitted by Mr. RATHISH R., in partial fulfilment of the requirement for the degree.

DR. E. K. THOMAS
CHAIRMAN
ADVISORY COMMITTEE.

DR. V. RADHAKRISHNAN
MEMBER.

DR. K. MUKUNDAN
MEMBER

Sri. V. K. G. UNNITHAN
MEMBER

EXTERNAL EXAMINER

A C K N O W L E D G E M E N T

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Introduction

INTRODUCTION

Sugar is a Universal sweetening agent and sugarcane is the primary age old source of it. Sugarcane is a very important industrial crop accounting for about 60 per cent of sugar production in the world. Sugar in some form has become a 'must' in human diet whether taken directly through various sweet preparations, or indirectly through various carbohydrate containing food stuff. Sugar as sucrose is important for energy and metabolic activities.

Originally, the cultivation of sugarcane was confined mostly to the semi-tropical fertile river valley belts. Now it is an important cash crop on various types of soils in the tropical areas wherever the local climate and water supplies are favourable. Today the sugarcane cultivation extends in the areas between 35° N and S latitudes and from sea level to a few thousand feet altitude. The important sugarcane producing countries are Brazil, Cuba, Mexico, USA, West Indies, Fiji, Philippines, Australia, China, Indonesia, South Africa, Kenya, Egypt, Mauritius, India and Pakistan.

India accounts for nearly 40 per cent of the cane area and 25 per cent of total sugar production of the world.

Sugarcane cultivation in India extends roughly between 8° and 35° N latitude and 68° and 95° E longitude covering both tropical and semitropical areas. There are two broad zones of sugarcane growing areas in India. The northern Indian belt including eastern States which account for 75.80 per cent of total annual sugarcane acreage includes Punjab, Haryana, Rajasthan, West Bengal, Assam and Uttar Pradesh. The tropical south zone comprises the States of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra and adjoining parts of Gujarat and Madhya Pradesh. India shows a very dismal position in the cane yield in northern semitropical States having only 25-45 tonnes per hectare. But the yield in Southern tropical states show values as high as 100 tonnes per hectare.

In Kerala, sugarcane is cultivated in two regions z. Central Travancore region which includes Thiruvalla d Chengannoor Taluks of Pathanamthitta District and

Chittoor Block of Palakkad District. Both these cultivations are concentrated around the sugar factories situated in these regions. Cultivation of sugarcane is prevalent to some extend in Idukki District also.

The present study has been carried out in the Chittoor Block of Palakkad District where the bulk of sugarcane cultivation is concentrated around the co-operative sugar factory, Chittoor. In this area, a rapid increase in the cost of cultivation of the crop was noticed during the past few years without a corresponding increase in the yield of the crop. Involvement of middle-men in the marketing of sugarcane produce (gur) was reported to be too high that a major share of the consumers' rupee was being taken away by them. Even though there is a steady increase in the price offered for sugarcane by the Factory, the farmers were reluctant to extend the area under sugarcane cultivation. Indiscriminate use of chemical fertilizers, plant protection chemicals, planting material etc. were reported to be the general practice in the area.

In this background, the present study on the production, marketing and supply response of sugarcane in

Chittoor Block was under taken during 1991-'92. The main objectives of the study were

(1) To estimate the supply response of sugarcane.
(2) To find out the economics of production.
(3) To estimate the resource use efficiency.
(4) To examine the marketing practices and problems.

The study is based on primary as well as secondary data, the nature and source of which are explained later.

The thesis is divided into six 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 for this study, while the results and discussion are presented in the fifth chapter. The summary of the major findings of the investigation is given as the last chapter.

Limitations of the study

The following are the main limitations of the study.

1. The study was conducted only in one of the two main sugarcane growing regions in the State due to lack of time.

2. A generalised policy for sugarcane in the State as a whole could not be derived from the results of the study since the study was conducted in only one region.

3. The marketing of alcohol, a product of sugarcane,was not studied.

4. Sugarcane is also raised as ratoon crop. The value of planting material was included only for planted crop and not for ratoon crop in cost of production analysis.

Review of Literature

REVIEW OF LITERATURE 05

An attempt is made, in this chapter, to review the past studies in production, marketing and supply response related to the present study. The different aspects are dealt with separately in 6 different sections. The first section deals with the Trend and growth analysis. The second section emphasises the decomposition analysis studies. Cost of cultivation and returns studies are dealt with in section three. Section four contains studies on resource use efficiency while section five covers the studies on supply response. The final section deals with studies on marketing and price spread.

Trend and growth analysis of area, production and productivity.

Singh and Bal (1974) in their study, economics of commercial crops in Punjab, dealt with the trends in area, production, yield and prices of various crops including sugarcane. The study concluded that the green revolution led to a significant decrease of 7.2 per cent per annum in the area under sugarcane and this resulted in the fall of production with no significant change in yield.

Lal and Singh (1980) attempted to examine the trend in area, production and productivity of sugarcane in Uttar Pradesh during the period 1950-'51 to 1974-'75 and Pre and Post 1965 periods. The growth rates were worked out by taking time as independent variable and index number of area, production and productivity as dependent variable. Exponential equations were fitted for estimating compound growth rate. It was found that area, production and productivity of sugarcane in different regions of better production, increased significantly over the years with moderate year to year fluctuation. They suggested appropriate manipulation of price and non price factors for stability in sugarcane production.

Negi and Grewal (1981) analysed the trends in interstate sugarcane and sugar production in seven major sugar producing states for the previous two decades. They concluded that Tamil Nadu, Karnataka, Maharashtra and Gujarat had a significant increase in sugarcane acreage. Production was less in Uttar Pradesh and Bihar. Cultivated area increased more during the 1970s than during the 1960s.

Yadav (1985) investigated the reasons for declining area of sugarcane in Bihar covering the period from 1967 to 1981 with tabulated data on sugarcane and other crops grown in Bihar including rice, maize, tobacco, wheat and linseed.

Raju et al (1988) examined the growth trends in production and productivity of various crops including sugarcane for various agro climatic regions of Andhra Pradesh. East Godawari in Zone II had a relatively better significant growth of 3.11 per cent in area and Chittoor District had a highest growth rate of 3.7 per cent in sugarcane production.

Kandaswamy (1988) in his study on commercial crops in India estimated the growth rate of sugarcane for the period 1967-'68 to 1985-'86. The study revealed that the growth rate in area under sugarcane was significant but that of production was very low. The variability of production of sugarcane was studied for two periods 1967-'68 to 1977-'78 and 1979-'80 to 1985-'86. He concluded that the variability was high in recent period as compared to the earlier period.

Pal and Sirohi (1988) examined the source of growth and unstability in the production of commercial crops in India including sugarcane. The study was done for two periods 1949-'50 to 1964-'65 and 1967-'68 to 1984-'85. Coefficient of variation was used for measuring the instability. The results revealed that rate of growth of area, production and productivity of sugarcane declined from the first period to the second period. The instability in production declined marginally during the period 1967-'68 to 1983-'84. Further analysis showed that sugarcane had a much lower yield instability than production instability.

Sidhu and Sidhu (1988) studied about the growth and area response of commercial crops in Punjab. In their study they examined the changes in the composition and growth of commecial crops including sugarcane. They found the compound growth rate per annum of area under sugarcane to be significantly negative. The growth rate of productivity of sugarcane was positive and significant. There was no significant improvement in the production of sugarcane over time.

Lal (1988) studied about the trend in area, production and productivity of sugarcane in India during

the year 1951-1987. He computed coefficient of variation for determining the variability in area, production and productivity. The study revealed that the variability in area and production of sugarcane were higher in the states having higher growth rates of these variables. Sugarcane productivity in general showed an increasing trend in all the states except Andhra Pradesh.

Singh et al (1991) studied about the factors responsible for the growth performance and regional imbalance of major crops in Bihar including sugarcane taking data for the period 1967-'68 to 1980-'81. Compound growth rates were estimated by using the function $Y_t = AB^t$ and variation was studied by computing coefficient of variation. A very dismal picture was noted in the case of sugarcane crop which showed negative area growth rate during period, although productivity of sugarcane had increased at the rate of 2.1 per cent per annum during the same period. Sugarcane showed stable yield in the state.

Naidu and Munikrishnudu (1991) in their study on growth and instability in agricultural production in Chittoor District of Andhra Pradesh, worked out linear and compound growth rate of area, production and productivity for three separate periods viz. 1954-'55 to 1985-'86,

Pre-green revolution period 1954-'55 to 1964-'65 and post green revolution period 1965-'66 to 1985-'86. For the whole period, sugarcane had a compound growth rate of 6.93 per cent. The variation was above 2 per cent in the production of sugarcane. Yield variability was higher in sugarcane during pre-green revolution period.

Decomposition analysis

Minhas and Vaidyanathan (1965) analysed the component elements in the growth of crop output in India for the period 1951-54 to 1958-61. They used a seven factor additive model for the decomposition of aggregate crop output into its components. The seven factor additive model included area effect, yield effect, crop pattern effect and interaction effect.

In order to eliminate the demerits of Minhas's model, Narula and Vidyasagar (1973), developed another model. Emperical verification was provided using data on HYV of wheat crop in 'IADP districts of Ludhiana, Aligarh etc. for the period 1966-71. The model they used was

$$Pn-Po = (Yn-Yo)\ Aw) \quad (An-Ao)\ Yw$$

where $Yw = \frac{Xn + Yo}{2}$ and $Aw = \frac{An + Ao}{2}$

Sharma (1977) included the effect of price also to measure the effect of area, yield and price in the value of crop out put in India.

Arya and Rawat (1988) measured the relative contribution of area, yield and prices to the increase in crop production of commercial crops in Haryana by decomposition analysis. One significant feature observed from the analysis was that the decrease in contribution of area was associated with the increase in percentage share of price component. The analysis revealed that, only a combination of increasing per hectare yield, area under cultivation and better price will give positive growth impact.

Lakshmi and Pal (1988) decomposed the aggregate crop output of Kerala in to its component elements using a seven factor additive model taking in to consideration of ten major crops. The component elements included were area effect, yield effect, cropping pattern effect and interaction effect. The study revealed that 50 per cent of change in crop output in Kerala was contributed by area effect while yield effect contributed 42 per cent. Croping pattern contributed 8.4 per cent and interaction effect accounted for 15.3 per cent.

Mitra and Sena (1991) assessed the contribution of area, yield and interaction to the total production of groundnut in Orissa for three periods (1) 1950-53 to 1962-65 (2) 1967-70 to 1983-86 and (3) for the entire period 1950-51 to 1985-86. The area effect was 51.34 per cent for the entire period under study while only 4.11 per cent was contributed by yield effect. The interaction effect was 44.55 per cent for this period.

Supply response

Nerlove (1956) estimated the elasticities of supply of selected agricultural commodities in United States over the period 1909 to 1932. The basic expectation model in linear form was extended to include a trend variable and thus the final estimation equation included lagged prices and lagged area. The results showed that the price elasticities were positive and significant.

Nowshirvani (1962) in his study on the supply elasticities of rice, wheat, barley and sugarcane in Bihar and Uttar Pradesh used a modified form of the Nerlovian model. The long run elasticities were positive and significant for sugarcane wheras for rice, wheat and barley, the coefficients were negative and non-significant.

Rajkrishna (1963) estimated the price response of major crops in the pre-partition Punjab over the period 1914-1945. In addition to the relative price he used three shifter variables, relative yield, irrigation and rainfall. All crops except Jowar showed positive and significant responses. The coefficients ranged from 0.1 in case of wheat and bajra, 0.2 to 0.4 in case of maize and sugarcane and 0.6 to 0.7 in case of cotton. the corresponding long run elasticities ranged from 0.15 to 0.16.

George (1965) analysed the impact of relative changes in price on the cropping pattern of Kerala during the decade 1952-53 to 1960-61. Paddy, coconut, sugarcane, tapioca, cashew and rubber which aggregately covered 73% of the total cropped area were selected for the analysis. His study revealed that there had been shift from food crops to cash crops during the period. The acreage response to price has been positive in most cases. The study revealed that it is the increase in relative and not the absolute prices which influenced the quantitative response in area under a particular crop.

Satyanarayana (1967) studied the influence of factors affecting acreage under sugarcane in India. The analysis was carried out both at all India level and state

level for the period 1950-51 to 1962-63. The state-wise installed capacity of sugar industry had a direct bearing for positive change inacreage under sugarcane. In Bihar, a change in relative price of cane has brought about a change in sugarcane acreage. Also changes in acreage were positively associated with the price of gur as the price of gur was more profitable than the price of competing crop, rice. This analysis showed that in Uttar Pradesh, acreage changes were positively associated with the relative yield.

Subbarao (1969) examined the acreage responses of sugarcane in Andhra Pradesh for a period of 13 years from 1952-'53 to 1964-'65. It was found that changes in relative acreage under sugarcane in Andhra Pradesh were positively associated with changes in its relative price. Non-land inputs changed less than proportionately with acreage. The rationality of farmer's response was studied by testing the predictive efficiency of lagged relative price by means of an autoregression, which has been found to be positive.

Jha (1970) used Nerlovian adjustment lag model to study the acreage response of sugarcane in factory areas of North Bihar for the period 1912-13 to 1964-'65. He

found that acreage under sugarcane, before 1932-33 was determined primarily by area under other grain crops. But since then price has been progressively important. The non-price variables like lagged yield and pre-sowing rainfall have emerged significant only recently.

Acharya and Bhatia (1974) examined the effect of various factors like effect of prices and their variability, relative yield, variability in yield and rainfall on the acreage response of sugarcane in Rajasthan and compared the results with those for other states and country. The period under study was 19 years from 1952-'53 to 1970-'71. The absolute price explained only 12 per cent of the variation in cane area. Rainfall and variability in yield had no significant effect on acreage allocation decision for sugarcane.

Wagle (1976), using a basic Nerlovian lagged adjustment model, studied the impact of tariff protection on sugarcane acreage in India over the period 1921-40. The study revealed that the price variable was non-significant after protection. He concluded that there existed a causal relationship between protection and acreage instability operating through the price variable.

Dowling and Jessadachar (1979) put forward a supply response model for sugarcane combining the features of both annual and perennial crops. The above model was fitted to the Thailand sugarcane data over the period 1959-1976. The short run elasticities ranged between 0.8 and 0.9 while the long run elasticities were 2 to 5 times more than that for the short run.

Lal and Singh (1981) examined the determinants of sugarcane acreage fluctuations in Uttar Pradesh for the period 1950-'51 to 1974-'75. Of the variables studied, gur price was the most relevant, the elasticity estimates of lagged sugarcane acreage were found to be consistently positive and highly significant. Relative sugarcane yield showed a positive and significant influence on cane acreage. Of all the variables, rainfall during sowing months emerged as the weakest factor in determining acreage variation in eastern and central Uttar Pradesh, while it was significant for the western region and Uttar Pradesh as a whole. Irrigation appeared to be a positive, significant variable in most of the regions in Uttar Pradesh. The acreage under sugarcane responded negatively but insignificant to the price risk in all the regions and state as a whole.

Singh and Rai (1982) studied the acreage response of sugarcane by fitting both linear and power function in Haryana state. The acreage response functions showed a significant impact of lag year sugarcane price and lag year's acreage under sugarcane.

Lal et al (1983) in their study to examine the impact of relative sugarcane profitability, risk and other non price factors on the acreage allocation behaviour of the farmers in Uttar Pradesh for the period 1950-'51 to 1976-'77 found that price and yield factors were relevant to the dynamics of farmers acreage decision pertaining to sugarcane. Lagged sugarcane acreage was found to be positively significant. Risk and acreage had a negative relationship. Rainfall received during the critical period emerged as one of the important factors. Disease and pest attack had only a little significance, while time showed a positive and significant effect.

Lal and Singh (1985) critically analysed the factors responsible for fluctuation in acreage under sugarcane in Uttar Pradesh. The study was confined to 26 important sugarcane growing districts. The districts were divided into 4 regions; Western, Bareilly, Central and Eastern. The major factors significantly influencing

sugarcane area in different agroclimatic regions of the state were lagged by farmers in adjusting the area, relative sugarcane profitability, rainfall and time trend.

Jagadishlal (1987) studied the response of sugarcane producers to price and non-price factors for the period 1950-'51 to 1976-'77. Using the adjustment lag model as basic frame of analysis, the response relationship in the study were estimated. The short run elasticities of acreage were directly obtained from Cobb-Douglas functions and long run elasticities were obtained by dividing the short run elasticities with the coefficient of adjustment. The farmer's response to lagged area, relative sugarcane profitability, rainfall during sowing months and trend were found significant and positive in influencing sugarcane area. The study suggests that if the farmers of the area are assured of irrigation facilities from canal or other sources, there is great scope for increasing cane area in spite of lo rainfall in pre-planting period.

Raju et al (1988) examined the acreage response of selected commercial crops to the price and non-price factors in Andhra Pradesh from 1968-'69 to 1985-'86 including sugarcane as one of the crops. Lagged area was

an important factor influencing sugarcane area allocation in the state. The cultivators were prepared to take risk fairly well. Overall rainfall during the sowing time had a positive impact though not significant in the area allocation of sugarcane. The possibility of acreage adjustment to price was observed.

Sidhu and Sidhu (1988) made an effort to examine the area response of commercial crops in Punjab including sugarcane using data for the period 1967-'68 to 1985-'86. In sugarcane, the relative price and one year lagged area had significant positive effect on the current area whereas two year lagged area had negative significant effect on cyclic fluctuation in area and production. Other factors turned out to be insignificant as determinants of sugarcane area in the state.

Costs and returns

Singh and Lohan (1960) in their study on economics of production of irrigated crops of sugarcane and other crops in some villages of the sonepat community project area, Rohtak district, Punjab, used data from growers for the years 1955-'56 and 1956-'57. They concluded that labour was the most expensive item for harvesting and processing of cane. Then irrigation was the second in labour followed by hoeing. The profit was 25 per cent of the expenditure.

Singh and Bal (1974) worked out the economics of commercial crops in Punjab including sugarcane. The estimates of cost per hectare for sugarcane were worked out for three zones in Punjab. Their study found out that the operation cost per hectare in Zone I was Rs.2065.80 and the returns over the operational cost were the highest at Rs.2811.60 for sugarcane, when compared to other crops.

Singh and Srivastava (1974) worked out the costs and returns of sugarcane per hectare in their study on the economics of resource use and productivity in sugarcane in Uttar Pradesh. This study was conducted for three different regions in the state. The results revealed that on an average the cost of production of sugarcane per hectare was Rs.2809.67. The average yield was 413.66 quintals per hectare. The net income on an average was Rs.2567.78 per hectare.

Singh et al (1974) compared the economics of sugarcane with its competing crops for different size of farms using data from 30 randomly selected farms of Rudeapur block of Nainital district in Uttar Pradesh. The data were collected from the sample farms pertaining to the agricultural year 1973-'74. The yield per hectare of sugarcane crop showed an increasing trend with the farm size because of increasing expenditure on fertilizer,

irrigation and intercultural operations.

Patil and Acharya (1974) worked out the cost of cultivation of sugarcane to compare it with that of banana in Nasik and Jalgaon Districts of Maharashtra. Using the ABC cost concepts they concluded that net profits were higher in sugarcane than in banana because of higher and stable prices of sugar.

Singh (1974) computed the economics of sugarcane cultivation on farms in Mawana Sugar Factory area, Uttar Pradesh. A total of 60 farmers from two villages were randomly selected representing small, medium and large farmers. The data were collected pertaining to the agricultural year 1969-'70. The results revealed that gross return as well as net returns per hectare was maximum on medium farmers followed by large farmers. He concluded that, due to the shortage of capital investment made by small farmers in inputs like manures, fertilizers, pesticides and irrigation was minimum and hence they lagged behind medium and large farmers in getting higher cash returns.

Radhakrishnan et al (1981) studied the economics of sugarcane cultivation using the data pertaining the year 1978-'79, in Chittoor area. From the list of sugarcane growing villages, six villages were selected randomly. From each village one sugarcane grower was selected randomly. The total cost per hectare for combined crop (planted & ratoon) amounted to Rs.11932/- expenditure on manures and manuring was the largest item followed by harvesting operation. Human labour was the most important input which accounted for 38 to 39 per cent of the total cost. Followed by Fertilizers and manures. The yield of ratoon crop was only 84 per cent of the planted crop. The benefit cost ratio were 1.72, 1.59 and 1.66 for planted, ratoon and combined crop respectively.

Kahlon and Tyagi (1983) defined bulk line cost as that cost which covers cost of production of the majority of farmers, production or area. Conventionally the bulk line cost is calculated so as to cover 85 per cent of farmers or production or area on cost C basis.

Pandey and Tewari (1988) analysed the cost functions in sugarcane production in West Uttar Pradesh and worked out the yield gaps in sugarcane production. Total cost was obtained by adding the estimated fixed cost

and variable cost. Minimum average cost was also calculated. The estimates of economic yield gaps indicated that some farmers operate at fairly close to the most efficient out-put level.

Dondyal (1989) in his book 'Farm Management: An economic analysis defined the concepts of costs viz. Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2.

Agarwal and Goswami (1992) in their study on the impact of cane co-operatives on sugarcane economy in Uttar Pradesh used data for the year 1986-'87. The study estimated the average cost of production as Rs.7,898 per hectare. Seed was the principal claimant of cost followed by animal cost, human labour, fertilizers, manure and tractor services. Average productivity had been worked out to 663 quintals per hectare. Sale of sugarcane accounted for 94.44 per cent of the production. Gur/ Khandra is not produced by most of the cane growers.

Resource use efficiency

Shastri (1958) studied input-output relations Indian Agriculture obtaining data from selected holdings of different sizes in 16 villages in the Upper Ganges in the Districts of Meerut and Muzaffar Nagar, Uttar Pradesh in the year 1950-'51. He fitted a linear function with human labour, bullock labour and manure applied as inputs

and yield per acre of sugarcane as output. The study revealed that manures played an important role in the output of sugarcane planted and sugarcane ratoon. Further analysis revealed that, for planted sugarcane, as the labour utilization becomes higher and higher, the yield per unit area of labour utilization goes down steadily. Sugarcane ratoon also behaved in the same manner.

Achari (1965) studied about the derivation of average production function for two groups of sample sugarcane farms from Ayr and Maekay districts of Queensland state. For Ayr, data for the years 1957-'58 to 1959-'60 and for Maekay, sample 1957-'58 to 1960-'61 were taken. The independent variables selected were fertilizers, labour, plant and machinery and land. Cobb-Douglas production function was used for the study. The marginal returns to fertilizer were greater than marginal cost. Labour productivity was below ruling wage rates in both the samples. Marginal returns to plant and machinary were low for both the groups. Marginal productivity for the land input was high.

Rajkrishna (1974) in his study on some production function for Punjab defined efficiency as the capacity or

ability of any person, process or thing to reach whatever end that may be desired. Average yield per acre or average cost in different size groups of farms can be used to measure their efficiency.

Singh et al (1974) in their study used Cobb Douglas production function to estimate the production function for cotton, sugarcane and oil seeds in Haryana for the year 1973-'74. The use of fertilizers, irrigation water and human labour explained about 87 per cent of the variation in the production of sugarcane. The regression coefficients of fertilizer and irrigation indicated negative contribution to the production of the crop. The marginal value productivity of fertilizer and irrigation for sugarcane was found to be less than zero.

Parthasarathy and Suryanarayana (1974) studied the regional variation in resource productivity and scale of returns in sugarcane farming in Andhra Pradesh by size of sugarcane farms. The results showed constant returns to scale in all regions. They suggested a decrease in the use of land and cattle labour for achieving more profit in sugarcane production among different size groups.

Azad and Garg (1974) fitted Cobb-Douglas production function to determine the productivity of various farm resources used in the production of sugarcane. For the purpose of investigation, a multi stage random sampling was done in which 100 cane growers of different size groups were randomly selected from 10 randomly selected villages in a development block, Hapur in Meerut district. They found that manures, fertilizers and irrigation had more effect on the returns on sugarcane ratoon than that of planted sugarcane. Human labour in sugarcane planted and bullock labour in sugarcane ratoon were found to be in excess.

Singh and Srivastava (197
of resources use and productivity in sugarcane in Uttar Pradesh. To estimate the productivity of various capital inputs in three different regions, Cobb-Douglas production function was used. They concluded that more use of fertilizer and irrigation in all the three regions will result in higher production of sugarcane.

Sastri (1977) in his study on resource use and productivity in sugarcane cultivation in Krishnarajasagar area used modified Cobb-Douglas production function with yield as dependent variable and sugarcane area, crop duration, bullock labour, human labour and fertilizer as

dependent variables for planted, ratoon and combined crop. The study revealed that there was excess use of all the resources.

Raju et al (1987) studied the efficiency of resource use in groundnut production in Mahaboobnagar district of Andhra Pradesh. Cobb-Douglas production function was fitted for the study which referred that land, organic manure, plant protection measures and irrigation only can explain the variation in output of groundnut under irrigated conditions while human labour, bullock labour and fertilizers were found to be unproductive. For irrigated crop, only bullock labour and land were productive.

Rahman and Islam (1988) conducted a study to determine the variation in resource use and land productivity in two villages of Bogra district of Bangladesh and studied the efficiency of factors with respect to different farm size groups. The results showed that performance was better for smallest size group having less than 1.25 acres than the largest size group having more than 1.5 acres. Size of farm had little effect on the production function.

Thakur et al (1990) studied the resource use, farm size and returns to scale on tribal farms of Himachal Pradesh. Production function were fitted for marginal, small and large farmers separately using farm human labour, manures and fertilizers, bullock labour and irrigation as variables. The results revealed highly significant elasticity coefficients for labour indicating more use of labour for the different size group of farmers for increasing returns.

Marketing and price spread

Lal (1979) attempted to estimate and compare the cost, margins and price spread of gur and khandasari in different markets in Uttar Pradesh. The study indicated that the shares of producers, marketing costs and intermediaries were 52 per cent, 20 per cent and 28 per cent and 60 per cent, 17 per cent and 23 per cent of the consumers price when gur was marketed to Calcutta and Lucknow markets respectively.

Singh and Rai (1982) analysed the market arrivals and prices of gur and khandsari in six markets and discussed the price spread and the economics of processing sugarcane in Haryana state during the period 1960-'61 to 1978-'79. Wide seasonal fluctuations in prices and arrivals of gur, khandasari and sugar were observed in all

the selected markets. Processing cost per quintal of gur was higher in bullock operated processing units than in power operated units. The study suggested the need for strengthening of co-operative marketing societies and following a liberal policy in marketing sugarcane purchases as well as proper price support policy.

Analysing 15 years data from Ankappalle Co-operative Sugar Factory, Andhra Pradesh and regulated market for jaggery, Rao (1985) reached at 3 conclusions. First, sugarcane supplies to the two markets fluctuated essentially as a result of violent fluctuation in the price of jaggary. Second, the cane price offered by the factory was higher than statutory minimum price in all years except one between 1975-'76 and 1983-'84. Third, even though cane price had a share of only 35 to 55 per cent in the manufacturer's price of sugar, the conversion of one ton of sugarcane into sugar fetched higher price than its conversion into jaggary.

Rohal et al (1985) analysed the processing and marketing of sugarcane product ie. gur in Muzaffarnagar district of Western Uttar Pradesh for the year 1980-'81. The study found that the marketing charges paid by the processors were the highest in Channel I (producers to processors). In Channel II (producers processed channel) the marketing charges paid by the producers were the

highest. Middle-men's margin was highest in Channel I. The study showed that sugarcane growers could increase their share from 65.8 to 73.6 per cent in the retail price of gur when they processed sugarcane to gur by themselves.

Azad et al (1988) studied the marketing of sugarcane products in Uttar Pradesh using data relating to the year 1982-'83. The study revealed that the marketing charges paid by the producers and middlemen were highest for gur. The share of sugarcane growers in the price paid by the consumers for sugarcane products was observed to be the minimum for free sale crystal sugar and levy sugar, where as it was maximum for khandasari sugar and gur.

Krishnaiah and Raju (1989) studied the existing marketing system and computed the price spread for different marketing channel of jaggery at Anakapalle of Andhra Pradesh in 1980. The channel identified were

(1) Producer - Commission Agent (wholesaler) Retailer - Consumer and

(2) Producer - Wholesaler-cum-Retailer - Consumer.

The study revealed that the shares of the producer was high where the number of intermediaries between the producer and consumer are less.

Area of Study

AREA OF STUDY

The present study is based on the sugarcane cultivation in Chittoor area of Palakkad District. The sugarcane cultivation in Palakkad is mainly centered around the factory area in Chittoor. So it is appropriate to regard the entire district in describing the area of study. The present chapter deals with the Palakkad District in general giving importance to Chittoor Taluk.

Palakkad District is bounded on the north by Malappuram District, on the east by Coimbatore district of Tamil Nadu, on the south by Trichur district and Idukki district. This district is located at the centre of the state.

The total geographical area of Palakkad district is 4480 sq.km. which comes to 11.53 per cent of the total area of the state. The district ranks second in total area. The land use pattern of the district is given in Table 3.1.

There are 5 taluks in the district viz., Mannarghat, Ottapalam, Palakkad, Alathur and Chittoor. The district

Table 3.1

LAND USE PATTERN OF PALAKKAD DISTRICT (1989-'90)

AREA	Area (in hectares)	
	Palakkad	Kerala
Total geographical area	438980	3885497
Forest	136257	1081509
Land put to non-agricultural uses	30698	285283
Barren and Uncultivable land	10368	66278
Permanent Pastural and other grazing land	135	2919
Land under tree crops not included in net area	7527	38138
Cultivable waste	22214	108232
Fallow other than current fallow	5076	27190
Current fallow	7869	46381
Net area sown	219106	2229567
Area sown more than once	111246	768912
Total cropped area	330352	2998479

Source: Farm guide, 1992, Department of Agriculture, Kerala.

is divided into 12 blocks, 3 muncipalities, 91 panchayats and 894 wards. Chittoor Taluk consists of 6 panchayats and 55 wards having a total area of 261.23 sq.km.

Population

Palakkad district ranks seventh in population, in Kerala, supporting 23.77 lakhs of which 11.52 lakhs are males and 12.25 lakhs are females. The rural population comes to 20.02 lakhs and urban population to 3.74 lakhs (Table 3.2). A growth rate of 16.23 per cent was showed by the district during the last decade. Density of population is 530 persons per sq.km. Sex ratio is 1065 females for every 1000 males. According to 1991 census, total literates are 16.59 lakhs (69.79 per cent), of which 8.57 lakhs are males and 8.02 lakhs are females. The rural literacy is 13.75 lakhs and urban, 2.84 lakhs (Table 3.3).

Chittoor taluk supports 4.07 lakhs in population, of which 1.99 lakhs are males and 2.08 lakhs are females (Table 3.2). Of the total, 1.43 lakhs males are literates while 1.19 lakhs females are literates. (Table 3.3)

Table 3.2

POPULATION DISTRIBUTION IN PALAKKAD AND CHITTOOR 1991

Palakkad	Total	Males	Females
Total population	2376561	1152253	1224308
Rural population	2002337	969363	1032974
Urban population	374224	182890	191334
Chittoor Taluk			
Total population	407362	199476	207886
Rural population	341966	167437	174529
Urban population	65396	32039	33357

Source : Census of India 1991, Series 12, Kerala.

Table 3.3

LITERACY STATUS IN PALAKKAD DISTRICT AND CHITTOOR TALUK
1991

Palakkad	Total	Males	Females
Total literates	1658630	856590	802040
Rural	1375057	710610	664447
Urban	283573	145980	137593
Chittoor Taluk			
Total literates	261711	142535	119176
Rural	214191	117402	96789
Urban	47520	25133	22387

Cource : Census of India 1991, Series-12, Kerala.

The Division of working population as given in Table 3.4 shows that 12.53 per cent of people are cultivators while 44.60 per cent are agricultural labourers. People engaged in household industry and other works are 3.83 per cent and 39.04 per cent respectively. In Chittoor Taluk, 12.26 per cent of total working population are cultivators and 51.26 per cent are agricultural labourers. Household industry workers and other workers are 3.91 per cent and 32.57 per cent respectively (Table 3.4).

Climate and rainfall

Palakkad district experiences a tropical humid climate. The annual ranfall received during 1990-'91 was 2329 mm. The average monthly rainfall distribution of the district is given in Table 3.5.

Water Resources

Area under irrigation, crop-wise and source-wise are given in Tables 3.6 and 3.7 respectively. The District has the largest area under irrigated paddy and vegetables in the state. Government canals contributes 70.04 per cent of the total irrigated area followed by private wells (11.72 per cent).

Table 3.4

WORKERS AND THEIR DISTRIBUTION IN PALAKKAD DISTRICT AND CHITTOOR TALUK 1991

Palakkad	Total	Cultivators	Agricultural Labourers	Household Industry Workers	Other Workers
Total	779682	97737	347702	29888	304355
Males	531171	78688	173319	21040	258124
Females	248511	19049	174383	8848	46231
Chittoor Taluk					
Total	163185	20011	[illegible]	6372	53147
Males	101699	15649	37122	4383	44545
Females	61486	44362	46533	1989	8602

Source : Census of India, 1991, Series 12, Kerala.

Table 3.5

AVERAGE MONTHLY RAINFALL IN PALAKKAD DISTRICT AND KERALA STATE - 1990

(in mm)

Month	Palakkad	Kerala
January	8	14
February	9	17
March	27	39
April	87	112
May	161	256
June	477	691
July	633	760
August	349	433
September	165	247
October	249	288
November	136	163
December	28	42
T O T A L	2329	3063

Source : Farm guide, 1992, Department of Agriculture,Kerala.

Table 3.6

AREA UNDER IRRIGATION (CROP-WISE) 1989-'90 IN PALAKKAD DISTRICT AND KERALA STATE

(in hectares)

Crops	Area	
	Palakkad	Kerala
Paddy	69101	243196
Tubers	5	740
Vegetables	862	5598
Coconut	5193	103253
Arecanut	1813	17428
Clove & Nut meg	8	703
Other spices & condiments	366	1376
Banana	929	9706
Betelvine	6	797
Sugarcane	1471	2291
Others	2756	11562
T O T A L	82510	396650

Source : Farm guide, 1992 Department of Agriculture, Kerala.

Table 3.7

AREA UNDER IRRIGATION (SOURCE-WISE) 1989-'90

IN PALAKKAD DISTRICT AND KERALA STATE

(in hectares)

Area	Area	
	Palakkad	Kerala
Government Canals	50505	103680
Private Canals	202	3570
Government Tanks	239	2429
Private Tanks	5046	44575
Government wells	32	713
Private wells	8454	63446
Minor and Lift irrigation	1467	22371
Others	6168	89144
T O T A L	72113	329928

Source : Farm guide, 1992 Department of Agriculture, Kerala.

Cropping pattern

The important crops grown in the district are paddy, coconut, vegetables, sugarcane, rubber, cotton, and groundnut. Paddy is cultivated in 146739 hectares of land which is 56.78 per cent of the total cropped area followed by vegetables which is having an area of 19414 hectares (7.51 per cent). Cotton is cultivated in 9756 hectares, ranking first in Kerala. Out of the total area of 8025 hectares of sugarcane in the State, 2769 hectares (34.50 per cent) is in Palakkad District, ranking first in the State. Cropping pattern in Palakkad District is shown in Table 3.8.

The major crops grown in Chittoor block are paddy, coconut, Tapioca, sugarcane, vegetables, groundnut and cotton.

Table 3.8

CROPPING PATTERN IN PALAKKAD DISTRICT 1989 - '90

Crop	Area (in hectares)	Percentage to total cropped area
Paddy	146739	56.78
Total cereals and millets	155536	60.19
Pulses	7413	2.87
Sugarcane/Palmyrah	8887	3.44
Spices and condiments	13424	5.19
Fruits	29136	11.27
Vegetables	19414	7.51
Coconut	34468	13.34
Groundnut	12100	4.68
Sesamum	883	0.34
Cotton	7956	3.08
Drugs and narcotics	74	0.03
Tea	681	0.26
Coffee	2292	0.89
Rubber	20872	8.08
Fodder Crop	86	0.01
Green manure crop	1442	0.55
Other non food crops	13897	5.37
Total cropped area	258425	100.00

Source : Farm guide 1992, Department of Agriculture, Kerala.

Methodology

METHODOLOGY

The study was conducted in Chittoor area in Palakkad District of Kerala. The District, with sugarcane area of about 3500 ha and an annual production of about 25000 tonnes of sugarcane, stands first in the State in terms of area and production of the crop. The bulk of the sugarcane area in Palakkad District is concentrated around the co-operative Sugar Factory, Chittoor.

Sampling procedure and collection of data

The study is based on both primary as well as secondary data. The secondary data on area, production, productivity and price of sugarcane and its competing crop (Paddy) in Palakkad District were collected from various publications of Government of Kerala and also from the Chittoor co-operative Sugar Factory (CHICOPS) for the period 1975-'76 to 1989-'90.

Two stage random sampling technique was adopted with villages as primary unit and individual holdings as secondary unit for generating primary data. From the list of nineteen villages under Chittoor Taluk, four villages viz. Meenakshipuram, Kozhinjampara, Kunnamkottupathy and

Vadakarapathy were selected. List of farmers who were cultivating planted and ratoon crop simultaneously was prepared based on factory records. This was done to divide the problems from the possible differences in managerial ability of the farmers cultivating planted and ratoon crop. From the above list 120 farmers were selected randomly, 30 from each selected village.

Data on area under sugarcane, details of cultivation operation and associated costs, output, returns, mode of marketing, various inputs used etc. were collected and pre-tested interview schedule by personal interview method was structured. The data pertain to the year 1990-'91. The study was conducted during 1991-'92. Post stratification of the samples based on the area under sugarcane cultivation was done and analysis was carried out separately for the different strata. The size classification adopted is given below.

Class	Area (ha)
I	Below 0.8
II	0.8 - 1.6
III	Above 1.6

Analytical frame work

For measuring the year to year movement of area, production and productivity of sugarcane in Palakkad District simple indices were computed for a period of 15 years from 1975-'76 to 1989-'90. The average of three years from 1975-'76 to 1977-'78 was taken as the base period so as to avoid the influence of extreme values. The indices were computed as follows:

Index No: of area $= \frac{a_i}{a0} \times 100$

$= IA_i$

Index No: of Production $= \frac{P_i}{P_0} \times 100$

$= IP_i$

Index No: of productivity $= \frac{Y_i}{Y_0} \times 100$

$= IY_i$

where

a_i = area under sugarcane in the i^{th} year

a_0 = area under sugarcane during the base period

P_i = production of sugarcane in the i^{th} year

P_0 = production of sugarcane during the base period

Y_i = productivity of sugarcane in the i^{th} year

Y_0 = productivity of sugarcane during the base period

Growth rate

The compound growth rate on area, production and productivity of sugarcane in Palakkad District was

computed by fitting exponential function to the time series data.

$Y = A B^t$

In the log linear form

$\log Y = \log A + t \log B$

where

t - time variable

Y - variable for which growth rates are to be computed viz. production, area and productivity

Compound growth rate (r) = (B-1)100

Decomposition

To find out the contribution of area, productivity and interaction effect towards changes in production, the method of component analysis given below was employed.

$$Q = A_0 \Delta Y + Y_0 \Delta A + \Delta A \Delta Y$$

where

$A_0 \Delta Y$	=	Yield effect
$Y_0 \Delta A$	=	Area effect
$\Delta A \Delta Y$	=	Interaction effect
ΔQ	=	$Q_n - Q_0$
ΔA	=	$A_n - A_0$
ΔY	=	$Y_n - A_0$
Q_n	-	Production in the n^{th} period
A_n	-	Area in the n^{th} period

Y_n - Productivity in the n^{th} period

Q_0 - Production in the base year

A_0 - Area in the base year

Y_0 - Year in the base year

To decompose total change in value of production (ΔX) the price effect (P) was also measured.

$$X = P_0A_0\Delta Y + P_0Y_0\Delta A + A_0Y_0\Delta P + P_0\Delta A\Delta Y + A_0\Delta P\Delta Y + Y_0\Delta A\Delta P + \Delta A\Delta P\Delta Y$$

where

$P_0A_0\Delta Y$ - Yield effect

$P_0Y_0\Delta A$ - Area effect

$A_0Y_0\Delta P$ - Price effect

$P_0\Delta A\Delta Y + A_0\Delta P\Delta Y + Y_0\Delta P\Delta A + \Delta A\Delta P\Delta Y$ - Interaction effect

Supply response

The determination of area was examined by fitting response function of the Nerlovian (Lagged adjustment) type. The general form of the model is as follows:

$$A_td = A_0 + a_1P + K\ a_i\ X_{1-1} + U_t$$

Where P is the expected price and X represent the shifter variable.

Specification of variable

Lagged area.

The supply response function can be expected to be influenced by the area under the crop in the previous year (A_{t-1}). In the case of sugarcane, since it is a ratoon crop, area lagged by two years A_{t-2} can also influence the present area. Both variables were included in the area response model as independent variables and analysed separately.

Relative price

The resource allocation decision of farmers can be expected to be influenced by the price of the produce of the main crop and also by the price of its competing crop. Relative price of sugarcane to paddy, its competing crop, lagged by one year (RP_{t-1}) and by two years (RP_{t-2}) was included for the study. The majority of farmers in the area are registered farmers to the factory and they supply their produce to the factory. Hence gur price is irrelevant and was not taken for the study.

Relative yield

The acreage decision of farmers can be affected by the yield of the crop and also by the yield of its competing crop during the previous years. Good yield of the crop during previous years may positively affect the

decision to raise the crop during the present year and vice versa. For the study relative yield lagged by one year (RY_{t-1}) and two years (RY_{t-2}) were included as independent variable

Yield of sugarcane
Yield of paddy

Risk factor

Market oriented crops can influence the responsiveness of farmers to risk factor. The risk factors in the model were represented by price variability and yield variability. The standard deviation of price and yield for the past three years from the period 't' represents, the price risk (PR_t) and yield risk (YR_t) respectively.

Time trend

The acreage decisions are also influenced by some other relevant factors like improved technology, changes in infrastructure facilities etc. Hence time trend (T) was included as a proxy for technology, in the models.

Including all the chosen variables into the lagged adjustment model, the final estimating equations were obtained as follows:

$$A_t = a_0 + a_1A_{t-1} + a_2RP_{t-1} + a_3RY_{t-1} + a_4PR_t + a_5YR_t$$

$$A_t = a_0 + a_1A_{t-1} + a_2RP_{t-1} + a_3RY_{t-1} + a_4PR_t + a_5YR_t + a_6T$$

$$A_t = a_0 + a_1 A_{t-2} + a_2 RP_{t-2} + a_3 RY_{t-2} + a_4 PR_t + a_5 YR_t$$

$$A_t = a_0 + a_1 A_{t-2} + a_2 RP_{t-2} + a_4 PR_t + a_5 YR_t + a_6 T + a_3 RY_{t-2}$$

The functions were estimated in linear form. The regression coefficients were tested for their significance using 't' test.

Costs and returns

The relationship between the costs incurred and returns obtained from crop production helps to evaluate the profitability of the crop enterprise. Cost of cultivation both operationwise and inputwise per hectare was worked out for planted crop and ratoon crop separately for the three size classes and for the sample as a whole. Input-output ratio was also worked out.

I. Cost A_1

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

1. Value of hired human labour

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

2. Value of animal labour

Animal labour is used for initial land preparation and the cost incurred for this labour was taken as value of animal labour.

3. Value of machine labour

Machine labour instead of animal labour is being used by some farmers for the preparation of land and the cost incurred for this is taken as value of machine labour.

4. Value of planting materials (setts)

Purchased setts were evaluated on the basis of their purchase price. The same price was used for evaluating farm produced setts.

5. Value of manures and fertilizers (farm produced and purchased)

Cost incurred for the purchase of manures and fertilizers were estimated at the purchase price. Farm produced items were valued at their market price.

6. Value of plant protection chemicals

Value of plant protection chemicals viz. insecticides and fungicides were calculated at their market price.

7. Depreciation on farm implements

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

8. Interest on working capital

The rate of interest charged by the commercial banks for short term agricultural loans which was 11.5 per cent per annum was charged for half the duration of the crop, as expenditure was spread over the year.

9. Land revenue

The actual rate of land tax paid to the revenue department at Rs.10/-per acre was taken.

10. Miscellaneous expenses

Expenses incurred for electricity, water etc. were included in this item.

II. Cost A_2

Cost A_2 = Cost A_1 + rent paid for leased in land. In this area leasing in of land by sugarcane growers was not found. Hence Cost A_2 is same as Cost A_1

III. Cost B_1

Cost B_1 = Cost A_1 + interest on owned fixed capital.

Fixed capital items like pumpsets, tractors etc. used for the operation of sugarcane cultivation was considered and interest for this was calculated at the rate of 11.5 per cent.

IV. Cost B_2

Cost B_2 = Cost B_1 + rental value of owned land

Rental value of owned land was calculated as equal to one fifth of the total produce.

V. Cost C_1

Cost C_1 = Cost B_1 + imputed value of family labour.

VI. Cost C_2

Cost C_2 = Cost B_2 + imputed value of family labour

Cost of family labour was computed based on the prevailing wages for hired labour in the area during the period. It was Rs.20/- per day for men and Rs.12/- per day for women.

Efficiency measures

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

1. Gross income

It includes the total value of the product. This was calculated based on the harvest price prevailing in the area.

2. Net income

This is the difference between gross income and cost C_2.

3. Family labour income

It was calculated by adding the imputed wages for family labour to the net income or the difference between gross income and cost B_2.

4. Farm investment income

It was calculated by taking the difference between gross income and Cost A_1+ family labour.

5. Farm business incom

It was computed by taking the difference between gross income and cost A_1.

6. Bulk line cost

Bulk line cost, computed for planted crop and ratoon crop, covers cost of production of majority of farmers, production or area on cost C_2 basis.

Generally it is calculated to cover 85 per cent of farmers or production or area.

Resource use efficiency

To estimate the resource use efficiency Cobb-Douglas production function was used which is logarithmically linear. Cobb-Douglas production function has the advantage over other functions that the estimation can be done more easily. The regression coefficients (b_i) in this model directly indicates elasticity of production which gives the percentage change in output for percentage change in input. The coefficient of each input denotes the return to scale with respect to that input with other inputs held constant and the sum of coefficients of inputs (b_i) denotes the return to scale when all factors are varied simultaneously in the same proportion.

Specification of the model fitted for planted crop is

$$Y = a\ x_1^{b_1}\ x_2^{b_2}\ x_3^{b_3} x_4^{b_4}\ x_5^{b_5} e^u$$

$$\text{Log } Y = \text{Log } a + b_1 \text{ Log } x_1 + b_2 \text{ log } x_2 + b_3 \text{ Log } x_3 + b_4 \text{ Log } X_4 + b_5 \text{ log } x_5 + u$$

and the model fitted for ratoon crop is

$$Y = a\ x_1^{b_1}\ x_3^{b_3}\ x_4^{b_4}\ x_5^{b_5}\ e^u$$

in log linear

$$\log Y = \text{Log } a + b_1 \log x_1 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + u$$

Where

Y = value of sugarcane production in rupees

x_1 = values of labour in rupees

x_2 = value of setts in rupees

x_3 = value of manures and fertilizers in rupees

x_4 = value of plant protection chemicals in rupees

x_5 = value of irrigation in rupees

a = intercept

u = regression error terms

b_1, b_2, b_3, b_4 and b_5 = elasticity coefficients

Marketing Channels and Price Spread

The channels of marketing of sugarcane from the point of production to the point of consumption were identified. Price spread study was conducted by computing the difference between the price paid by the consumer and price received by the producer.

Results And Discussion

RESULTS AND DISCUSSION

The production of any crop is a function of area under the crop and its productivity level. As a part of the study on economics of sugarcane cultivation in Chittoor area of Palakkad District, it is most appropriate to have a detailed analysis on the performance of sugarcane production during the past few years. With this objective, a trend analysis using simple indices on area production and productivity of this crop in the district is done and the results are presented in table 5.1.

Trend analysis

The changes in area, production and productivity of sugarcane during the period 1975-'76 to 1989-'90 were analysed at the district level by computing simple indices (Table 5.1). Area increased during the intitial years upto 1981-'82, but suffered a set back of 33 points from the previous year during 1982-'83. After 1982-'83, the

Table 5.1

INDICES OF AREA, PRODUCTION AND PRODUCTIVITY OF SUGARCANE IN PALAKKAD DISTRICT

Year	Area index	Production Index	Productivity Index
1975-'76	90.25	93.30	103.25
1976-'77	104.87	98.00	93.33
1977-'78	104.87	108.70	103.55
1978-'79	162.53	170.20	104.59
1979-'80	197.38	206.69	104.59
1980-'81	194.20	201.35	103.55
1981-'82	214.59	220.26	102.51
1982-'83	181.75	143.90	79.11
1983-'84	196.88	55.80	79.11
1984-'85	224.79	173.04	76.88
1985-'86	239.08	182.20	76.14
1986-'87	298.49	309.07	103.40
1987-'88	234.56	242.88	103.40
1988-'89	231.99	240.29	103.40
1989-'90	231.32	259.08	111.85

index of area showed a rapid increase upto 1986-'87 and it again fell by 64 points during the next year. The area index was steady during the next two years.

The productivity index remained steady during the initial period under study which is indicated for the indices concentrated around 100. But during 1982-'83, a deep fall occurred in the productivity trend. This setback regained its position only during 1986-'87. The highest index was during the year 1989-'90.

Analysis of production index revealed a similar trend as that of area index. There occurred a steep fall in production during 1982-'83 (143.90) from 1981-'82 (220.26) after a steady increase from 1975-'76 upto 1982-'83. During 1986-'87 a steep rise in production index by 127 points from the previous year occurred indicating a high production. But on detailed analysis, it could be seen that this rise was due to a corresponding increase in cultivated area during the year.

Table 5.2

ESTIMATED REGRESSION COEFFICIENT (B^t), COMPOUND GROWTH RATE (CGR) FOR AREA, PRODUCTION AND PRODUCTIVITY OF SUGARCANE IN PALAKKAD.

Particulars	Area	Production	Productivity
Intercept (A)	1296.3641	8547.9505	6.5942
Regression coefficient (B^t)	1.0687	1.0661	-1.0024
Coefficient of multiple determinate (R^2)	0.727	0.637	0.007
Compound growth Rate (CGR)	6.87	6.61	-0.2450

However, to get more clear idea, growth rates of area, production and productivity of the crop was estimated using the equation $y = AB^t$. The analysis showed that the compound growth rate for the area was 6.87 per cent, that of productivity and production were 0.2450 and 6.61 respectively. This substantiates the general impression that sugarcane production during the period under study was more influenzed by area than by yield. Further to quantify the effect of area, yield and other factors like price on total production, a decomposition analysis as explained in methodology was attempted. The result of the analysis is presented in table 5.2 and 5.3

Decomposition analysis

Decomposition analysis was done with and without price to study the effect of area, yield, interaction effects on the production of sugarcane in Palakkad District. Production was the lowest during 1975-'76 from the base which can be attributed to the high negative area effect as shown in Table 5.3. During the next year, a high negative yield effect was opposed by a high positive yield effect to make the production figure almost hundred. Therearter there was a steady positive effect in the area, yield and interaction to bring the production level above the base figure. An indicated in Table 5.3, the yield

Table 5.3

DECOMPOSITION ANALYSIS OF SUGARCANE PRODUCTION IN PALAKKAD DISTRICT

Year	Area effect	Yield effect	Interaction effect
1975.'76	(-) 144.70	(+) 47.13	(-) 2.43
1976.'77	246.48	(-)332.69	(-)13.79
1977.'78	56.52	41.47	2.01
1978.'79	89.33	6.57	4.10
1979.'80	91.48	4.32	4.20
1980.'81	93.17	3.52	3.31
1981.'82	95.50	2.10	2.40
1982.'83	186.76	(-) 47.76	(-)39.00
1983.'84	174.00	(-) 37.70	(-)36.30
1984.'85	171.35	(-) 31.75	(-)39.60
1985.'86	169.52	(-) 29.09	(-)40.43
1986.'87	95.05	1.68	3.27
1987.'88	94.39	2.39	3.22
1988.'89	94.35	2.44	3.21
1989.'90	82.73	7.47	9.80

effect was negative for 5 years under the study, while the interaction effect was negative for 6 years. The area effect was negative only for the first year. The interaction effect was found to be negligible thoughout the years having a highest value of 9.80 and a lowest value of -40.43. It is evident from the table that the increase in production of sugarcane in Palakkad District was mainly on account of increase in area. This is quite appreciable in a state like Kerala where the prospect of increase in production by area expansion is rather limited.

For studying the effect of price on the production of sugarcane (Table 5.4) the interaction effects were classified into four different effects viz. Area-yield effect, price - yield effect, Area - price effect and Area-price-yield effect. Yield effect showed negative values during five years, area effect during one year, and price effect during two years. The price effect had the highest value of 38.05 per cent during 1983-'84 and the lowest value of -4.68 during 1976-'77. Among the interaction effects, the Area-price effect showed significant values ranging from -0.227 to 47.13 per cent. Other interaction effects were found to be negligible in contributing to the change in production.

Table 5.4

DECOMPOSITION ANALYSIS OF SUGARCANE PRODUCTION IN PALAKKAD DISTRICT (PRICE EFFECT INCLUDED)

	Yield effect	Area effect	Price effect	Area-yield effect	Price-yield effect	Area-price effect	Area-price yield effect
1975-'76	34.83	-104.47	-28.94	-3.40	-0.90	2.83	0.092
1976-'77	-296.66	215.61	-4.68	-14.37	0.320	-0.227	0.02
1977-'78	30.53	41.72	24.20	1.47	0.863	1.17	0.04
1978-'79	6.07	82.63	4.420	3.79	0.203	2.76	0.13
1979-'80	4.00	85.10	3.450	3.90	0.158	3.30	).15
1980-'81	1.57	41.65	27.40	1.48	0.97	25.80	).92
1981-'82	0.96	44.00	24.54	1.09	0.62	28.11	).71
1982-'83	-24.02	93.95	34.56	-19.6	-7.20	28.20	5.91
1983-'84	-15.2	70.60	38.05	-14.7	-7.94	36.86	7.61
1984-'85	-14.4	78.16	31.40	-18.1	-7.20	39.21	).06
1985-'86	-11.13	64.70	33.90	1-5.4	-8.00	47.13	L.23
1986-'87	0.57	33.19	21.10	1.10	0.72	41.91	1.42
1987-'88	0.79	31.20	27.50	1.00	0.94	37.31	1.26
1988-'89	0.76	29.60	28.56	1.01	0.97	37.82	1.28
1989-'90	2.10	23.90	27.60	2.80	3.20	36.22	4.23

SUPPLY RESPONSE

The output of crop varies responding to economic stimuli by altering the area under the crop. The total output response can be obtained by measuring the area response. The model specified for the supply response analysis is

$A_t = F\ (A_{t-1}, RP_{t-1}, RY_{t-1}, YR_t, PR_t, A_{t-2}, RP_{t-2}, RY_{t-2}, T)$

Where A_t = Area under sugarcane in period 't'

A_{t-1} = One year lagged area under sugarcane

A_{t-2} = Two year lagged area under the crop

RP_{t-1} = One year lagged relative price of sugarcane to that of its competing crop, paddy

RP_{t-2} = Two year lagged relative price of sugarcane to that of paddy

RY_{t-1} = One year lagged relative yield of sugarcane to that of paddy

RY_{t-2} = Two year lagged relative yield of sugarcane to that of paddy

YR_t = Yield risk in period 't' represented by standard deviation of crop yield during the three preceding years

PR_t = Price risk in period 't' measured by standard deviation of price for the preceding three years

T = Time trend

Using four combinations of independent variables, area response was estimated. In model I(a), one year lagged area, lagged relative price, lagged relative yield, along with yield risk and price risk were included. In model I(b), in addition to the variables in model I(a), time trend was also incorporated. Two year lagged area, lagged relative price, lagged relative yield, yield risk and price risk were the variables used in model II(a) and in model II(b). In addition to these, time trend was also included. All these models were estimated in the linear forms.

The estimated acreage response functions are presented in Table 5.5 In model I(a), the explanatory variables used could explain seventyeight per cent of the variation in area under sugarcane. Coefficient of one year lagged area was found to be significant with a positive relationship with current area. Relative price and the relative yield both lagged by one year, though not significant showed a negative relationship with area while yield risk and price risk were positive though insignificant. When time trend was introduced, in addition to the variables in model I(a) (model I(b)), none of the variables showed significance with time trend showing a positive relationship. In this model, the R^2 was 0.82 indicating that 82 per cent of the variation in

Table 5.5

AREA RESPONSE FUNCTIONS FOR SUGARCANE (1975-'76 TO 1989-'90), PALAKKAD DISTRICT

Models	Constant terms	Regression Coefficients of Explanatory variables									
		A_{t-1}	RP_{t-1}	RY_{t-1}	PR_t	YR_t	T	A_{t-2}	RP_{t-2}	RY_{t-2}	R^2
I(a)	1154.44	0.75*	- 261.98	-204.15	224.33	1.89					0.7845
I(b)	1143.62	0.41	-1018.18	-115.59	284.82	3.19	65.62				0.8201
II(a)	1256.38				292.22	4.25		0.55*	547.15	-140.53	0.7588
II(b)	1153.57				340.02	3.81	131.50	-0.10	468.99	9.49	0.8244

* Significant at 0.05 per cent level of significance.

the dependent variable could be explained by the independent variables. Raju (1988) obtained lagged area as an important factor influencing sugarcane area allocation in Andhra Pradesh. The elasticity estimates of lagged sugarcane acreage were found to be consistently positive and highly significant among the determinants of sugarcane acreage fluctuations in Uttar Pradesh (Lal & Singh, 1981).

In model II(a), two year lagged area was the only significant variable which was positive. Two year lagged relative yield was the lone negative coefficient though insignificant while all other variables showed a positive response. This model showed an R^2 of 0.75 which indicates that 75 per cent of variation in the dependent variable, area under the crop could be explained by these independent variables. When time trend variable was included in model II(a) none of the variables showed significant values as in the case of model I(b). Here, area lagged by two years showed a negative response even though insignificant while all other variables showed positive response. This model had an R^2 of 0.82 indicating that 82 per cent of variation in the area response could be explained by the independent variables.

Summing up, it can be concluded that there was no concrete relationship with any of the independent variables considered. Eventhough lagged area by one year and two years allowed a significant relationship with current area, this significance was neglected when time trend was included for the analysis. Contrary to the results obtained by Singh and Bhatnagar (1983), time trend emerged as an insignificant factor in the determination of farmer's sugarcane acreage allocation decision. Yield risk and price risk showed insignificant values. It could be infered that the cultivators were prepared to take these risks fairly well. The relative yield and relative price of sugarcane to that of its competing crop, paddy had no effect on the acreage response of farmers.

Cost of cultivation of sugarcane

Operation wise cost of cultivation for planted sugarcane

We now attempt to examine the cost of cultivation of sugarcane This is being done operationwise as well as inputwise. Since ratooning is a common practice in the study area, this exercise has been done separately for planted as well as ratoon crop.

Operationwise cost of cultivation per hectare of sugarcane (planted) for different size classes and for the sample as a whole were worked out and is given in table 5.6. The total costs of cultivation for the sample as a

whole was Rs.20,677.78 per hectare. For class I, class II and class III the total costs were Rs.19,237.16, Rs.21,056.83 and Rs.21,454.88 respectively. From the table it is evident that per hectare cost of cultivation increases with farm size. The major item of cost in all the classes was rental value of own land, followed by costs on harvesting and post harvest handling and manures and fertilizers. Rental value of land was 24.15 per cent, 27.69 per cent, 29.34 per cent and 27.41 per cent of the total cost of cultivation of class I, class II, class III and sample as a whole respectively.

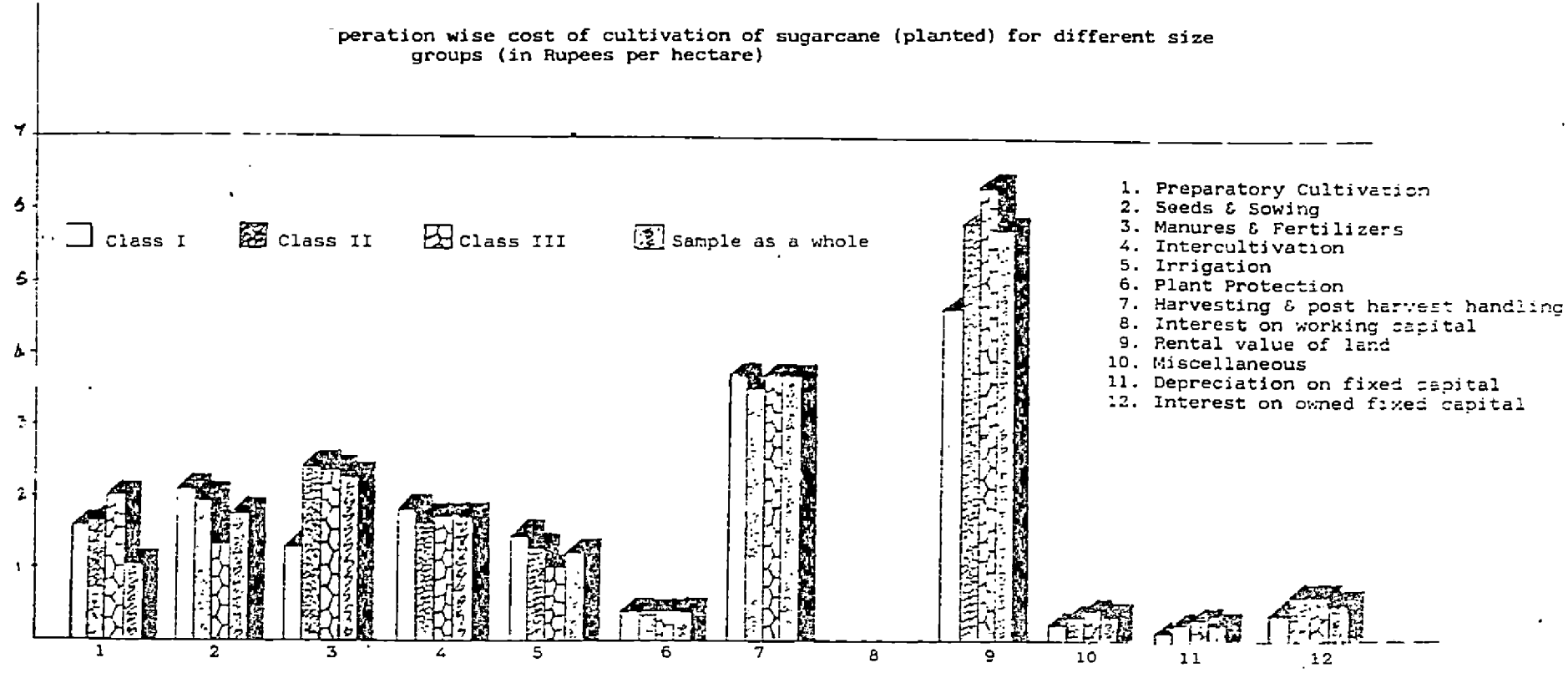
Harvesting and post harvest handling expenses varied from 18.59 per cent of the total cost in class I to 16.80 per cent in Class II, while for the sample as a whole it was 17.80 per cent. In the case of manures and fertiliser application, the cost varied from 11.60 per cent of the total cost in Class II to 8.15 per cent in Class I. At the aggregate level, it was 10.56 per cent. Other explicit cost items, such as preparatory cultivation, seeds and sowing, intercultivation, irrigation and plant protetion accounted for 38.45 per cent, 32.86 per cent, 29.76 per cent and 33.11 per cent of the total cost of cultivation respectively for class I, II, III and the sample as a whole.

Table.5.6. Operationwise cost of cultivation of sugarcane (planted) for different size groups (in Rupees per hectare)

Sl.No.	Operations	Class I	Class II	Class III	Sample as a whole
1.	Preparatory cultivation.	1647.30(8.56)	1680.65(7.98)	2001.61(9.33)	1802.52(8.72)
2.	Seeds & sowing.	2110.96(10.97)	1940.33(9.21)	1382.09(6.44)	1761.64(8.52)
3.	Manures & fertilizer application.	1567.74(8.15)	2442.22(11.60)	2453.99(11.44)	2185.30(10.56)
4.	Intercultivation.	1761.92(9.15)	1612.82(7.66)	1577.95(7.36)	1643.10(7.96)
5.	Irrigation.	1453.74(7.56)	1329.78(6.30)	1019.57(4.75)	1239.21(5.99)
6.	Plant protection.	425.92(2.21)	360.78(1.71)	403.45(1.88)	397.84(1.92)
7.	Harvesting & postharvest handling.	3576.57(18.59)	3536.97(16.80)	3854.98(17.97)	3679.72(17.80)
8.	Interest on working capital.	1081.87(5.63)	1112.93(5.29)	1094.83(5.10)	1096.18(5.30)
9.	Rental value of land.	4645.07(24.15)	5831.00(27.69)	6295.32(29.34)	5667.11(27.41)
10.	Land taxes.	25.00(0.13)	25.00(0.12)	25.00(0.11)	25.00(0.12)
11.	Miscellaneous expenses.	297.03(1.55)	419.00(2.00)	459.60(2.14)	401.26(1.94)
12.	Depreciation on fixed capital.	201.43(1.06)	262.64(1.25)	353.23(1.65)	281.60(1.36)
13.	Interest on owned fixed capital.	442.63(2.30)	502.71(2.39)	533.26(2.49)	497.30(2.40)
	Total.	19237.16(100.00)	21056.83(100.00)	21454.88(100.00)	20677.78(100.00)

Figures in parentheses show percentages to total.

Fig.1


peration wise cost of cultivation of sugarcane (planted) for different size groups (in Rupees per hectare)
Class I
Class II
Class III
Sample as a whole
1. Preparatory Cultivation
2. Seeds & Sowing
3. Manures & Fertilizers
4. Intercultivation
5. Irrigation
6. Plant Protection
7. Harvesting & post harvest handling
8. Interest on working capital
9. Rental value of land
10. Miscellaneous
11. Depreciation on fixed capital
12. Interest on owned fixed capital
1
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11
12

Operationwise cost of cultivation for ratoon sugarcane

Operationwise cost of cultivation for the ratoon crop for the different classes and sample as a whole were computed and is presented in table 5.7. The total cost of cultivation in Class I was Rs.15,958.73, Rs.17,243.42 for Class II and Rs.17,827.16 for Class III. Harvesting and transporting operations recorded the second highest expenditure in all the three classes. In terms of the absolute value, this operation accounted for Rs.3,689.44, Rs.3,605.39 and Rs.3,421.26 for Class III, Class II and Class I respectively. But when expressed as a percentage of the total cost of cultivation, the results were just the reverse, with Class I having the highest percentage followed by Class II and Class III. Rental value of land claimed the highest expenditure in all the three classes. This item of expenditure per hectare varied directly with size from Rs.4,165 in the smallest size to Rs.5,159 in the largest size. As in the case of planted crop, here also manures and manuring was the third highest expensive operation. Among the three classes, Class III recorded the highest expense on this operation followed by Class II and Class I, showing a direct relationship with farm size.

Inputwise cost of cultivation of sugarcane (Planted)

The inputs involved in cultivation of sugarcane crop could be grouped into three, viz. the labour inputs,

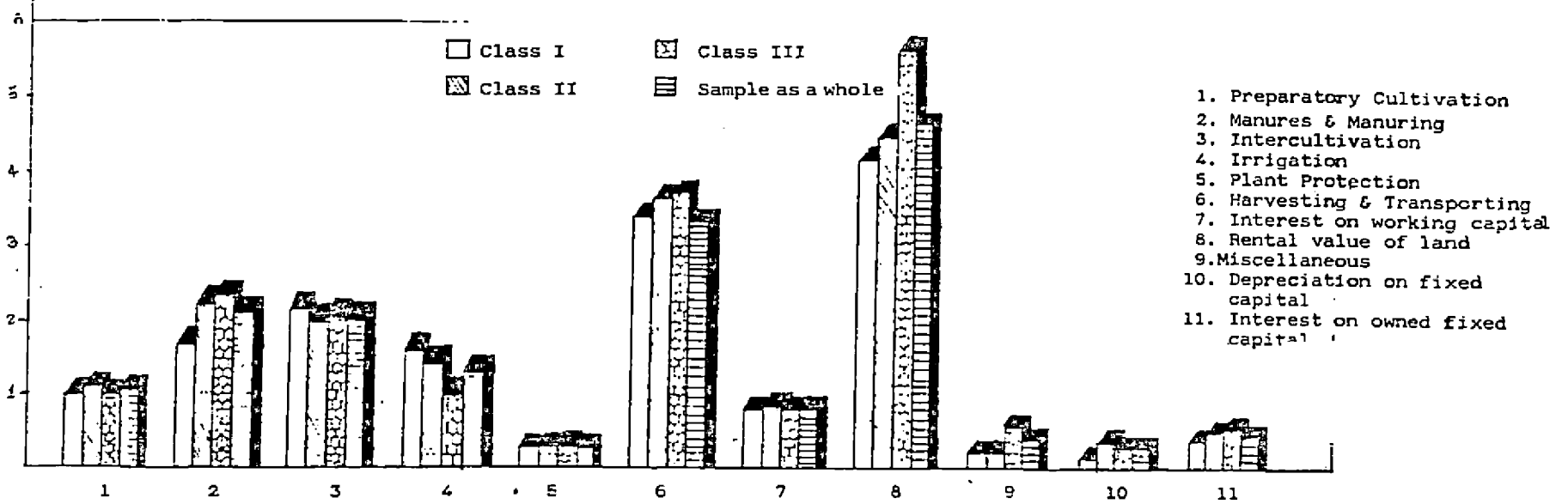
Table 5.7. Operationwise cost of cultivation of sugarcane (Ratoon) for different size groups (in Rupees per hectare)

Sl.No.	Operations	Class I	Class II	Class III	Sample as a whole
1.	Preparatory cultivation.	984.36(6.17)	1111.43(6.45)	1020.33(9.72)	1089.55(6.35)
2.	Manures & Manuring.	1650.35(10.34)	2195.10(12.73)	2355.21(13.21)	2100.13(12.24)
3.	Intercultivation.	2116.54(13.26)	2120.81(12.30)	1972.16(11.06)	2057.44(11.99)
4.	Irrigation.	1586.56(9.94)	1488.46(8.63)	1029.55(5.78)	1325.88(7.73)
5.	Plant protection.	324.47(2.03)	292.40(1.70)	321.58(1.80)	314.12(1.83)
6.	Harvesting & postharvest handling	3421.26(21.44)	3605.39(20.91)	3689.44(20.70)	3585.82(20.90)
7.	Interest on working capital.	828.67(5.19)	846.42(4.90)	861.49(4.83)	847.44(4.94)
8.	Rental value of land.	4164.80(26.10)	4453.20(25.83)	5159.20(28.94)	4662.46(27.17)
9.	Land taxes.	25.00(0.16)	25.00(0.14)	25.00(0.14)	25.00(0.15)
10.	Miscellaneous expenses.	246.25(1.54)	397.50(2.30)	512.25(2.88)	400.50(2.32)
11.	Depreciation on fixed capital.	203.21(1.27)	211.49(1.23)	358.66(2.01)	270.61(1.58)
12.	Interest on owned fixed capital.	407.26(2.56)	496.22(2.88)	522.29(2.93)	480.68(2.80)
	Total	15958.73(100.00)	17243.42(100.00)	17827.16(100.00)	17159.63(100.00)

Figures in parentheses show percentages to the total

Fig.2

Operation wise cost of cultivation of sugarcane (Ratoon) for different size groups (in Rupees per hectare)



materials and other items. The labour costs consisted of human, bullock and family labour, while the material costs included the cost on manures and fertilisers, planting materials and plant protection chemicals. The other items consisted of interest on working and fixed capital, rental value of land, land taxes, depreciation and miscellaneous expenses.

The results as presented in table 5.8 reveal that the major share of the total cost was on account of labour. Similar results were reported by Singh and Lohan (1960). It varied from 48.41 per cent of the total cost in class I to 43.46 per cent in class II and at the aggregate level, it was 44.85 per cent. Among the different components of labour, human labour accounted for the largest share with 88.38 per cent for the sample as a whole of the total labour cost. The contribution of family labour showed much variations in the different classes, which varied from 14 per cent of total human labour cost in Class I to 7.45 per cent in Class III. For the sample as whole the percentage contribution was 10.96. The high expenditure on family labour in Class I could be attributed to the fact that small farmers do some of the cultural operations by themselves while large farmers use hired labour in place of family labour.

ble 5.[illegible]

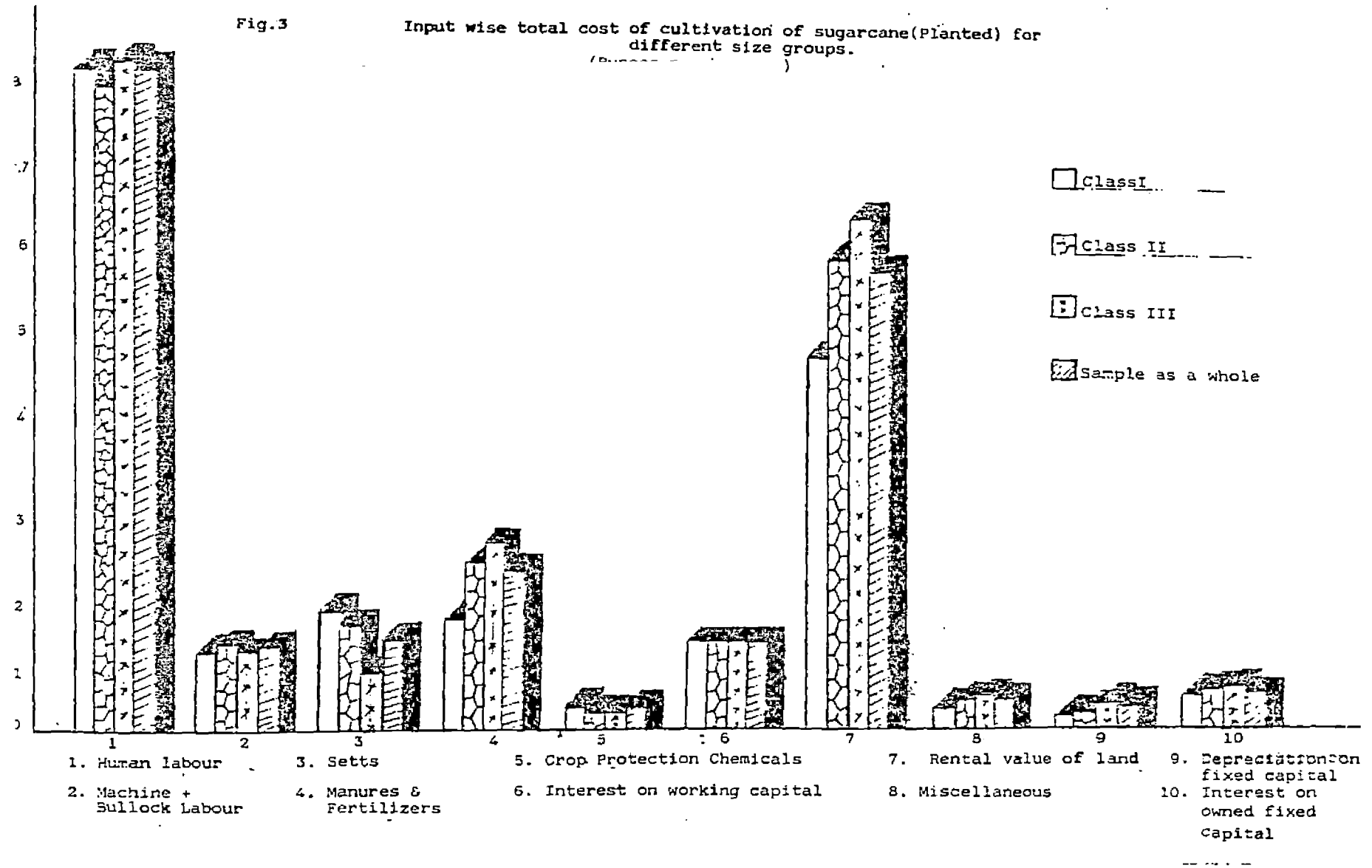
INPUTWISE COST OF CULTIVATION OF SUGARCANE PLANTED IN CHITTOOR AREA FOR DIFFERENT SIZE GROUPS

(In Rupees per hectare)

	Class I	Class II	Class III	Sample as a whole
Labour				
a) Hired human labour	7084.49 (36.83)	6976.33 (33.13)	7636.36 (35.59)	7280.37 (35.21)
b) Family labour	1142.64 (5.94)	1064.43 (5.06)	646.81 (3.02)	915.91 (4.43)
c) Bullock labour	751.91 (3.91)	478.26 (2.27)	438.58 (2.04)	543.94 (2.63)
Sub Total	9311.08 (48.41)	9151.43 (43.46)	9332.[illegible]1 (43.50)	9273.74 (44.85)
Material cost				
a) Planting material (setts)	1507.63 (7.84)	1378.46 (6.55)	749.38 (3.49)	1158.20 (5.60)
b) Manures and fertilizers				
(1) Manures	417.93 (2.17)	507.41 (2.40)	399.74 (1.86)	436.31 (2.11)
(2) Fertilizers	1013.60 (5.27)	1592.58 (7.56)	1943 65 (9 06)	156[illegible].50 (7.56)
c) Plant Protection chemicals	293.89 (1.53)	273.67 (1.30)	268 46 (1.25)	27[illegible] 58 ([illegible].34)
Sub Total	3233.05 (16.81)	3752.12 (17.81)	3361.23 (15.66)	3436.59 (16.61)
I. Other costs				
a) Interest on working capital	1081.87 (5.60)	1112.93 (5.28)	1094.83 (5.10)	1096.18 (5.30)
b) Rental value of land	4645.07 (24.15)	5831.00 (27.69)	6295.32 (29.34)	5667.11 (27.42)
c) Land taxes	25.00 (0.13)	25.00 (0.12)	25.00 (0.11)	25.00 (0.12)
d) Miscellaneous Expenses	297.03 (1.55)	419.00 (2.00)	459.60 (2.14)	401.26 (1.94)
e) Depreciation on fixed capital	201.43 (1.05)	262.64 (1.25)	353.23 (1.66)	281.60 (1.36)
f) Interest on owned fixed capital	442.63 (2.30)	502.71 (2 3[illegible])	53[illegible].26 ([illegible].49)	497.30 (2.40)
Sub Total	6693.03 (34.78)	8153 28 (38.73)	8 6[illegible].24 (40.84)	7968.45 (38.54)
Grand Total	19237.16 (100)	21056.8[illegible] [illegible]00.	21[illegible] 5 .88 (C [illegible]	20677.78 (100)

Figures in Parentheses show percentages to the total

Fig.3 Input wise total cost of cultivation of sugarcane(Planted) for different size groups.



1. Human labour
2. Machine + Bullock Labour
3. Setts
4. Manures & Fertilizers
5. Crop Protection Chemicals
6. Interest on working capital
7. Rental value of land
8. Miscellaneous
9. Depreciation on fixed capital
10. Interest on owned fixed capital

The material cost varied from 15.66 per cent of the total cost in Class III to 17.81 per cent in Class II. Among the different components of material cost, fertilizers accounted for the largest share with 7.56 per cent for the sample as a whole, followed by cost on planting materials (5.6 per cent) cost on manures (2.11 per cent) and plant protection chemicals (1.34 per cent).

The classwise analysis showed that cost on fertilizers varied from 5.27 per cent in Class I to 9.06 per cent in Class III. The expenditure on planting materials was 7.84 per cent, 6.55 per cent and 3.49 per cent respectively for Class I, Class II and Class III. This decreasing trend in expenditure from Class I to Class III can be attributed to the fact that large farmers use the planting materials from their own nursery, while the small farmers buy it from other sources.

Cost on other items varied from 34.78 per cent in Class I to 40.84 per cent in Class II and at the aggregate level it was 38.54 per cent of the total cost. Among the different items of other cost, rental value of land accounted for the largest share with 27.42 per cent, followed by interest on working capital (5.30 per cent) at the aggregate level. Rental value of land which is computed on the basis of return was the highest for Class III(29.34 per cent) followed by Class II (27.69 per cent)

and Class I (24.15 per cent). The interest on working capital varied from 5.1 per cent in class II to 5.6 per cent in class I.

Inputwise cost of cultivation of sugarcane (Ratoon)

The inputwise cost of cultivation of sugarcane ratoon is presented in table 5.9. The analysis showed that the most expensive item was hired human labour which accounted for 44.75 per cent, 43.02 per cent and 40.58 per cent of the total cost for class I, class II and class III respectively and at the overall level, it was 42.50 per cent. Family labour expenses showed a significant decreasing trend from class I to class III. It was 6.71 per cent for class I and 2.88 per cent for class III. The expenditure on manures and fertilizers were more or less the same as the planted crop except that class II recorded the highest expense on manures followed by class III and class I. The rental value of land was the highest for class III (28.94 per cent) followed by class I. (26.10 per cent) and class II (25.83 per cent). For both planted and ratoon crops, both depreciation and interest on fixed capital showed an increasing trend from class I to class III since these two items indirectly account for irrigation expenses.

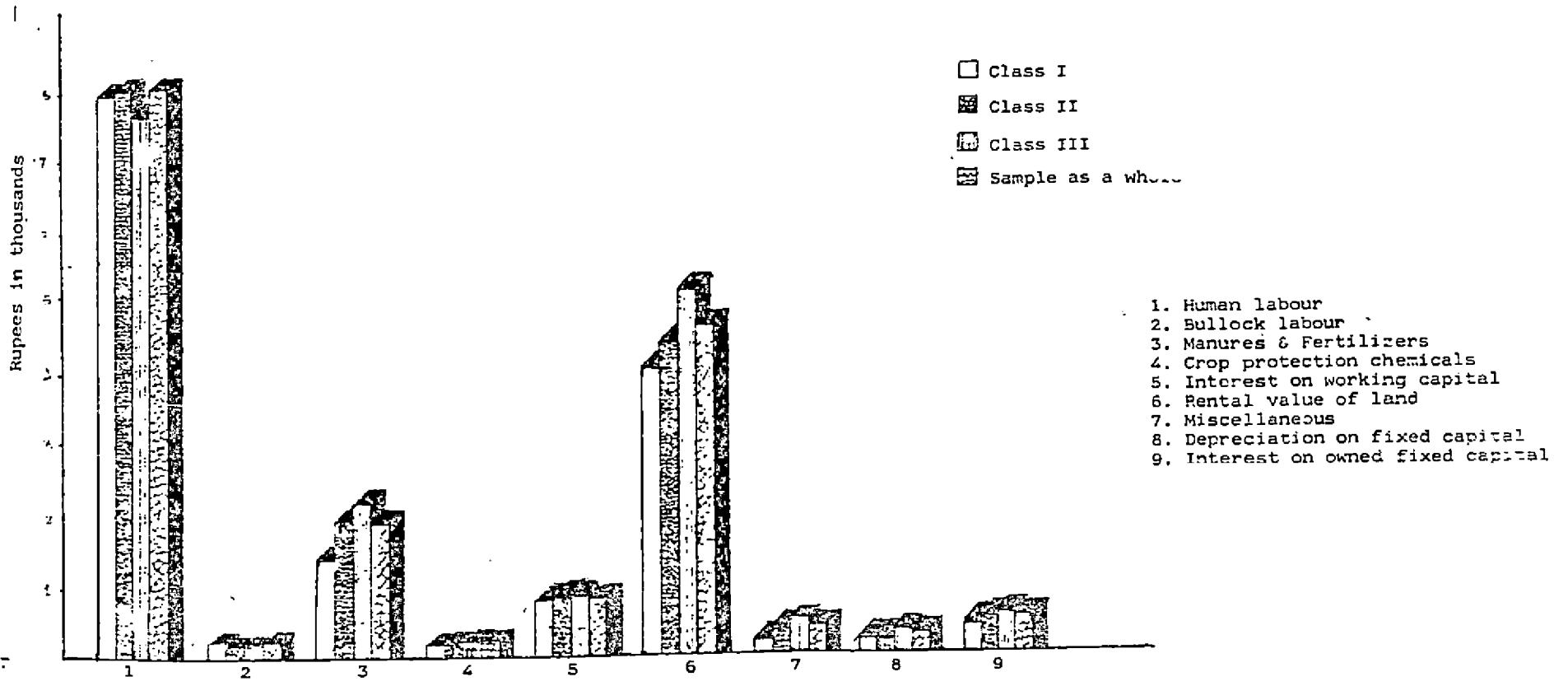
ble 5.9

INPUTWISE COST OF CULTIVATION OF SUGARCANE (RATOON) IN CHITTOOR AREA FOR DIFFERENT SIZE GROUPS (IN RUPEES PER HECTARE)

	Class I	Class II	Class III	Sample as a whole
Labour				
(a) Human	7142.09 (44.75)	7417.43 (43.02)	7234.44 (40.58)	7292.59 (42.50)
(b) Bullock labour	246.32 (1.54)	231.29 (1.34)	198.63 (1.11)	223.11 (1.30)
(c) Family labour	1071.42 (6.71)	977.04 (5.67)	513.32 (2.88)	815.08 (4.75)
Sub Total	8459.83 (53.0)	8625.76 (50.03)	7946.39 (44.57)	8330.78 (48.55)
I. Material cost				
(a) Manures and fertilizers				
(1) Manures	114.74 (0.72)	159.26 (0.92)	142.40 (0.80)	139.63 (0.81)
(2) Fertilizers	1294.53 (8.11)	1815.38 (10.53)	2050.48 (11.50)	1766.92 (10.30)
(b) Plant protection chemicals	214.41 (1.34)	213.19 (1.24)	249.00 (1.39)	235.61 (1.37)
Sub Total	1623.68 (10.17)	2187.83 (12.69)	2441.88 (13.69)	2142.16 (12.48)
III. Other costs				
(a) Interest on working capital	828.67 (5.19)	846.42 (4.90)	861.49 (4.83)	847.44 (4.94)
(b) Rental value of land	4164.80 (26.10)	4453.20 (25.83)	5159.20 (28.94)	4662.46 (27.17)
(c) Land taxes	25.00 (0.16)	25.00 (0.14)	25.00 (0.14)	25.00 (0.15)
(d) Miscellaneous expenses	246.25 (1.54)	397.50 (2.30)	512.25 (2.87)	400.50 (2.33)
(e) Depreciation on fixed capital	203.21 (1.27)	211.49 (1.23)	358.90 (2.03)	270.61 (1.58)
(f) Interest on owned fixed capital	407.26 (2.56)	496.22 (2.88)	522.29 (2.93)	480.68 (2.80)
Sub Total	5875.19 (36.82)	6429.83 (37.28)	7439 13 (41.74)	6689.69 (38.97)
Grand Total	15958.73 (100)	17243.42 (100)	178 7 29 (100)	17159.63 (100)

Fig.4

Input wise total cost of cultivation of sugarcane (Ratoon) for different size groups
(in Rupees per hectare)



Production and value of output

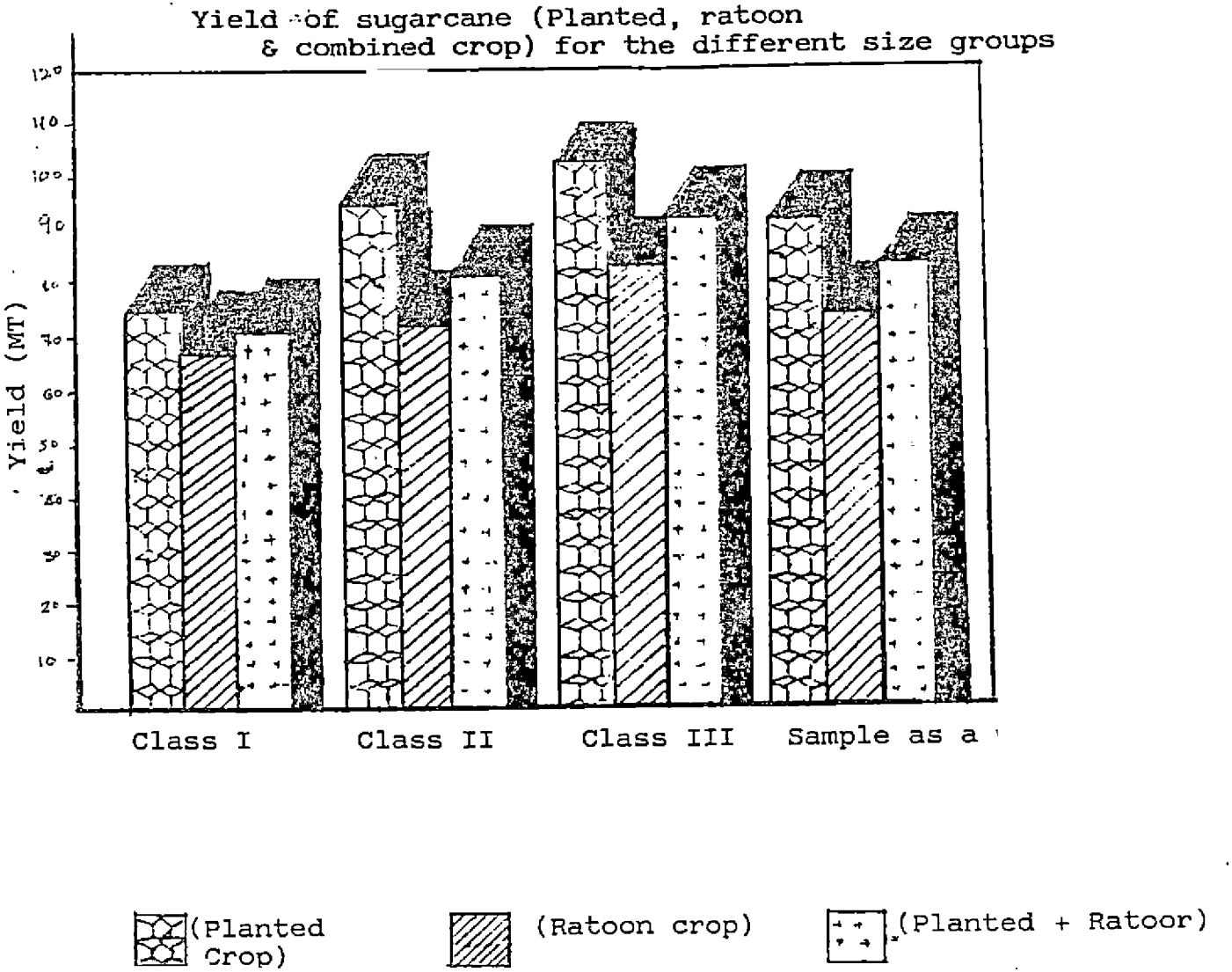
The output and value of sugarcane planted, ratoon and combined crop (planted + ratoon) on per hectare basis are given in table 5.10. The average productivity of sugarcane was higher for planted crop in all the three classes. It varied directly with farm size for planted, ratoon and combined crop. (Singh et al 1974) The relevant figures for planted sugarcane were 74.93 MT, 94.05 MT, 101.53 MT and 91.41 MT for the classes I, II, III and at aggregate level. Correspondingly, the values of income per hectare were Rs.23,225.36, Rs.29,155.00, Rs.31,476.61, and Rs.28,335.64. The yield obtained from sugarcane ratoon were 67.18 MT, 71.82 MT, 83.22 MT and 75.20 MT for the classes I, II, III and at aggregate level respectively. The corresponding values of income were Rs.20,324.80, Rs.22,265.64, Rs. 25,796.00 and Rs.23,312.00 This relation between the size of holding and yield per hectare can be due to the lesser expense on critical inputs like irrigation and machine labour. For the combined crop the yield obtained were 71.06 MT, 82.93 MT, 92.36 MT, and 83.30 MT for classes I, II, III and sample as whole respectively. The corresponding values of income were Rs.22,025.08, Rs.25,701.32, Rs.28,636.30, Rs.25,823.38 respectively. Here also the yield varied directly with the farm size.

Table 5.10

YIELD AND RETURNS FROM SUGARCANE (PER HECTARE)

Particulars	Class I	Class II	Class III	Sample as a whole
		Sugarcane (Planted)		
Yield (MT)	74.93	94.05	101.53	91.41
Income (Rs.)	23225.36	29155.00	31476.61	28335.64
		Sugarcane (Ratoon)		
Yield (MT)	67.18	71.82	83.22	75.20
Income (Rs.)	20324.80	22265.64	25796.00	23312.12
		Sugarcane (Planted + Ratoon)		
Yield (MT)	71.06	82.93	92.36	83.30
Income (Rs.)	22025.08	25710.30	28636.30	25823.38

Fig.5


Yield of sugarcane (Planted, ratoon & combined crop) for the different size groups
Yield (MT)
Class I
Class II
Class III
Sample as a
(Planted Crop)
(Ratoon crop)
(Planted + Ratoor)

Cost of cultivation of Sugarcane under different cost concepts

The cost of cultivation of sugarcane under different costs concepts (cost A_1, A_2, B_1, B_2, C_1, C_2) was estimated for planted, ratoon and combined crops and it is presented in table 5.11. The cost of planted crop had a direct relationship with farm size under all the cost concepts. It was the highest in Class III followed by Class II and Class I. At cost C_2 the cost of cultivation amounted to Rs.19,237.16, Rs.21,056.83 and Rs.21,454.88 for Class I, Class II and Class III respectively and for the sample as a whole, the cost came to Rs.20,677.78. Whereas at Cost A_1 and Cost A_2, the cost of cultivation came to Rs.13,007.56, Rs. 13,658.69, Rs.13,979.49 for the Classes I, II and III respectively and to Rs.13,597.46 for the sample as a whole. The minimum value of cultivation expense for the planted crop was at A_1 and A_2 and the maximum was at cost C_2 for all the Classes under study.

The cost of cultivation under the different cost concepts for the ratoon crop showed similar results. Here too, a direct relationship was noticed between farm size and cultivation expenses. At costs A_1 and A_2, the cost of cultivation came to Rs.10,315.24, Rs.11,316.96, Rs.11,632.48 for Classes I, II and III while it was

Table.5.11. Cost of cultivation of sugarcane under different cost concepts(Rupees per hectare).

Cost concepts	Class I	Class II	Class III	Sample as a whole
		Sugarcane(Planted)		
Cost A_1	13007.56	13658.69	13979.49	13597.4o
Cost A_2	13007.56	13658.69	13979.49	13597.46
Cost B_1	13450.19	14161.40	14512.75	14094.76
Cost B_2	18095.26	19992.40	20808.07	19761.87
Cost C_1	14592.83	15225.83	15159.56	15010.67
Cost C_2	19237.16	21056.83	21454.88	20677.78
		Sugarcane(Ratoon)		
Cost A_1	10315.24	11316.96	11632.48	11201.41
Cost A_2	10315.24	11316.96	11632.48	11201.41
Cost B_1	10722.50	11813.18	12154.77	11682.09
Cost B_2	14887.40	16266.38	17313.97	16344.55
Cost C_1	11793.92	12790.22	12668.99	12497.17
Cost C_2	15958.73	17243.42	17827.29	17159.63
		Sugarcane(Planted+ Ratoon)		
Cost A_1	11661.49	12487.83	12805.98	12399.44
Cost A_2	11661.40	12487.83	12805.98	12399.44
Cost B_1	12086.34	12987.29	13333.76	12888.43
Cost B_2	16491.33	18129.39	19061.02	18053.25
Cost C_1	13193.37	14008.13	13913.82	13753.92
Cost C_2	17597.94	19150.13	19641.08	18918.70

Rs.11,201.41 for the sample as a whole. At costs B_1 and B_2 the cultivation expenses were much higher for all the classes and the sample as a whole. The cost of cultivation at cost C_2 was Rs.15,958.73, Rs.17,243.42 and Rs.17,827.29 respectively for Class I, II and III respectively whereas it came to Rs.17,159.63 for the sample as a whole. The highest value of cost of cultivation was recorded at cost C_2 and the lowest value was recorded at costs A_1 and A_2.

On the analysis of sugarcane (planted and ratoon) cost of cultivation varied directly with the farm size with Class III having the highest value of cost of cultivation followed by Class II and Class I. At cost C_2, the costs of cultivation for this crop per hectare were Rs.17,597.94, Rs.19,150.13, Rs.19,641.08 and Rs.18,918.70 for Class I, Class II, Class III and the sample as a whole. At costs A_1 and A_2, the values came to Rs.11,661.40 Rs.12,487.83 Rs.12,805.98 and 12,399.44 respectively for Classes I, II, III and the whole sample respectively. The value of costs of cultivation were found to be much higher (ranging from Rs.12,086.34 to Rs.19,061.02) at the cost concepts B_1 and B_2.

The cost of production of sugarcane in relation to the various cost concepts is given in table 5.12. It was the highest for Class I followed by Class II and Class III between cost of production and farm size. The cost of production per tonne on cost C_2 basis for classes I, II, III and pooled class were Rs.256.74, Rs.223.89, Rs.211.32 and Rs.226.21 respectively. For the sample as a whole, the cost of production per tonne based on costs A_1,A_2,B_1, B_2,C_1 and C_2 were Rs.148.75, Rs.148.75, Rs.154.19, Rs.216.19, Rs.164.21 and Rs.226.21 respectively.

The cost of production per tonne for the ratoon crop was the highest for Class II (Rs.240.09) followed by Class I (Rs.237.55) and Class III (Rs.214.22). The cost of production per tonne based on the costs A_1, A_2, B_1, B_2, C_1 and C_2 were Rs.148.95, Rs.155.35, Rs.217.35, Rs.166.19 and Rs.228.19 for the sample as a whole.

A comparison of the cost of production of planted and ratoon crops based on the various cost concepts showed more or less similar results.

For the combined crop (Planted + ratoon), the cost of production per tonne came to Rs.247.15, Rs.231.96, Rs.212.77 and Rs.227.20 at cost C_2 for Class I, Class II, Class III and sample as a whole respectively. Here also there was an inverse relationship between cost of production and farm size.

Table 5.12

COST OF PRODUCTION OF SUGARCANE CULTIVATION (PER TONNE)

Particulars	Class I	Class II	Class III	Sample as a whole
	Sugarcane (Planted)			
Cost A1	173.60	145.23	137.68	148.75
Cost A2	173.60	145.23	137.68	148.75
Cost B1	179.50	150.57	142.94	154.19
Cost B2	241.50	212.57	204.95	216.19
Cost C1	194.75	161.89	149.31	164.21
Cost C2	256.74	223.89	211.32	226.21
	Sugarcane (Ratoon)			
Cost A1	153.55	157.57	139.78	148.95
Cost A2	153.55	157.57	139.78	148.95
Cost B1	159.61	164.48	146.06	155.35
Cost B2	221.60	226.49	208.05	217.35
Cost C1	175.56	178.08	152.22	166.19
Cost C2	237.55	240.09	214.22	228.19
	Sugarcane (Planted & Ratoon)			
Cost A1	163.58	156.40	138.73	148.85
Cost A2	163.58	156.40	138.73	148.85
Cost B1	169.55	157.53	144.50	154.77
Cost B2	231.50	219.53	206.50	216.77
Cost C1	185.15	169.98	150.77	165.20
Cost C2	247.15	231.96	212.77	227.20

On analysis, it could be found that cost B_2 was much higher than cost B_1 showing a high rental value of owned land. The difference between cost B_2 and cost C_2 was found decreasing from Class I to Class III. This could be attributed to the fact that there was an inverse relationship between family labour and farm size.

Benefit cost ratio

Benefit cost ratio indicates whether the costs incurred commensurate with the returns obtained. Benefit cost ratio for planted sugarcane was found to be greater than one for all the four classes (Table 5.13). Benefit cost ratio based on costs A_1, A_2, B_1, B_2, C_1 and C_2 for the pooled class were 2.08, 208, 2.01, 1.43, 1.89 and 1.37 respectively.

The benefit cost ratio for the ratoon crop of sugarcane was the highest for Class III (1.45) followed by Class I (1.30) and Class II (1.29) at cost C_2. For the sample as a whole, the ratios were 2.08, 2.00, 1.43, 1.87 and 1.36 at costs A_1 & A_2, B_1, B_2, C_1 and C_2 respectively.

The benefit cost ratios of planted, ratoon and combined crops showed almost similar values (1.37, 1.36 and 1.36) respectively at cost C_2. The benefit cost ratio for the combined crop was the highest in Class III followed by Class II and Class I at all the cost concepts for the sample as a whole. The least benefit cost ratio

Table 5.13

BENEFIT COST RATIO OF SUGARCANE CULTIVATION AT DIFFERENT COST CONCEPTS

Particulars	Class I	Class II	Class III	Sample as a whole
Sugarcane (Planted)				
Cost A1	1.79	2.13	2.23	2.08
Cost A2	1.79	2.13	2.23	2.08
Cost B1	1.73	2.06	2.17	2.01
Cost B2	1.28	1.46	1.51	1.43
Cost C1	1.59	1.91	2.08	1.89
Cost C2	1.21	1.38	1.47	1.37
Sugarcane (Ratoon)				
Cost A1	2.02	1.97	2.22	2.08
Cost A2	2.02	1.97	2.22	2.08
Cost B1	1.94	1.88	2.12	2.00
Cost B2	1.40	1.37	1.49	1.43
Cost C1	1.77	1.74	2.04	1.87
Cost C2	1.30	1.29	1.45	1.36
Sugarcane (Planted + Ratoon)				
Cost A1	1.91	2.05	2.22	2.08
Cost A2	1.91	2.05	2.22	2.08
Cost B1	1.94	1.88	2.12	2.00
Cost B2	1.40	1.37	1.49	1.43
Cost C1	1.77	1.74	2.04	1.87
Cost C2	1.30	1.29	1.45	1.36

was seen at cost C_2 (1.36) and the highest at Cost A_1 and A_2 (2.08).

Measures of efficiency

Income measures in relation to various cost concepts were computed for both planted, ratoon and combined crops (Table 5.14). For planted, ratoon and combined crops, all the income measures increased from Class I to Class III. The gross income for planted crop under the Classes I, II, III and sample as a whole were Rs.23,225.36, Rs.29,155.00, Rs.31,476.61 and Rs.28,335.64 respectively. For both Class II and Class III, the net income was more than double of that of Class I. The family labour income or profit at Cost C_2 for Class III was 108 per cent (Rs.5538.44) more than the same for Class I. The farm investment income were Rs.9075.16, Rs. 14431.88, Rs.16850.31, Rs.13822.27 for the Classes I, II, III and sample as a whole. Farm business income had a direct relationship with farm size. It was the lowest in Class I followed by Class II and Class III for the planted crop showing values ranging from Rs.10217.80 in Class I to Rs.17497.12 in Class III.

For the ratoon crop of sugarcane, the gross income for the four different classes were Rs.20824.80, Rs.22265.64, Rs.25796.00, Rs.23312.00 respectively. The

Table 5.14

INCOME MEASURES IN RELATION TO DIFFERENT COST CONCEPTS FOR SUGARCANE CULTIVATION

(in Rupees Per hectare)

Particulars	Class I	Class II	Class III	Sample as a whole
		Sugarcane (Planted)		
1. Gross Income	23225.36	29155.00	31476.61	28335.64
2. Net Income	3988.20	8098.17	10021.73	7657.86
3. Family Labour Income	5130.10	9162.6	10668.54	8573.77
4. Farm Investment Income	9075.16	14431.88	16850.31	13822.27
5. Farm business Income	10217.80	15496.31	17497.12	14738.18
		Sugarcane (Ratoon)		
1. Gross Income	20824.80	22265.64	25796.00	23312.00
2. Net Income	4866.07	5022.22	7968.71	6152.37
3. Family Labour Income	5937.40	5999.26	8482.03	6967.45
4. Farm Investment Income	9438.14	9971.64	13650.20	11295.51
5. Farm Business Income	10509.56	10948.68	14163.52	12110.59
		Sugarcane (Planted + Ratoon)		
1. Gross Income	22025.08	25710.32	28636.30	25823.82
2. Net Income	4427.13	6560.15	8995.22	6905.12
3. Family Labour Income	5533.75	7580.66	9575.28	7775.61
4. Farm Investment Income	9256.65	12201.76	15250.25	12558.89
5. Farm Business Income	10363.68	13222.49	15830.32	13424.38

net income increased by 1.06 times in Class III than that of Class I, while an increase of just 1.03 times was observed in Class II. The family labour income for the classes I and II was almost the same (Rs.5937.40 and Rs.5999.26). But an increase of Rs.2544.63 was recorded in class III over class I. The farm investment income for class I and class II were 69.14 per cent (Rs.9438.14) and 73 per cent (Rs.9971.64) of that of Class III. Farm business income was Rs.10509.56 Rs.10948.68, Rs.14163.52 and Rs.12110.59 for Class I, Class II, Class III and the sample as a whole respectively.

For the combined crop also, the income measures behaved similarly. All income measures were higher in Class III followed by Class II and Class I. The net income in Class III was almost double than that of Class I. The farm business income showed a range of Rs.10,363.68 to Rs.15,830.32.

Bulk line Cost

Bulk line cost of production refers to t which covers cost of production of the majority of farmers, production or area. Cost of production per tonne for both planted and ratoon crops of sugarcane on cost C_2 basis was computed and the cost at which 85 per cent of total output was supplied was selected as bulk line cost (Table 5.15 and Table 5.16). For the planted sugarcane,

Table 5.15

BULK LINE COST OF SUGARCANE (PLANTED)

Average cost per tonne	Percentage of total output supplied	Percentage of cultivation producing at the cost indicated under 1 and 2
Upto Rs. 30	5.98	5.62
140	9.22	8.71
150	16.56	13.12
160	19.22	14.02
170	30.69	20.42
180	36.29	24.55
190	43.96	32.36
200	52.55	40.64
210	61.62	44.21
220	67.82	48.02
230	67.82	56.97
240	74.59	59.76
250	80.22	66.21
260	85.69	73.36
270	87.22	74.27
280	88.96	79.39
290	88.96	79.39
300	91.55	80.82
310	91.90	81.87
320	92.66	83.91
330	93.10	85.68
340	93.10	85.68
350	93.58	86.17
360	93.96	87.06
370	95.22	89.01
380	96.66	91.21
390	97.21	92.36
400	97.86	93.26
410	97.86	93.26
420	98.22	94.87
430	98.99	95.82
440	99.12	96.01
450	99.16	97.17
460	99.78	99.56
470	100.00	100.00

Fig.6

Bulkline cost of Sugarcane (Planted)

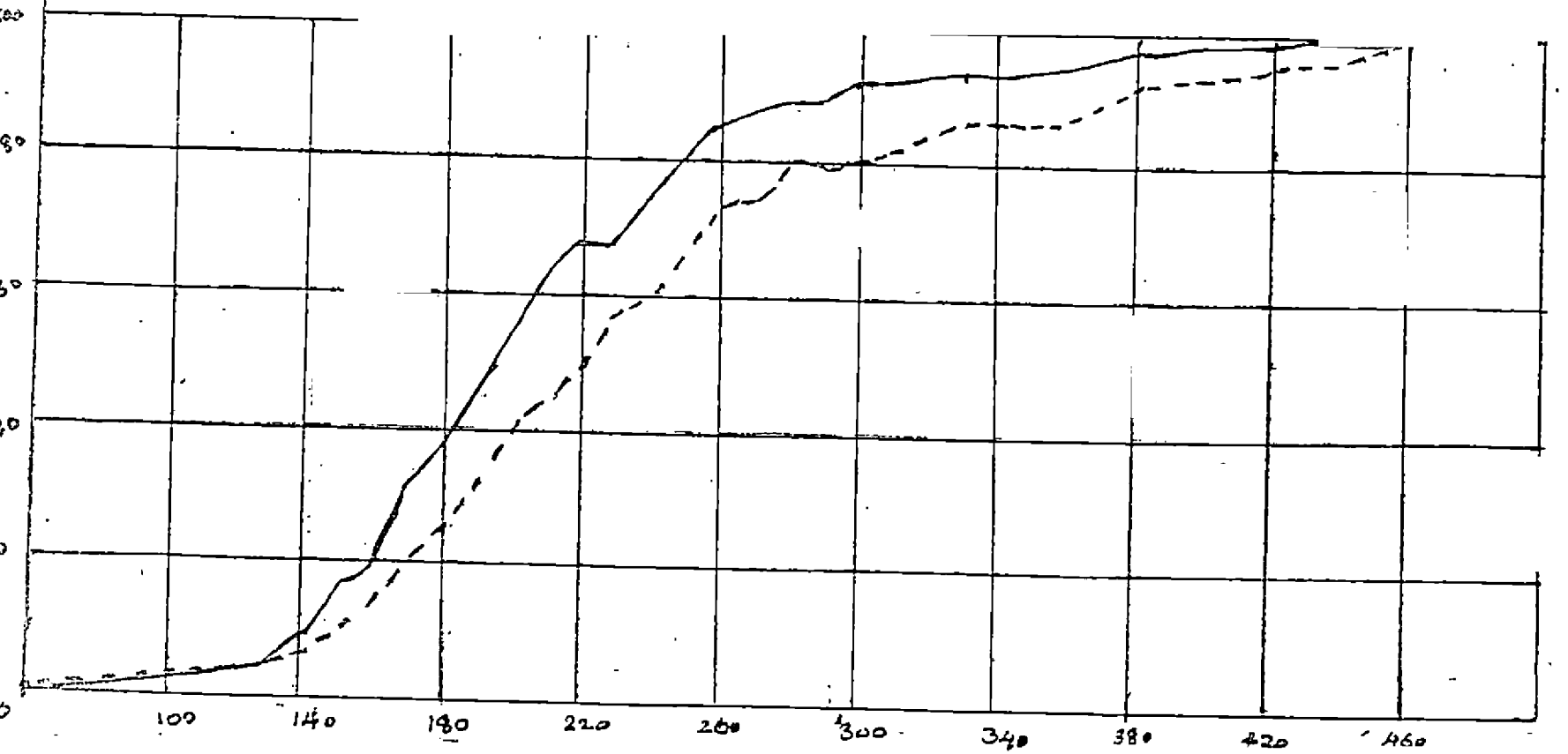


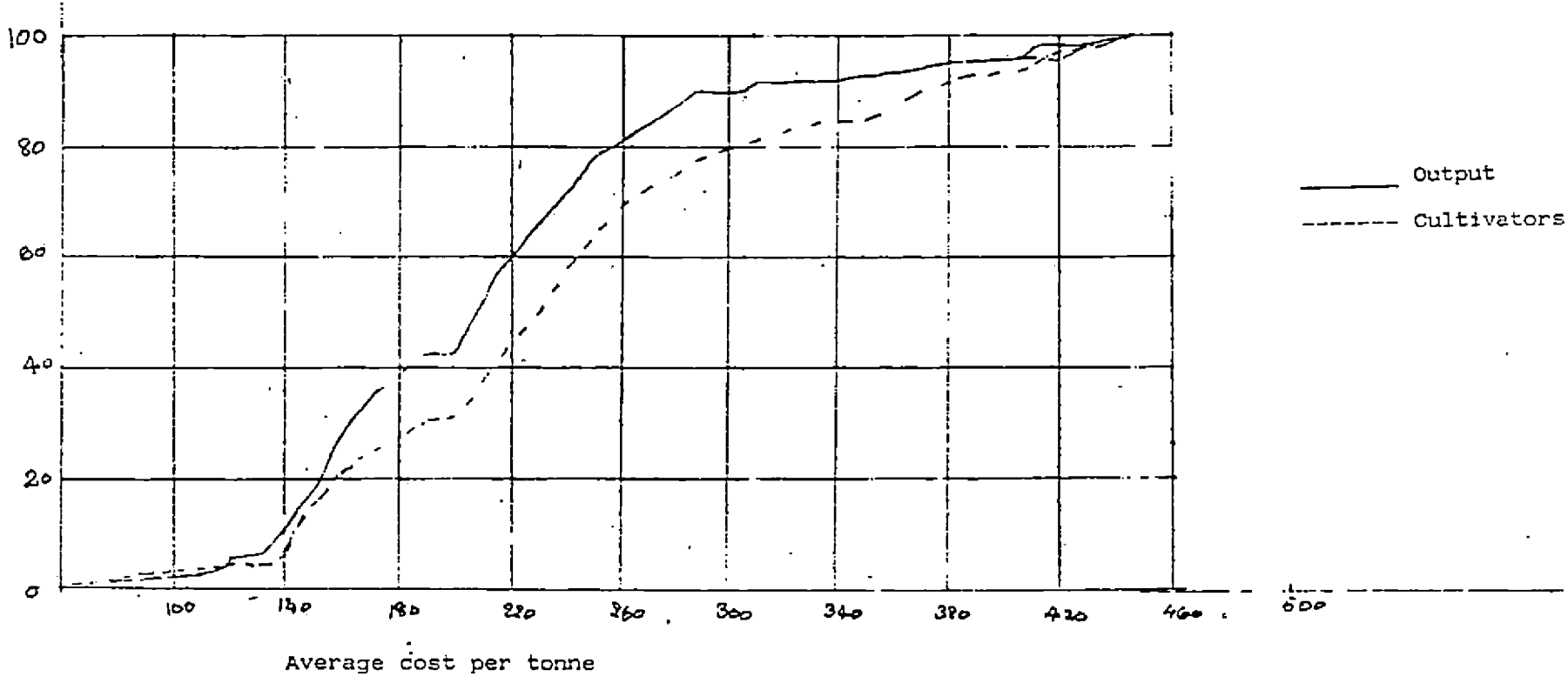
Table 5.16

BULK LINE COST OF SUGARCANE (RATOON)

Average cost per tonne Rs.	Percentage of total output supplied	Percentage of cultivation producing at the cost included under 1 and 2
Upto 110	2.26	2.22
120	4.32	4.56
130	4.32	4.56
140	10.99	10.61
150	17.22	14.72
160	26.59	20.56
170	33.23	23.59
180	39.88	27.32
190	42.16	30.21
200	42.16	30.21
210	54.26	38.57
220	60.01	44.66
230	66.22	49.12
240	71.26	58.06
250	78.24	63.56
260	81.55	69.92
270	84.66	72.11
280	87.21	76.17
290	90.06	78.26
300	90.06	78.52
310	91.26	80.61
320	91.98	82.20
330	92.16	83.79
340	92.16	83.99
350	92.88	84.16
360	94.39	87.51
370	95.38	90.42
380	95.69	92.00
390	96.09	93.06
400	96.09	93.06
410	98.88	96.29
420	98.88	96.29
430	99.16	98.61
440	99.59	99.15
450	100.00	100.00

Fig.7

Bulkline Cost of Sugarcane (Ratoon)



bulklinecost was estimated at Rs.260 per tonne where the bulk line output was supplied by 73 per cent of the total cultivators. The bulk line cost of production for sugarcane ratoon came to Rs.270. The bulk line output at this cost was contributed by 72 per cent of the total farmers.

RESOURCE USE EFFICIENCY

To study the relationship between the ou and the various inputs used, production function analysis was carried out. This will provide a guideline to the farmers to operate at the least cost combination and to get the maximum profit. The efficiency of each input can be studied from the production function analysis by deriving the marginal productivity or elasticity of those resources.

Cobb-Douglas production function was used to study the resource use efficiency or both planted and ratoon crops. The regression coefficients, their standard error and the marginal value products for the 'Planted' crop is given in table 5.17. The elasticity coefficient for the inputs like labour and pesticides were found to be negative while the rest of the coefficients had a positive effect on total output which is indicated by the 't' value. Of the five variables used, three of them viz. expenditure on manures and fertilizers, plant protection chemicals and irrigation had significant effects on the output. The expenditure on plant

Table 5.17

ELASTICITIES OF PRODUCTION (b_i) STANDARD ERRORS (SE) AND MARGINAL VALUE PRODUCTS (MVP) FOR VARIOUS INPUT FACTORS OF SUGARCANE (PLANTED)

Inputs	Regression coefficients (b_i)	Standard error (SE)	Marginal Value products (MVP)
X_1	-0.0168	0.0307	-0.0147
X_2	0.0103	0.0395	0.0073
X_3	0.0552*	0.0271	0.0399
X_4	-0.0954*	0.0285	-0.0538
X_5	0.2679*	0.0518	0.1999

*Significant at five per cent level of probability

protection chemicals showed a negative influence that this input is in excess use and reduced expense on this will add to the net returns. Quite contrary to the results obtained by Singh et al (1974), expenditure on manures and fertilizers indicated a significant positive value showing that there was a positive response in total returns to this input. A rupee of additional expenditure on manures and fertilizers would increase the total returns by five per cent when all other factors were held constant at their geometric mean levels. The analysis showed an excess use of labour though not significant. This may be due to the employment of family labour which is otherwise idle.

The positive regression coefficient associated with irrigation expenses was found to be highly significant. This indicates that irrigation practised for this crop is inadequate and an increased expenditure on timely irrigation can boost up the final returns. Similar results were obtained by Singh and Srivastava (1974). A rupee invested for irrigation purpose would increase the total returns by twenty six per cent when all other factors remain constant at their geometric mean level.

The marginal value product was the highest for irrigation showing a value of 0.1999. Expenditure on labour and plant protection chemical showed negative marginal value products.

The regression coefficients, their standard errors and the marginal value of products for sugarcane (ratoon) is given

in table 5.18. The expenditure on labour was found negative and significant indicating that any addition to this would reduce the total returns. The labour used was in excess and a cut of rupee in this expenditure would in turn increase the net profit obtained by eleven per cent. As in the planted crop, here too, the expenditure on plant protection chemicals was noticed to be in excess but not significantly. Here also the negative elasticity associated with plant protection chemicals indicated the indiscriminate use of pesticides by the cultivators without the proper identification of pests and diseases. The significant negative influence on planted crop can be due to the additional expense on this item for treatment of setts before planting, or else, it could be due to the high incidence of pest and diseases on the planted crop compared to the ratoon crop.

The marginal value products were negative for expenditure on labour and plant protection chemicals, while that of irrigation showed the highest value of 0.0836.

This study revealed a positive effect of irrigation expenses in total returns. There is scope for increasing returns from the planted as well as ratoon crop by providing adequate irrigation. Hence, priority should be given to this aspect of production and more money should be diverted to develop the required infrastructural facilities for irrigation.

Table 5.18

ELASTICITIES OF PRODUCTION (b_i) STANDARD ERRORS ($SE)_X$ AND MARGINAL VALUE PRODUCTS (MVP) FOR VARIOUS INPUT FACTORS OF SUGARCANE (RATOON)

Inputs	Regression Coefficients (b_i)	Standard error ($SE)_X$	Marginal value products (MVP)
X_1	-0.1365*	0.0650	0.1217
X_3	0.0801*	0.0218	0.0598
X_4	-0.0145	0.0192	0.0082
X_5	0.1109*	0.0342	0.0836

*Significant at five per cent level of probability

An efficient system of marketing ensures a better share of the consumer's rupee to the producer. The existence of intermediaries is inevitable since the producers always do not contact the ultimate consumers. The reward taken by them is a matter of concern as it affects the efficiency of marketing system. The difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of farm product is termed price spread and it includes marketing costs and margins of intermediaries. The movement of goods and service from producer to consumer at minimum cost reveals the efficiency of marketing system.

In the present study, an attempt has been made to identify the important marketing channels of sugarcane and also the efficiency of marketing.

Marketing channels

The products move from the hands of the producer to the consumer through various routes which are referred to as marketing channels. Important marketing channels identified in the marketing of sugarcane in Palakkad district were:

1. Producer - Factory
2. Producer - Gur Producer - Wholesaler (as gur) - Retailer - Consumer
3. Producer - Commission agents - gur producer - wholesaler - Retailer - Consumer
4. Producer - Gur producer - Commission agents - Wholesaler - Retailer - Consumer
5. Producer - Wholesaler (as gur) - Retailer - Consumer.

Among the above five channels, the producer-factory channel was found to be the most important. The sugarcane obtained from the producers was converted into sugar and distributed to the consumers through private intermediaries and also through public distribution system. Sugar production resulted in the by-product molasses from which alcohol was produced and marketed by the factory. Another important product, gur, was produced by the farmers by themselves and gur producers. The producers bought sugarcane either from the farmers directly or through commission agents.

The farmers were classified according to the type of buyers to whom they sold sugarcane. (Table 5.19), which showed that 69.17 of the farmers sold their produce to the factory. This was due to the fact that from the nearby fields, the factory took the produce and transported at

Table.5.19. Distribution of the sample farmers according to the type of buyers

Products sold to	No. of farmers	Percent
Factory	83	69.17
Gur producers	13	10.83
Commission agents	5	4.17
Wholesalers as gur	19	15.83
Total	120	100.00

its own cost and for far away fields, a subsidy amount was given for transportation. A good proportion of the farmers (15.83 per cent) produced gur by themselves, which was more profitable than selling sugarcane to gur producers. While 10.83 per cent of the farmers sold their produce directly to gur producers, only 4.17 per cent sold their produce through commission agents.

Marketing efficiency

In order to analyse the marketing efficiency, price spread study was carried out. The marketing efficiency was assessed based on the marketing costs and margins. Marketing costs denote the costs that are incurred by the producers and intermediaries for the purpose of marketing. This includes transportation costs, cost and variable costs. The profit which goes to the intermediaries forms the margin.

The sugar that is produced in the factory is routed through different channels to the consumers. Here, the government agency is also involved which undertake the public distributing system where the excise duty is free for sugar. Hence the marketing aspects of sugar was not considered for the study. The different methods in the marketing of gur, was studied in detail. The average price received by the sugarcane farmers were compared with the prevailing prices in the gur wholesale and retail

markets. Marketing margins and costs are calculated and is presented in table 5.20.

When sugarcane was marketed through the different channels, the proportion of the consumer's price that went to the hands of the producers was different. While considering the farmer-gur-producer - wholesaler-retailer-consumer channel, only 58.49 per cent of the consumer's price went to the producers. When commission agents were involved, the producers got a lower share (56.04 per cent) The highest proportion of the ultimate consumer price (83.02 per cent) went to the farmers when they produced gur by themselves excluding all middle men. Eventhough farmers got a higher share when they produced gur, it involved certain costs. Data on unit cost of production of gur by farmers may be useful in comparing the net availability.

In all the marketing channels, the wholesaler's margin was the highest followed by retailer's and the gur producer's. When commission agents were included in the channel, the margin to the gur producers was reduced. The wholesaler's margin accounted for 7.17 per cent of the consumer's price while the retailer's margin accounted for 4.91 per cent. In the third channel, the commission agents shared 2.45 per cent of the consumer's rupee. The

BLE 5.20

MARKETING MARGINS AND COSTS (IN RUPEES PER TONNE) FOR SUGARCANE IN PALAKKAD DISTRICT

1. : Shares	Producer - Gur producer - wholesaler - Retailer - Consumer		Farmers - Gur producing themselves - wholesaler - Retailer - Consumer.		Producer - Commission agents - gur producers - wholesalers - retailers - consumer	
	Rupees	Percentage	Rupees	Percentage	Rupees	Percentage
Price received by the producer	310	58.49	440	83.02	297	56.04
Commission charges paid by the producer to the commission agents	-	-	-	-	13	45
Price received by commission agents or price paid by gur producer	-	-	-	-	312	87
Cost of conversion of sugarcane to gur (100 Kg. gur from 1 tonne of sugarcane)	123	23.21	127	23.96	123	21
Net margin taken by gur producer	17	3.21	-	-	15	
Price received by gur producer or price paid by wholesaler	440	83.02	440	83.02	440	
Cost incurred by wholesaler	12	2.26	12	2.26	12	
Net margin taken by wholesaler	38	7.17	38	7.17	38	
Price received by wholesaler or price paid by retailer	490	92.45	490	92.45	490	
Cost incurred by retailer	14	2.64	14	2.64	14	
Net margin taken by retailer	26	4.91	26	4.91	26	
Retailer's sale price or price paid by consumer	530	100.00	530	100.00	530	

marketing costs incurred accounted for 28.11 per cent while marketing margins accounted for 15.28 per cent of the consumer's cost. In the present study, marketing cost is inclusive of the cost of conversion of sugarcane to gur.

Thus it was evident from the study that the middlemen took a major share of the consumer's price. The producers could obtain more profit when they produced gur by themselves rather than selling sugarcane to gur producers or to the factory.

Summary

SUMMARY

The present study on the production, marketing and supply response of sugarcane in Chittoor block of Palakkad District was undertaken during 1991-'92 taking data pertaining to the year 1990-'91. The main objectives of the study were the estimation of growth rates, supply response, cost of cultivation, cost of production, resource use efficiency, marketing costs and margins and identification of marketing channels.

Secondary data on area, production and productivity, price of sugarcane and its competing crop etc, were collected from secondary source and primary data were collected by personal interview of farmers and traders. Two stage random sampling technique was adopted with villages as primary units and individual holdings as secondary units for generating primary data.

The area index showed fluctuations, while the productivity index which remained steady during the initial period showed a steep fall during 1982-'83. The production index also behaved similary. The compound growth rates were 6.87 per cent, 0.24 per cent and 6.61 per cent for area, productivity and production respectively.

Decomposition analysis revealed that the increase in production of sugarcane was mainly on account of area increase. The yield effect showed negative values during five years, area effect during one year and price effect during two years. Among the four interaction effects, only area-price effect showed significance.

Using four combinations of independent variables, area response was estimated. In model I(a), area lagged by one year was found to be significant with a positive relationship with current area. When time trend was introduced to the variables in model I(a) (model I(b)), none of the variables showed significance. In model II(a) two year lagged area was the only significant variable which was positive. When time trend was included in the above, area lagged by two years showed a negative response, though insignificant.

The cost of cultivation for the planted and ratoon crops was determined. For the planted crop, the total cost of cultivation for the three classes were Rs.19,237.16, Rs.21,056.83 and Rs.21,434.88 for Class I, II and III respectively. For the sample as a whole, the cost come to Rs.20,677.78 at cost C_2.

Rental value of land was the highest expensive item followed by costs on harvesting and post harvest handling for planted crop. It ranged from 24.15 per cent in class I to 29.34 per cent in class III. Harvesting and post harvest handling expense was 17.80 per cent of the total cost for the sample as a whole.

The cost of cultivation for the ratoon crop also behaved similarly. Harvesting and transporting operations recorded the second highest expenditure having values Rs.3,689.44, Rs.3,605.39, Rs.3,421.26 for class III, II and I respectively. As in the case of planted crop, manures and manuring was the third highest expensive operation.

Considering the input wise cost of cultivation, hired human labour was the most expensive input for both planted and ratoon crops. Family labour was the highest in class I followed by class II and class III. For planted crop, it was 5.94 per cent, 5.09 per cent and 3.02 per cent for classes I, II and III respectively. But for ratoon crop, it was 6.71 per cent, 5.67 per cent and 2.88 per cent for classes I, II and III respectively. Among the materials used, the highest material cost was incurred by manures and fertilizers for both the crops. In both cases depreciation and interest on fixed capital showed an

increasing trend from class I to class III, these items indirectly accounted for irrigation expenses.

A comparison of yield and value of out-put showed that planted crop produced higher yield than that of ratoon crop. The yield had a direct relationship with farm size. For the planted, ratoon and combined crops, the whole sample indicated yields of 91.41 Mt. having a value output of Rs.28,335.64, 75.20 Mt. with a value of Rs.23,312.12 and 83.30 Mt. worth Rs.25,823.38 respectively.

Cost of cultivation at different cost concepts were estimated for planted, ratoon and combined crops. For all the crops, all the costs showed a direct relationship with farm size. For the planted crop, at cost C2, the cost of cultivation was Rs.19,237.16, Rs.21,056.83, Rs.21,454.88 and Rs.20,677.78 for classes I, II, III and sample as a whole respectively. For the ratoon crop, the corresponding values were Rs.15,958.73, Rs.17,243.42, Rs.17,827.29 and Rs.17,159.63. For the combined crop, the cost of cultivation at cost C2 ranged from Rs.17597.94 in Class I to Rs.19,641.08 in class III.

The cost of production had an inverse relationship with farm size for planted crop. It was Rs.256.74, Rs.223.89, Rs.211.32 and Rs.226.21 for classes I, II, III

and sample as a whole respectively. For the ratoon crop, it was the highest in Class II (Rs.240.09) following by class I (Rs.237.55) and class III (Rs.214.22). The combined crop also gave similar results.

The benefit-cost ratio based on various cost concepts were greater than one for all the three crops. It was the highest in class III showing values 1.37, 1.36 and 1.36 for planted, ratoon and combined crops respectively at cost C_2.

Net income, family labour income, farm investment income, farm business income etc. were computed for planted, ratoon and combined crops. Net income was the double of class I in class III. The family labour income at cost C_2 for class III was 108 per cent more than that for class I. Farm investment income and farm business income also had a direct relationship with farm size.

At cost C_2 basis, the cost at which 85 per cent of total output was supplied was selected as bulk line cost. The bulk line cost was Rs.260 per tonne and Rs.270 per tonne for the planted and ratoon crops respectively.

To study the relationship between the output and the

various inputs used, production function analysis was carried out using Cobb-Douglas production function. For the planted crop, expenditure on manures and fertilizers, plant protection chemicals and irrigation had significant effects on the output. Expenditure on plant protection chemicals showed a negative influence indicating that this input was used in excess. Expenditure on manures and fertilizers indicated a significant positive value showing that there was a positive response in total returns. The analysis showed excess use of labour though not significant. Irrigation expense was found to be inadequate. Similar results were obtained for the ratoon crop.

Important marketing channels of sugarcane were identified and efficiency of marketing was studied. Five important marketing channels were identified. They were

1. Producer - Factory
2. Producer - Gur producer - wholesaler (as gur) - Retailer - consumer
3. Producer - Commission agents - gur producer - wholesaler - Retailer - Consumer
4. Producer - Gur producer - Commission agents - wholesaler - Retailer - Consumer
5. Producer - Wholesaler (as gur) - Retailer - Consumer

Of the total farmers, 69.17 per cent sold their produce to the factory while 15.83 per cent produced gur by themselves. Some of the producers sold their produce to gur producers.

In order to study the price spread, marketing aspects of gur was considered. The study revealed that the wholesaler's margin was the highest in all the channels followed by retailer's and gur producer's. The highest proportion of the ultimate consumer's price (83.02 per cent) went to the farmers when they produced gur by themselves excluding all middlemen. The marketing costs incurred accounted for 28.11 per cent while marketing margins accounted 15.28 per cent. The producers could obtain more profit when they produced gur by themselves rather than selling sugarcane to gur producers or to the factory.

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PRODUCTION, MARKETING AND SUPPLY RESPONSE OF SUGARCANE IN CHITTOOR AREA

By

R. RATHISH

ABSTRACT OF A THESIS

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Kerala Agricultural University

Department of Agricultural Economics
COLLEGE OF HORTICULTURE
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A B S T R A C T

The present investigation on the production, marketing and supply response of sugarcane in Chittoor Area of Palakkad District was conducted during 1991-'92. The main objectives of the study were :-

(1) To estimate the supply response of sugarcane
(2) To find out the economics of production
(3) To estimate the resource use efficiency
(4) To examine the marketing practices and problems

Secondary data were collected from secondary sources and primary data from One hundred and Twenty farmers and traders using two stage random sampling technique.

The compound growth rates were 6.87 per cent, 0.24 per cent and 6.61 cent of area, productivity and production respectively.

Increase in sugarcane production was mainly due to area increase. Area-price interaction effect was also found to be significant.

Area lagged by one year and two years were significant but when time trend was included thev became insignificant.

For the sample as a whole, Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2 per hectare were Rs.13,597.46, Rs.13,597.46, Rs.14,094.76, Rs.19,761.87, Rs.15,010.67 and Rs.20,677.78 respectively for sugarcane planted crop, Rs.11,201.41, Rs.11,201.41, Rs.11,682.09, Rs.16,344.55, Rs.12,497.17 and Rs.17,159.63 for ratoon crop and Rs.12,399.44, Rs.12,399.44, Rs.12,888.43, Rs.18,053.25, Rs.13,753.92 and Rs.18,918.70 for combined crop.

For the sample as a whole, costs of production were Rs.148.75, Rs.148.75, Rs.154.19, Rs.216.19, Rs.164.21 and Rs.226.21 for planted crop, Rs.148.95, Rs.148.95, Rs.155.35 Rs.217.35, Rs.166.19 and Rs.228.19 for ratoon crop and Rs.148.85, Rs.148.85, Rs.154.77, Rs.216.77, Rs.165.20 and Rs.227.20 for combined crop based on Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2 respectively.

The output of planted, ratoon and combined crops were 91.41 MT, 75.20 MT and 83.30 MT for the sample as a whole, having corresponding values of Rs.28,335.64 Rs.23,312.12 and Rs.25,823.38 respectively.

At Cost C_2, benefit cost ratio was the highest in Class III showing values 1.37, 1.36 and 1.36 for planted, ratoon and combined crops respectively.

Farm business income for planted, ratoon and combined crops were Rs.14,738.18 Rs.12,110.59 and Rs.13,424.38 for the sample as a whole. Farm investment income showed values Rs.13,822.27 Rs.11,295.51 and Rs.12,558.89, while family labour income was Rs.8,573.77 for planted, Rs.6,967.45 for ratoon and Rs.7,775.61 for the combined crop.

The Cobb-Douglas production function fitted with returns (rupees) as dependent variable and expenditure on labour, seeds, manures and fertilizers, irrigation and plant protection chemicals as independent variables revealed the expenditure on manures, fertilizers and irrigation were inadequate for both the crops. At the same time, expenditure on plant protection chemicals was found to be in excess.

The major marketing channel identified was producer-factory in which 69.17 per cent of the farmers were involved. Of the total, 15.83 per cent of farmers produced gur by themselves and were involved in the producer-wholesaler (as gur)- retailer-consumer channel.

The marketing cost incurred accounted for 28.11 per cent while marketing margins accounted for 15.28 per cent. The analysis revealed that producers could obtain more profit when they produced gur by themselves than by selling sugarcane to gur producers or to the factory.