ECONOMICS OF PRODUCTION AND MARKETING OF VEGETABLES IN OLLUKKARA BLOCK IN THRISSUR DISTRICT

By

SANDHYA V.

THESIS

Submitted in partial fulfilment of
the requirement for the degree of

Master of Science in Agriculture

Faculty of Agriculture
Kerala Agricultural University

Department of Agricultural Economics
COLLEGE OF HORTICULTURE
Vellanikkara - Thrissur

1992

DECLARATION

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

Vellanikkara,
5th August 1992

Sandhya.V
SANDHYA, V.

CERTIFICATE

Certified that this thesis entitled "Economics of Production and Marketing of Vegetables in Ollukkara Block in Thrissur district" is a record of research work done independently by Mrs.SANDHYA,V., under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.

Dr.V. RADHAKRISHNAN
Chairman
Advisory Committee
Professor and Head of Department
of Agricultural Economics

Vellanikkara,
20 Aug 92

CERTIFICATE

We, the undersigned members of the Advisory Committee of Mrs.SANDHYA, V. a candidate for the degree of Master of Science in Agriculture with major in Agricultural Economics, agree that the thesis entitled "Economics of Production and Marketing of Vegetables in Ollukkara Block in Thrissur district" may be submitted by Mrs.SANDHYA, V. in partial fulfilment of the requirement for the degree.

Dr.V. Radhakrishnan
Chairman
Advisory Committee

Dr.K. Mukundan
Member

Dr.E.K. Thomas
Member

Mr.V.K.G. Unnithan
Member

ACKNOWLEDGEMENT

I wish to place on record my profound gratitude and indebtedness to Dr.V. Radhakrishnan, Chairman of the Advisory Committee, Professor and Head, Department of Agricultural Economics for his valuable guidance, critical suggestions and encouragement throughout the investigation and for the preparation of this thesis.

I consider it as my privilege to express my deepfelt gratitude and indebtedness to Dr.E.K. Thomas, Associate Professor, Department of Agricultural Economics for his sustained interest, constant encouragement and constructive criticisms during the course of this investigation. My heartfelt thanks are also due to Dr.K. Mukundan, Professor, Department of Agricultural Economics and Sri.V.K.G. Unnithan, Associate Professor, Department of Agricultural Statistics for their valuable help and critical suggestions rendered to me during the preparation of this thesis.

My sincere thanks are due to all the staff members of the Department of Agricultural Economics for their sincere help and valuable co-operation which helped me a lot to carry out this investigation effectively.

I have no words to express my indebtedness to my fellow students, junior students and friends for their immense help and encouragement throughout this investigation.

I also gratefully acknowledge the Kerala Agricultural University for awarding me the Junior Fellowship for the Post-graduate programme.

Sandhya.V

SANDHYA, V.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

Introduction

INTRODUCTION

Vegetables play an important role in human nutrition and the importance of vegetables in a balanced diet is a well known fact. They are the cheapest and richest sources of natural protective foods contributing proteins, carbohydrates, minerals, vitamins and roughages which constitute the essentials of a balanced diet. Protein yield per acre of the leafy vegetables far exceeds that from other sources. Besides they can also supplement the essential aminoacids available in cereals and pulses. Vegetables like carrot, spinach, amaranthus, pumpkin, muskmelon and watermelon are rich sources of vitamin A, the deficiency of which can cause night blindness. Tomato, muskmelon and bittergourd are rich sources of vitamin C, and deficiency of this vitamin often causes tooth decay. Peas and beans are good sources of protein which is an important constituent of human cell. Starchy roots of potatoes, casava and sweet potatoes contain enough of carbohydrate to provide energy.

The status of vegetable production in India is unique, consisting of diverse kinds of vegetables, and nearly 60 kinds of leafy, fruit and other varieties of vegetables are being cultivated in India. The country is endowed with a wide variety of agro-climatic conditions and soils suited for the production of a number of vegetables.

During the recent years, the interest in vegetable production has increased rapidly as a result of greater appreciation of the food

value of vegetables and of the place of vegetables in the nation's food requirement. Besides their nutritional value, vegetables are highly productive as compared to grain crops and offer quick returns.

India is the second largest producer of vegetables in the world, next only to China. The present estimated area under vegetables in India is 3.5 million hectares with a production of about 32.0 million tonnes. Contribution of Kerala is 1.5 million hectares of area (42.8 per cent) with a production of 14.3 million tonnes (44.6 per cent). With the present production, percapita consumption of vegetables per day in India is 100-120 grams compared to 250 grams in China. In the rural households consumption of vegetables may be even less. According to the Diet Advisory Committee of the Indian Council of Medical Research, an adult requires 284 grams of vegetables a day, which includes 114 grams of leafy vegetables, 85 grams of root vegetables and 85 grams of other vegetables. The present production enables us to provide hardly one-half of the daily requirement of vegetables. Due to this inadequacy large sections of the population are suffering from chronic malnutrition because of their unbalanced diet and malnutrition is the most serious problem affecting public health in developing countries like India.

Productivity of vegetables is low in India, as compared to the developed countries and low productivity is the reason for reduced availability of vegetables. For example in India, the average yields

of onion, tomato and cauliflower are 7.50, 9.15 and 7.33 tonnes per hectare respectively as against the world average of 12.27, 20.99 and 13.29 tonnes respectively (Pandey, 1990).

The total area under vegetables is hardly 2 to 2.5 per cent of the total cropped area and this is very low, considering the large population and its rate of growth. So production has to catch up with the growing population in order to fulfill the growing nutritional requirements. To meet the demand for vegetables both in quality and quantity crop improvement is to be stepped up. The target of vegetable production for 1995 is 75 million tonnes. Short term (1990-1995) and long term (2000 A.D) targets in area, production and productivity of vegetables is given in Table 1.1.

Table 1.1. Targets in vegetable production

Year	Area (million hectare)	Production (million tonnes)	Productivity (tonnes per hectare)
Present	3.5	32.0	9.1
Short term (1990-1995)	6.0	75.0	12.5
Long term (2000 A.D)	8.0	120.0	15.0

Source: Survey of Indian Agriculture, 1990

In the case of vegetables, losses both in terms of quality and quantity can occur at all stages from harvesting, handling, storage and marketing. In India 20 to 40 per cent of vegetables and fruits are spoiled every year causing a loss of Rs.3,000 crores (Pandey,

in the trends of area, production, yield and prices of four major commercial crops namely, Desi and American Cotton, groundnut and sugarcane. The operational costs per hectare and yields per hectare for each crop as well as the price trends were dealt with. From this profitability of each crop was worked out.

Rathori et al. (1973) analysed the economics of vegetable crops like potato, ginger, tomato, french beans and chilli in temperate regions. The per hectare total cost of cultivation was found to be Rs.6,165, Rs.7,667, Rs.7,736, Rs.7,864 and Rs.5,989 respectively. It was also found that over one third of total cost of cultivation was claimed by imputed rental value of land. The ratios of marginal value product to factor cost for different variables indicated vast scope for the re-allocation of resources. It was observed that there was scope for more investment in quality seeds, except in Ginger, and fertilizers and manures except in tomatoes to increase the farm income substantially.

Gaarg and Prasad (1974) studied the comparative profitability of vegetable crops in the vicinity of Kanpur city. According to them vegetable crops yielded high returns when compared to foodgrain crops. Net returns per hectare was high for brinjal and onion due to their short duration. Investment was highest being Rs.17,896 per hectare on onion. Of the total labour days utilisation, family labour amounted for 64.59 per cent to 81 per cent on different

1990). Transporting, storage and processing facilities have to be developed in order to reduce the post harvest losses.

The disorganised system of marketing service is a threat to vegetable production. Major constraints in marketing of vegetables are perishability, bulkiness and seasonability in production. Marketing of vegetables in India is largely uncontrolled, unorganised and generally inefficient. There is no proper grading and standardisation of agricultural produce. Because of the involvement of a large number of middlemen, producers share on consumers' rupee is very low. It was estimated that 50.47 per cent of the overall retail price of the vegetables is taken away as 'Commission' charges and 37.62 per cent for transportation charges (Seshadri, 1990).

Economics of production and marketing aspects of vegetables has not yet received the attention that it deserves, particularly so in Kerala. Lack of enough production statistics for identifying the priorities and gaps in perspective planning, lack of supply of inputs, and inefficient marketing system are reported to be the major constraints in vegetable production (Pandey, 1990). It is necessary to know the present cost of production, returns and price received etc., so that proper planning can be done to make production more remunerative and attractive. A study on economics of production and marketing of vegetables would appear very relevant in this context. Ollukkara block in Thrissur district which is one of the major vegetable growing areas in the State was selected for the study.

The major objectives of the study are the following:

1) To estimate the cost of cultivation and returns of bittergourd and ashgourd.
2) To study the efficiency on the use of various resources in crop production.
3) To identify the major marketing channels in vegetable marketing.
4) To estimate the marketing cost and price spread.

This thesis consists of eight chapters including the present one. A review of the relevant literature is given in the chapter two. A brief description of the area of study is given in the chapter three. Chapter four deals with the materials and methods used in this study. The general socio-economic conditions of the sample farmers are given in chapter five while chapter six deals with results and discussion. The summary of the major findings of the study is given in the final chapter.

Review of Literature

REVIEW OF LITERATURE

In this chapter an attempt is made to review the past studies in economics of production and marketing relevant to the present study.

The chapter is divided into three sections. In Section I review of cost of cultivation studies are included. Section two contains review of studies in functional analysis and Section three contains past studies in marketing. On account of the similarity of marketing problems of vegetables and fruits past studies on vegetables as well as fruits have been included in the third Section.

Section I
Cost of cultivation studies

Sahni and Johi (1967) examined the economic potentialities of vegetable cultivation on sullage water farms in Punjab and found that vegetable cultivation requires heavy capital input and was risky in nature and that it was possible to enhance the returns to the fixed farm resources to the tune of over 29 per cent over the returns from the existing production plan through rationalization of resource use alone.

Nirmal Singh and Bal (1967) studied the economics of cultivation of commercial crops in Punjab, dealing with the shifts

vegetable crops. When the economics of highest paying vegetable crop was compared with that of high yielding variety of wheat in the same locality, per hectare investment was higher by 3.64 per cent on wheat over tomato.

Mital and Srivastava (1975) reported that the cost of production of bulb crop onion was Rs.4,700 per hectare. Among cost components, irrigation charges accounted for the highest share followed by cost of manures and fertilizers. Gross income and net profit per hectare were Rs.7,500 and Rs.2,800 respectively. They also estimated that the per hectare output of onion was 300 quintals.

Shukla (1976) conducted a study on the input price effect on agricultural production and farm business income in Purnea district, Bihar. It was observed that farms belonging to less than one hectare of land maintained the pace of input use in order to increase the gross output. An increase in paid out cost of marginal farmers by 31.05 per cent in 1970-71 over 1969-70 resulted in an increase of 5.48 per cent and 0.41 per cent in output and farm business income per hectare respectively. An increase of paid out cost by 65.86 per cent in 1971-72 over 1970-71 resulted in an increase of gross output by 20.8 per cent and of farm business income by 9.14 per cent.

Naidu and Rao (1977) conducted a study on costs, returns and marketing of brinjal crop in Tenali area of Guntur district in

Andhra Pradesh. Cost of cultivation of brinjal was found to be Rs.1,136.60 per acre. It was found that labour cost was Rs.380 which accounted for 33.44 per cent of the total cost followed by fertilizers with Rs.340.75 and manures with Rs.100.00. Gross income from brinjal was estimated at Rs.1,968 and net income at Rs.831.33. Yield of brinjal was 60 quintals per acre.

Subrahmanyam and Doss (1981) estimated the cost of cultivation of vegetables in Malur and Chickballapur taluks of Kolar district of Karnataka. It was found that the total cost of cultivation per hectare of tomato and brinjal were Rs.5,133.75 and Rs.4,141.25 respectively in Malur taluk and Rs.5,604.71 and Rs.5,456.17 respectively in Chickballapur taluk. Manures and manuring accounted for nearly 70 to 75 per cent of total cost. Gross returns were Rs.21,222.12 from tomato and Rs.13,990.29 from brinjal. Input-output ratios of tomato and brinjal were 3.92 and 3.16 respectively.

Ramasamy (1981) conducted a study on production aspects of major vegetables in Coimbatore district and found out that the realised yield of brinjal varied from 2.66 tonnes to 23.78 tonnes per hectare in the sample farms. Average realised yield was 67 per cent of expected yield in the study region. Estimated cost elasticity indicated increasing returns to scale in brinjal production. The yield of bhindi varied from 1.80 tonnes to 14.56 tonnes and the average being 9.60 tonnes. The coefficient of variation in yield was estimated to be 19.26 per cent for the same crop.

Shah (1982) found that the total variable costs per hectare of onion, tomato and brinjal in Himalayan region were Rs.3,754.60, Rs.3,098.90 and Rs.2,936.35 respectively. The gross and net returns for these vegetables were Rs.7,650.00 and Rs.4,551.10, Rs.5,336.25 and Rs.2,399.90, Rs.7,887.00 and Rs.5,029.57 respectively. Cost benefit ratios were 2.47, 1.82 and 2.76 respectively. Average yields of tomato, brinjal and chillies were 51.00, 71.15 and 9.54 quintals per hectare.

Nahatkar and Pant (1984) conducted a study on farm profitability and resource productivity in cultivation of chillies in Chhindwara district of Madhya Pradesh. It was found that the average cost of cultivation of chillies was Rs.4,260.27 per hectare. It was Rs.4,942.66 on small farms, Rs.4,133.58 on medium farms and Rs.3,704.64 on large farms. Operational costs accounted for the highest percentage (60%) of the total costs of cultivation followed by rental value of land (30.32 per cent). Out of total operational costs, cost of fertilizers and manures was the highest on small farms, whereas cost of hired labour was higher on medium and large farms as compared to small farms.

Babar and Waghmare (1985) studied the resource use and productivity in the onion cultivation in Maharashtra. It was found that the use of hired labour and bullock labour was more in Khariff than in Rabi season. Cost of seeds in both the seasons was

observed to be more or less the same. The study also revealed that per hectare yield and gross income for Rabi crop of onion showed an increasing trend with the size of holding and it was vice-versa in the case of Khariff.

Gupta (1987) reported that vegetables accounted for more than 70 percentage of the total income of the farmers around Solan in Himachal Pradesh. It was found that income on large farms was 3.5 and 1.7 times higher than that of small and medium size farms respectively. As much as 48 per cent of the total expenditure went on hired labour alone. Cost of production per unit area was lower on large sized farms, making them economically more efficient.

Saraf and Mishra (1987) have estimated the cost of cultivation of tomato, potato, cauliflower and brinjal based on samples drawn from the villages situated within a radius of 10 Km from Jabalpur city in Madhya Pradesh. The cultivation of tomato is shown to be quite remunerative as compared to other three vegetable crops. The cropping intensity was worked out and found that cropping intensity declined with an increase in the size of holdings. The net return from tomato was Rs.2,037 per acre followed by brinjal with Rs.1,952, cauliflower with Rs.1,467 and potato with Rs.1,428.

According to Latha Bastine (1988) in a study of economics of Banana cultivation in Irijalakkuda block in Trichur district, cost

of cultivation per hectare of banana was Rs.36,349.00. The returns worked out to Rs.45,068 and net income was found to be Rs.8,819 on cost C basis. The main items of expenditure was found to be human labour (26.98 per cent) and manures (24.60 per cent). The farm business income, family labour income and farm investment income amounted to Rs.20,439, Rs.11,061 and Rs.18,197 per hectare respectively.

Singh and Rizvi (1988) made an attempt to analyse the comparative economics of production, cost of production, input-output ratios and returns from Soyabean and its competing crops in Uttar Pradesh. The average gross as well as net returns per hectare from Soyabean was found to be highest in Nainital and amount of net income from Soyabean was found to be thrice the net returns from other Khariff crops.

Waghmare and Pathak (1988) have compared the costs, returns and employment potential of commercial crops in Sholapur district of Maharashtra using cross sectional data from unirrigated and irrigated conditions. The economics of crop production under unirrigated condition reveals that farms with no commercial crops secured higher income (Rs.613/ha) than those with commercial crops mainly because of low productivity of commercial crops. Under irrigated condition, farms with commercial crops secured higher net return (Rs.2,815 per hectare) as against those with no commercial crops.

Singh and Bhati (1988) have examined the role of vegetables in augmenting farm income and employment in Himachal Pradesh. Examining the area under vegetables, average yield and yield gap between experimental field and farmer's field, the authors have arrived at the conclusion that for some of the vegetables like pea, cabbage, cauliflower, tomato and potato, there is vast scope to increase productivity through proper use of technology.

According to Kiresur and Kumar (1988), vegetables had low cost of production, but received high prices in Dharwad district of Karnataka. Cost of production was higher for potato compared to onion and brinjal. Profits were higher in case of onion followed by brinjal and potato. It was found that tomato was the most profitable crop enterprise with a net profit of Rs.3,195 per acre followed by brinjal and onion.

Venkatanarayanan (1990) analysed the economics of chilli cultivation in Khammam district of Andhra Pradesh. He found out the operation of diminishing factor returns in general on all the farm size groups. The marginal value product to opportunity cost ratios indicated a high degree of resource-use inefficiency and revealed the scope of re-organization of resources. High input-output ratios revealed the profitability of chilli farming and breakeven analysis also clearly indicated that chilli cultivation was a highly paying proposition.

Section II

Production function analysis

Heady (1946) derived production function for a random sample of 738 Iowa farms which was the first empirical estimate of production function for agricultural farms in United States. Function were derived both for types of farmers and areas of the State. In all cases the inputs were land, labour, power, equipment, livestock, feed and operational expenses.

Heady and Shaw (1954) conducted a study on resource returns and productivity coefficients in selected farming areas of Alabama, Iowa and Montana of United States. Cobb-Douglas production function was tried for crops and livestock in each area. It was found that the coefficients of neither crops nor livestock differ significantly among the four areas. Marginal capital productivity was higher for crops than for livestock in Montana. On comparing the marginal resource productivity with factor prices, it was found that the marginal land productivity was significantly greater than rental rates for all areas.

Dhondyal (1958) found out the input-output relationship between the amount and kind of fertilizers used and yields obtained in the production of maize at the Agricultural College, Kanpur. Of the input factors, land and capital were scarce and labour was relatively abundant. There was no effective combination of inputs

but there was scope of adjusting such variable factors as amount of irrigation water, fertilizers, improved seeds, number of spraying to a given size of farm at low cost combination.

Shastri (1964) analysed the input and output relations in agriculture, plantations, animal husbandry including forestry and fisheries. The analysis revealed that an increase of 10 per cent in factor payment of agriculture sector caused an increase of 8.6 per cent in the price of output of same sector, 3.2 per cent in the price of output of animal husbandry and 1.9 per cent in manufacturing sector. The prices of outputs in the other two sectors did not seem to change. A 10 per cent increase in factor payments in the animal husbandry sector caused 5.0 per cent increase in the price of output of the same sector, causing little or no change in the prices of output of the other sectors.

Abraham and Bokil (1966) in a study on resource productivity in agriculture with special reference to labour found out that human and bullock labour together accounted for nearly 70-85 percentage of prime cost in various crops in Punjab and Gujarat. Cobb-Douglas type of production function fitted showed that 70-90 percentage of of variation in output was explained by the dependent variables. Small and non-significant co-efficients of bullock labour in small farms indicated excess use of bullock labour. Low elasticity coefficients for fertilizers and plant protection measures was found to be due to little outlay on these factors.

Patel et al. (1968) studied about the productivity and allocation of resources in the production of hybrid Bajra in Delhi Territory. Cobb-Douglas production function was used for estimation and comparison of marginal value products of inputs, and determination of economic optimum levels. It was found that input variables namely hired labour, seed, manures and fertilizers explained more than 50 per cent of variation in the output of hybrid Bajra. Marginal value product of human labour, seeds and manures and fertilizers were Rs.8.35, Rs.10.75 and Rs.1.84 respectively. Low value of marginal product of manures and fertilizers revealed that farmers were using it near optimum levels.

Peter (1974) examined the input output relations of Banana plantation in Kanyakumari district. Analysis of production function indicated that there was highly significant positive response in the gross income to the positive changes in the manuring expenses. Since the marginal value product of labour was less than the average rate, a shift of resources to manuring where the marginal value product was higher than the rupee expenditure on it, would assure more of net income as well as gross income with the existing level of expenditure.

Singh et al. (1974) estimated production function for cotton, sugarcane and oilseeds in Haryana. Negative regression coefficients of fertilizers and irrigation with respect to sugarcane, irrigation

and human labour for cotton, and human labour for rapeseed mustard indicated possibilities of reducing these inputs. Positive marginal value product of human labour in sugarcane indicated the possibilities of increasing human labour on sugarcane farms. Per hectare total cost of production of sugarcane was Rs.5,748. Sugarcane and rapeseed mustard gave a per hectare income of Rs.975 and Rs.685 respectively.

Economic analysis of small scale farming in Southern Rajasthan by Acharya and Shukla (1976) revealed that total labour, hired labour, family labour, non-conventional capital, non-mechanical capital and variable expenses exerted a significant effect on output. Marginal value product of labour was 4.42 which was twice the wage rate prevailing during the period. This showed that the adoption of labour intensive high yielding variety crops would increase the income of small farmers.

Sastry (1977), in a study on resource use and productivity in sugarcane cultivation in Krishnarajasagar area found that total cost of cultivation, yield and gross returns per acre were Rs.31,260.82, 44.04 tonnes, and Rs.4,899.45 respectively. Modified Cobb-Douglas production function were fitted for planted, ratoon and combined crops with yield as dependent variable and sugarcane area (in acres), crop duration in months, bullock labour in pair days, human labour in mandays, fertilizers in rupees as independent

variables. Marginal value product to opportunity cost ratios indicated excess use of all resources except land.

Puttaswamy (1979) formulated linear production function for potato. Variables considered were rental value of land, human labour, seeds, manures and fertilizers and plant protection chemicals. All variables were found to be highly significant and explained 76 percentage variation in output. Results also showed that the average labour productivity was Rs.21.80 and Rs.20.88 on medium and large farms respectively.

Suresh (1980) reported the resource use and productivity in grape cultivation in Bangalore North taluk of Bangalore district. Total expenditure incurred was found to be Rs.30,941.06 and Rs.36,471.38 for Bangalore blue and Anab-e-Shahi. Results of the functional analysis indicated that the independent variables namely, land, age, manures and fertilizers, plant protection and labour explained about 88 to 89 percentage of variation in the yields of Bangalore blue and Anab-e-Shahi. Analysis revealed possibilities for increasing the income through re-allocation of resources at their existing mean levels.

Rao (1985) studied the factors affecting milk production. Marginal value products computed at the geometric mean level when compared with their respective factor costs showed that marginal value product associated with green fodder and concentrates were

greater than unity and that these two inputs were underutilised in farms.

Thomas and Gupta (1987) studied the economics of production of banana based on information collected from 47 banana cultivators of Kottayam district in Kerala. Cobb-Douglas type of production function was used to find out the productivities of labour, manures and fertilizers and working capital. More than 91 per cent of the variation in total income from banana is explained by these variables. They concluded that by re-allocation of these independent variables, the net income can be increased by 390 per cent.

Muraleedharan (1987) conducted a study on resource use efficiency in Kole lands in Trichur. Functional analysis using output of rice as dependent variable, farm size, human labour, bullock labour, fertilizers and manures as independent variables revealed that use of human labour and fertilizers and manures were higher than their optimum levels. Constant returns to scale was indicated by the 't' test.

Rahman and Islam (1988) evaluated the variations 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 analysis revealed that the smallest (0.01-1.25 acres) and the largest (7.5 acres and above) size groups of farms had better performance, than farms of other size groups

and that farmers had failed to allocate available resources optimally. They found that the size of the farm had little effect on the production function.

Tej Bahadur et al. (1988) estimated the resource use efficiency in dry farming areas of Ibrahimpatam Block in Hyderabad district. Explanatory variables included in the functions had indicated 48 percentage, 56 percentage and 76 percentage variations in output in small farms, marginal farms and large farms respectively. On small farms one percentage increase in cattle labour resulted in 4.59 per cent increase in output. On medium farms it resulted in negative returns, and one percentage increase in cattle labour decreased the value of gross output by 2.35 percentage. Marginal value product of human labour which was equal to one indicated optimum use of the resource, where as marginal value product to factor cost ratio for cattle labour on small farms was more than one (1.63) indicated too little use of the resource.

Khan and Alam (1988) reported the effect of land reforms on resource use efficiency in Jammu and Kashmir. Production function fitted using value of output as dependent variable and cropped area, human labour, working capital and fixed capital as independent variables indicated that capital was the only input factor used in excess. On progressive farms and non-progressive farms, major input factors indicated an inverse association with size of holding. Inter-farm and intra-farm comparison suggested that higher output per

acre was due to relatively higher fertilizer intensity, irrigation intensity and relatively lower human labour intensity.

Thakur et al. (1990) conducted a study on resource use, farm size and returns to scale on tribal farms of Himachal Pradesh. Production functions were fitted using farm income, human labour, manures and fertilizers, bullock labour and irrigation as explanatory variables for marginal, small and large farms separately. Highly significant elasticity coefficients for labour indicated that, the hypothesis of zero marginal product of labour was not correct for the three categories of farms.

Randev et al. (1990) reported the resource use efficiency in Almond crop in Kinnaur district of Himachal Pradesh. It was found that more than 78 percentage of the variation in the returns from Almond crop was explained by the explanatory variables on medium and large orchards, while in small orchards it was found to be more than 84 percentage. Analysis of returns to scale indicated constant returns to scale in case of small orchards (0.99) and decreasing returns to scale for medium and large orchards (0.780 and 0.7824 respectively). It was concluded that contribution of all the variables under consideration, viz., number of trees, human labour, manures and fertilizers, fungicides, marketing and management towards total income from Almond was found to be significant and positive, explaining thereby further increase in the total income of Almond orchards by the use of these variables.

Reddy et al. (1990) studied the resource use efficiency in Betelvine cultivation in Cuddapah district of Andhra Pradesh. Costs and return components for the crop were at high magnitude and it was found that imputed cost of family labour and rental value of land constituted nearly 50 per cent of total costs. Net income of first year was Rs.3,000 as against Rs.36,000 in subsequent two years. The fitted function revealed that there was scope for further use of labour, manures and fertilizers upto optimal levels. Increase in the expenditure on seeds and miscellaneous costs was not desirable as revealed from insignificant elasticity coefficients.

Section III
Marketing

Joshi (1968) conducted a study on advances in marketing, standardisation, storage and transporation of fruits and vegetables in India. It was found that in the field of fruit and vegetable marketing, most important development was provision of market regulatory acts thereby ensuring fair trading practices. The problem of gluts and fall in prices during the peak season was solved by the creation of additional cold storage facilities as well as by the increased utilisation of perishable commodities by the processing and preservative industry.

George and Singh (1970) analysed the structure, conduct and performance of wholesale vegetable markets in Ludhiana and

Amritsar in Punjab. The study revealed that producers' share ranged from 38.44 per cent of the consumers' rupee for brinjal to 68.45 per cent of consumers' rupee for peas. The net margin of the wholesalers varied from 3.35 per cent to 12.45 per cent and that of the retailers varied from 10.52 per cent to 36.19 per cent of consumers' rupee. Marketing costs and margins absorbed a major portion ranging from 31.55 per cent to 61.56 per cent, of the consumers' rupee. It was also found that short-term supply of vegetables was highly price inelastic, and this resulted in lower prices to producer-sellers and high profit margins to the intermediaries.

Singh and Mann (1971) studied the marketing margin and its economic significance in the marketing of apples, grapes, onion and tomatoes. Three marketing channels were identified of which producer - wholesaler - retailer - consumer was the most important and 77.80, 52.31, 77.64 and 20.27 per cent of the total produce of apples, grapes, onion and tomatoes flowed through this channel. Percentage of producers' share on consumers' rupee was 53.09, 67.56 and 8.63 per cent for apples, grapes and onions respectively. It was also found that the higher the perishability the higher the percentage share of the producer in the consumers' rupee.

Singh (1975) estimated the price spread and marketing margin for potato in Secunderabad. It was found that producers

received only Rs.88-90 whereas consumer paid Rs.132-150 per quintal. Total marketing cost of producer accounted for 8.49 per cent. Marketing cost of producer was more than that of wholesaler and retailer which accounted for 5.65 and 1.88 per cent respectively.

According to Bhatia and Ram (1977) retail margins accounted for about 50 per cent of the consumers' price in retail vegetable markets in Delhi. Producers' net price in consumers' rupee for the different vegetables varied from 30.5 per cent to 68.2 per cent averaging for all vegetables to be 51.49 per cent. Producers' share in consumers' rupee was less than fifty paise. Among the different classes of retailers, pavement sellers got the lowest average percentage of net retail margins and hence indicated economic efficiency. Operational efficiency was highest in case of permanent shopkeepers.

Govardhana (1979) studied the marketing of dry chillies in Karnataka. Marketing cost of producer was Rs.61.34 per quintal of dry chillies. The transporting cost per quintal per kilometre was 45 paise by bullockcart. The market intermediaries namely, co-operative societies, commission agents and traders on an average received a profit per annum of Rs.10,988, Rs.4,498 and Rs.28,098 respectively at Hubli market. Important marketing channels identified were Producer-Trader, Producer-Co-operative Society-Trader and Producer-Commission Agent-Trader. The Producers' share in traders' sale price and price spread were 90.23 per cent and 9.77 per cent

in channel I, 80.09 per cent and 19.91 per cent in channel II, 83.16 per cent and 16.84 per cent in channel III.

Prasad (1979) analysed the price spread and the producers' share in the consumers' rupee in the marketing of selected vegetables in Bangalore city. Price spread at producers level amounted to Rs.0.55, Rs.0.51 and Rs.0.49 for every kilogram of beans, cabbage and brinjal respectively.

Suryaprakash et al. (1979) compared the price spread of arecanut, coconut, copra, cotton and groundnut in Karnataka. It was found that there was no unique marketing channel for these commodities. Price spread was found to vary from commodity to commodity and according to the number of intermediaries or type of marketing channel involved. Price spread was minimum (4.99 per cent) for groundnut when it was sold to the processor through the wholesaler and maximum (25.43 per cent) for cotton when it was sold through village merchant. Profit margins was maximum in the case of village merchants.

Gupta et al. (1979) conducted a study on the behaviour of marketing margins and costs of vegetables like brinjal, cabbage, carrot, cauliflower, greenpeas and tomato in Delhi. Producers were found to receive a very low share of 38 per cent in consumer price whereas retailers' margin and marketing costs were quite substantial,

each appropriating one fourth of consumers' rupee. Transport, packing and labour expenses were found to be the major components of marketing cost.

Ram and Gupta (1980) made a comparative analysis of business structure of vegetable traders in Delhi. Commission agents incurred on an average cost of Rs.10,000 per month and earned a net margin of about Rs.2,500/-. It was also found that wholesalers' monthly expenses were Rs.1,000 as against their gross returns of Rs.1,980 yielding almost 100 per cent returns over investment in the business. The monthly total costs of retailers were estimated at about Rs.1,100, Rs.1,400 and Rs.2,100 as against their gross returns of Rs.1,800, 2,300 and 3,500 in low, medium and high income localities.

Singh et al. (1980) studied the price spreads for wheat and paddy in Punjab state. In the case of wheat producers' share of the consumers' rupee for the sale through Consumers' Co-operative stores was found as 83.46 per cent where as producers' share for sale through wholesalers and retailers was 80.39 per cent. It was found that costs incurred by the fair price shope were the highest at Rs.8.58, and lowest at Rs.1.99 for sales routed through co-operative marketing societies. Producers' share of the consumers' rupee for sales through fair price shop was 88.37 per cent, in case of paddy, and 80 per cent for sales through open market.

Shete et al. (1980) measured price spread of tomatoes in Ahmednagar district in Maharashtra. Total cost of marketing was

worked out to Rs.20.97 and Rs.20.76 per quintal in case of irrigated and rainfed tomatoes respectively. The producer, itinerent traders, commission agents and retailers incurred on an average, 20.80, 42.05, 8.75 and 27.30 per cent of the total cost of marketing of tomatoes. Price paid by the consumers was Rs.500 per quintal and producers' share was 52.27 and 56.33 per cent in case of tomatoes produced under rainfed and irrigated conditions. Itinerent traders, commission agents and retailers together derived a profit of Rs.54.65 and Rs.48.87 per quintal in the case of rainfed and irrigated conditions.

Singh et al. (1980) conducted a study on economics of production and marketing of green chillies in Gazhipur district of Uttar Pradesh. Producers' share in the consumers' rupee came to 68.80 per cent. Marketing costs and margins accounted for 31.20 per cent. The middlemen's margin came to 12.10 per cent of the price paid by the consumers.

Tyade et al. (1981) worked out the price spread for selected vegetables in Phule market, Pune. They concluded that producers' share in the consumers' rupee was 57.33 per cent while retailers margin was 38.98 per cent in onion. It was also indicated that in onion, potato and green chillies producers' share, on an average, was about 57 per cent while the margin of the retailer was about 33 per cent. Margin of the retailers was very high, about 60 per cent in case of brinjal and tomato which resulted in producers share in consumers rupee, being at 32 per cent.

Sivakumar (1981) conducted a study on economics of production and marketing of brinjal and tomato in Tiruchirappalli. Cost of marketing per quintal of brinjal and tomato was Rs.17.25 and 11.24 respectively. Price spread analysis revealed that producers' share on consumers' rupee was 73.13 per cent for brinjal and 67.06 per cent for tomato excluding the cost of marketing. Comparative analysis of brinjal and tomato showed that the gross income and net income realised for brinjal was higher than that of tomato.

Balarayan (1981) studied the economics of production and marketing of cabbage in Gudiyattam taluk of North Arcot district. Price spread analysis of cabbage showed that producers' share on consumers' rupee was 65.80 per cent in Madras market, while it was 64.99 per cent for consignment sold in Vellore market. Cost of marketing incurred by farmer was found as 22.8 per cent of gross income from cabbage.

A study was conducted to find out the problems in production and marketing of major vegetables in Coimbatore district by Ramasamy (1981). Producer-Commission agent-Wholesaler-Retailer-Consumer was identified as the major marketing channel for brinjal and producers' share on consumers' rupee was 47.35 per cent. Producer-Commission agent-Wholesaler-Retailer-Consumer was identifield as the major marketing channel for bhindi and producers' share on consumers' rupee was 38 per cent.

John D'silva (1982) analysed the marketing of Coorg Mandarin Oranges in Mysore. Marketing channel identified was Producer - Preharvest contractor - Retailer - Consumer. The growers' share in the consumers' rupee ranged between 48.60 and 51.40 per cent. Thus about 50 per cent of consumer rupee was taken up by marketing costs. The preharvest contractor, commission agent and retailer obtained 18.55, 8 and 23.96 per cent of consumers' rupee. A linear trend line fitted to the price data indicated that, there was an increasing trend in the price of oranges by 9.8 per 100 fruits per month over the years from 1973 to 1978.

Ojha et al. (1983) studied the role of middle men in agricultural marketing. It was found that middle men took away the lion's share of the price paid by the consumer and consequently producer got only a poor share of price. Out of consumers' money spend on rice and wheat, the middlemens' share amounted to 33.2 per cent and 31.5 per cent respectively. The study revealed that majority of farmers were selling their produce through traditional channel of commission agents and that at the same time it further revealed a big majority of farmers did not prefer to sell their produce through their commission agents.

Singh et al. (1983) conducted a study on economics of production, marketing and storage of potato in Farrukhabad district of Uttar Pradesh. It was found that producers' share in consumers' price at Farrukhabad potato mandi came to 64.66 per cent. Marketing

cost incurred by the producers was 18.53 per cent whereas, wholesalers and retailers together incurred a marketing cost of 15.04 per cent.

According to Hugar et al. (1983), the major marketing channels in marketing of brinjal in Belgaum city were Producer - Seller - Commission agent - Retailer - Consumer ahd Producer - Seller - Co-operative Society - Retailer - Consumer. Price spread was Rs.38.56 per cent quintal under channel I and Rs.33.38 per quintal under channel II. Effect of consumer price variation on the shares of producer and retailer was analysed by fitting Cobb-Douglas type of function. The producers' share was found to be inversely related to the consumer price, while retailers' share was positively related to consumer price. The share of the producer in the consumers' rupee was found to be higher when brinjal was sold through the Co-operative Society, than those sold through the commission agent.

Ramamoorthy et al. (1984) conducted a study on structure, conduct and performance of tomato marketing in Coimbatore. Price heights were estimated as the percentage of price difference between purchase price and sale price to the purchase price. Producers, Commission agents and Wholesaler-cum-retailers' realised price heights of 185 per cent, 10 per cent and 116 per cent respectively. Cost per kilogram among commission agents, wholesalers and retailers were 2.62 paise, 3.69 paise and 9.60 paise respectively.

Raut et al. (1984) estimated price spread in the marketing of vegetables grown in the vicinity of Pune city. The per quintal cost of marketing of vegetables ranged between Rs.17.35 and Rs.32.67. Price spread analysis showed that the producers got 93.59 per cent of consumers' price, the lowest and highest in case of onion and guar respectively. Retailers were found to be the real beneficiaries and they got high margin of about 31-41 per cent of consumers' price.

Anandamoysen (1984) made a case study on the problems of potato marketing in West Bengal. It was found that the Government or the local bodies had very little control over the business adopted by the private traders and as a result the major benefits went to the private traders at the cost of the growers. Cold storage had provided the middlemen and traders an opportunity to manipulate prices. Traders returns from a quintal of the crop was also higher than producers' return.

Agarwal et al. (1984) conducted a study on marketing of sesamum oil seeds and state intervention in Rajasthan. Marketable and marketed surplus as a percentage of total production of sesamum was found to be almost equal. About 60 per cent of sesamum growers sold their surplus within village and only 40 per cent of farmers took advantage of market sale. Average marketing cost was Rs.5.7 per quintal.

Nagaraj et al. (1985) made a market appraisal for a few fruits and vegetables in Karnataka. Producer - Commission agent - Retailer - Consumer was identified as the major marketing channel for beans, cabbage, brinjal and tomato. The share of producer in the consumer rupee ranged from 37 to 68 per cent. Out of the total marketing cost retailers appropriated the highest share of 26 per cent. Lack of storage facilities, undue delay in getting cash from the intermediaries, high rate of commission, and improper weighment were identified as the major problems in marketing of vegetables.

Swarup et al. (1985) estimated the price spread and marketing margins for Himachal apples. Producers' share was 48 per cent which was highest in Delhi market. It was also found that a rise or fall in the Producers' share was more than proportional to the change with price. The benefit of rise in prices were not fully availed of by the growers and their gains were interupted by the middlemen, reflecting inefficiency of marketing mechanism.

Vigneshwar (1986) conducted a study on dynamics of fruits and vegetable marketing in India. Out of the total production of about 20 million tonnes of fruits and 35 million tonnes of vegetables, nearly 30-40 per cent was accounted for post-harvest losses. It was also estimated that about 10-25 per cent of the perishables and semiperishables were lost due to spoilage in the absence of adequate cold storage facilities.

According to Sidhu (1988) in a study on new thrusts in Agricultural marketing in Punjab found that there should be right type of marketing infrastructure, correct Government policies and a sound net work of input supply system for marketing of agricultural commodities. It was found that about 30 per cent of fruits and vegetable production was lost due to lack of processing and cold-storage facilities.

Subrahmanyam (1988) made in interstate comparison of practices and associated costs of marketing of vegetables in Karnataka, Andhra Pradesh and Tamil Nadu. Producer - Commission agent was the most popular marketing channel, followed by direct sale by cultivators. Commission charges were found to be high in Karnataka and Andhra Pradesh, at around 10 per cent as compared to Tamil Nadu at 7 per cent. Most of the cultivators in Tamil Nadu used carts for transporting vegetables due to short distances transported and ready availability of carts in villages.

Gill (1989) estimated the price spread in vegetable marketing in Punjab. Price spread was worked out by 'mode method'. Major marketing channel in the marketing of selected vegetables, potato, onion, green chillies, green peas and cauliflower was Producer - Wholesaler - Retailer - Consumer. Study also revealed the importance of co-operative marketing sales, and retail outlets in marketing of vegetables at important consuming centres.

Area of Study

AREA OF STUDY

As already mentioned, the present study is based on vegetable cultivation in Ollukkara Block in Thrissur district. The wholesale vegetable market in Thrissur town serves as the wholesale outlet for the produce of this area. It is therefore appropriate to regard the entire district as the study area. The present chapter deals with Thrissur district in general and Ollukkara block in particular.

Thrissur district located in the central region of Kerala is rich in history and cultural tradition. It is bounded on the north by Malappuram and Palakkad districts, on the east by part of Palakkad district and Coimbatore district of Tamil Nadu, on the south by Idukki and Ernakulam districts and on the west by the Arabian sea. The district lies between North latitude 10° and 10°4' and East longitude 75°57' and 76°54'.

Area

Total geographical area of the district is 299390 hectares, which is 7.8 per cent of the total area of the State. Land utilisation pattern in Thrissur district is given in Table 3.1.

The district is divided into 5 Taluks, viz., Kodungallur, Chavakkad, Thalappilly, Mukundapuram and Thrissur Taluks. There are 7 Municipalities, 17 NES blocks spreading over 98 Panchayats, 251 revenue villages and 1074 wards in the district.

Table 3.1. Land utilisation pattern for the year 1989-90

Description	Area (in hectares)	
	Thrissur	Kerala
Total geographical area	299390	3885497
Forest	103619	1081509
Land put to non-agricultural uses	25452	284391
Barren and uncultivable land	1608	71198
Permanent pastures and other grazing land	91	3285
Land under miscellaneous tree crops not included in net area	1087	41543
Cultivable waste	4155	115786
Fallow other than current fallow	3184	28195
Current fallow	5606	46623
Net area sown	154588	2212866
Area sown more than once	59511	750607
Total cropped area	214111	2963473

Source: Department of Economics and Statistics, Kerala

The district is also divided into high land, mid land and low land based on its natural division.

Population

According to 1991 provisional census reports, Thrissur supports a total population of 27.34 lakhs of which 13.09 lakhs are males and 14.24 lakhs females. Growth rate in population during the last decade is 12.08 per cent in the district. Density of population is 902 persons per square kilometre. Sex ratio shows that there are 1,088 females for every 1000 males. Literacy according to 1991 census reports is 79.3 per cent. Educational status of males and females showed that literacy was more among males (81.7 per cent) than females (77.09 per cent).

Agriculture provides employment to 45.7 per cent of the total working force and contributes 41.6 per cent of the total income of the district. Total working population of the district is 6,45,334 of which 9.4 per cent are cultivators and 25.5 per cent are agricultural labourers. Percentage of household industry workers and other workers are 5.8 and 59.30 respectively.

Climate and rainfall

Thrissur district experiences a tropical humid climate. Annual rainfall of 3094 mm was received during 1990-91 and 80.8 per cent of annual precipitation is received during the south west monsoon

season from June to September. The average monthly distribution of rainfall for the district during 1990-91 is given in Table 3.2. Average daily maximum temperature is 31-32°C in the coastal regions and 36°C to 37°C in the interior.

Soil

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

Water resources

The district has many water resources, such as canals, tanks, wells, major, minor and lift irrigation projects. Canoli canal, Shanmugan canal and Puthenthode canal are the three main canals in the district. Important rivers flowing through the district are Chalakudy, Karuvannur and Kecheri rivers. Bharathapuzha flows westwards at the northern boundary and Periyar flows westwards at the southern boundary. Major irrigation projects operating in the district are Peechidam, Mangalamdam, Chalakudy Diversion Scheme, Vazhani Scheme and Cheerakuzhy irrigation project. Source wise and crop wise irrigated area in the district is shown in Tables 3.3 and 3.4.

Table 3.2. Monthly rainfall in Thrissur district for the year 1990-91

Months	Rainfall (in mm)
October	313.3
November	69.8
December	1.8
January	3.9
February	0
March	1.8
April	83.8
May	56.1
June	993.1
July	975.6
August	533.3
September	61.5
Total	3094.0

Source: Department of Agricultural Meteorology, College of Horticulture, Vellanikkara.

Table 3.3. Area under irrigation in Thrissur district (source wise) 1991

Source	Area irrigated (in hectares)
Government canal	18149
Private canal	839
Government tanks	618
Private tanks	10924
Government wells	252
Private wells	14012
Minor and lift irrigation	5136
Other sources	17432
Total	67362

Source: Department of Economics and Statistics, Kerala

Table 3.4. Area under irrigation in Thrissur district (crop wise) 1991

Source	Area irrigated (in hectares)
Paddy	48367
Tuber crops	56
Vegetables	289
Coconut	35327
Arecanut	4427
Cloves and nutmeg	39
Other spices and condiments	526
Banana	873
Betel leaves	15
Others	766
Total	90685

Source: Department of Economics and Statistics, Kerala

Cropping pattern

Major crops grown in the district are rice, coconut, arecanut, banana, vegetables and rubber. Rice is cultivated in 74,451 hectares of land which is 34 per cent of total cropped area and is the important food grain crop of the district. Tea, coffee, rubber and cocoa are the major crops grown in the high land, and they occupy 4.07 per cent of total cropped area. Coconut is grown in 77,452 hectares of land which is 36.17 per cent of total cropped area, and is the main crop in the sandy coastal belts which streches over a length of 51.5 km from Kodungallur to Chavakkad. Vegetables occupy 3.62 per cent of the total cropped area. Cropping pattern in Thrissur district is shown in Table 3.5.

The district is well connected by roads and rail. It has 3802.73 km. of metallic roads and 4517.06 km of non-metallic roads. The National Highways 17 and 47 passes through the district.

The district has a well developed marketing system for agricultural produce. There are 43 public markets and 47 private markets in the district.

Ollukkara block has been selected for the present study. The block is situated in the Central part of the Thrissur taluk between 10°29' - 10°35' N latitude and 76°13' - 76°20' E longitude. This block is bounded by Talappilly taluk, Thrissur town, Mukundapuram, Wadakkancherry and Ollur blocks of Thrissur district and

Table 3.5. Cropping pattern in Thrissur district for the year 1989-90

Crop	Area (in hectares)	Percentage to total cropped area
Paddy	74451	34.77
Other cereals	39	0.02
Pulses	1590	0.74
Sugarcane/Palmyrah	670	0.32
Spices and condiments	13822	6.46
Fruits	24839	11.60
Vegetables	7744	3.62
Coconut	77452	36.17
Oil seed crops	1100	0.52
Drugs and narcotics	79	0.03
Tea	456	0.21
Coffee	32	0.01
Rubber	7778	3.63
Cocoa	447	0.22
Fodder crops	43	0.02
Green manure crops	485	0.22
Other nonfood crops	3084	1.44
Total cropped area	214111	100.00

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

Alathur taluk of Palakkad district. The total area of the block is 315.73 square kilometre.

Topography of the block area is mostly hilly and terraced. Usual type of soils are laterite and lateritic loam.

Ollukkara block consists of 7 Panchayats viz., Ollukkara, Pananchery, Kolazhy, Madakkathara, Nadathara, Vilvattam and Puthur. Panchayat wise population in Ollukkara block according to 1981 census report of Kerala is given in Table 3.6. Total population in the block was 189,955. Density of population was 602 persons per square kilometre. There were 1,033 females for 1000 males. Literacy was 75.4 per cent and literacy was more among males (79.3 per cent) than females (71.7 per cent).

Occupational distribution of the population in the block showed that the percentage of working population was 33.23 of which main and marginal workers were 91.4 and 8.6 percentage respectively. Agriculture provided employment for 41.05 per cent of the main working force. Occupational distribution of the block during 1981 is given in Table 3.7.

Major crops grown in the area are paddy, coconut, arecanut, pepper, tapioca, rubber, cashew and vegetables. Paddy is the main food grain crop and is grown in an area of 8014 hectares which is 10.16 per cent of the total rice growing area of Thrissur district.

Table 3.6. Panchayat wise population in Ollukkara block

Panchayat	Area in square kilo-metres	No.of house holds	Population			Literate population			Scheduled Castes	Scheduled Tribes
			Male	Female	Total	Male	Female	Total		
Kolazhi	16.62	3184	9185	9890	19075	7473	7460	14933	1533	-
Madakkathara	25.04	3162	8782	9158	17940	6939	6357	13296	1449	-
Nadathara	20.91	4291	12342	12876	25218	9812	9366	19178	1678	145
Ollukkara	17.57	5458	16255	16720	32975	13408	12731	26139	2134	-
Pananchery	141.71	6241	16873	17178	34051	12598	11422	24020	2840	570
Puthur	79.08	5458	15608	16317	31925	12049	11280	23329	4067	167
Vilvattom	14.80	4933	14372	14399	28771	11825	10657	22482	2926	6
Total	315.73	32727	93417	96538	189955	74104	69273	143377	16627	888

Source: Census report of Kerala, 1981

Table 3.7. Occupational distribution of population in Ollukkara block during 1981

Particulars	Number of persons
Cultivators	6890.33
Agricultural labourers	16798.79
House hold industry workers	1690.84
Other workers	32328.02
Total main workers	57708.00
Marginal workers	5418.00
Non-workers	126829.00
Work participation rate	30.4

Source: Block Level Statistics, Department of Economics and Statistics, Kerala

Cropping pattern in Ollukkara block is given in Table 3.8. Vegetables occupy an area of 180 hectares.

The land is irrigated by different sources such as Peechi canals, wells, tanks and private tube wells. Peechi canals covers an area of 5396.24 ha, private tube wells 1100 ha, other wells 3000 ha and tanks 650 ha. About 61 per cent of the irrigated area in the block was covered by Peechi canals and 34.1 per cent by other sources.

Transport and communication facilities are unevenly developed in the block. The national highway 47 is passing through the block. The total length of metallic, non-metallic and kutcha roads is 147.5, 568.37 and 55 km respectively. Only a 5 km railway track is passing through the block.

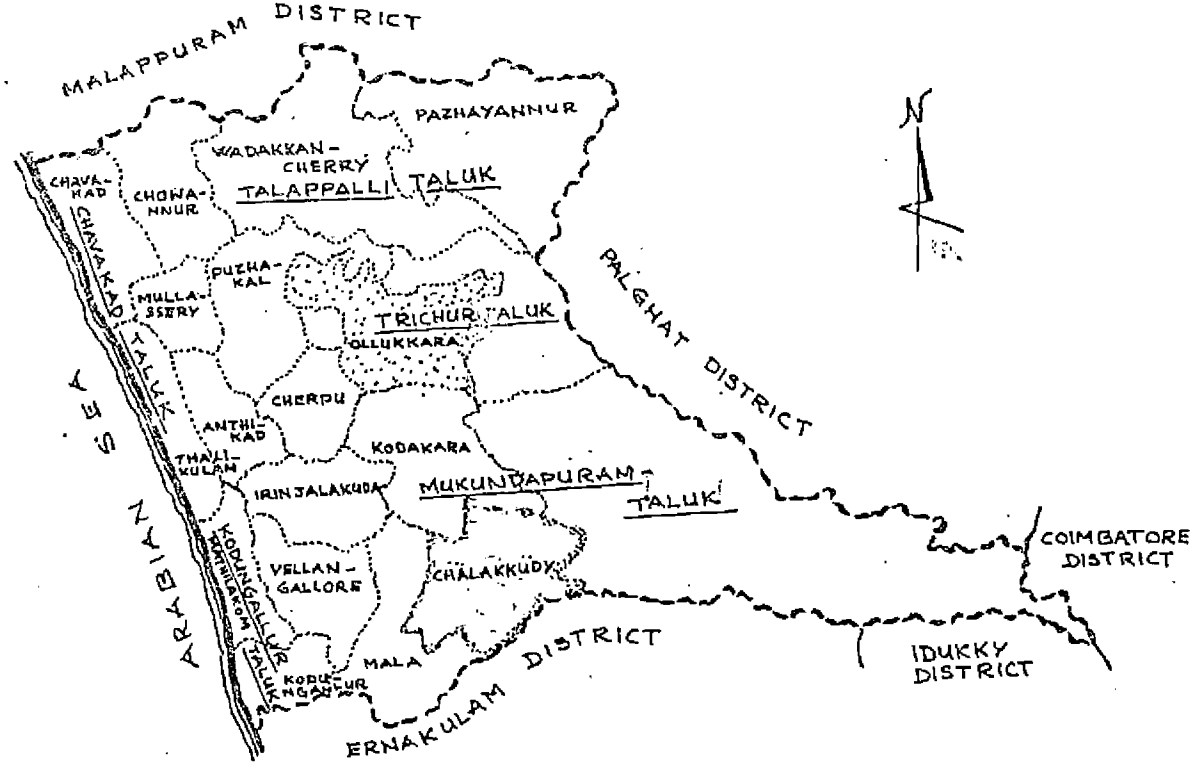
The map of Thrissur district is shown in Fig. 1 and a map indicating Ollukkara block is shown in Fig. 2.

Table 3.8. Cropping pattern in Ollukkara block for the year 1988-89

Particulars	Area (in hectares)
Paddy	8014
Coconut	2446
Arecanut	468
Pepper	235
Tapioca	508
Rubber	2263
Cashew	815
Vegetables	180
Area under non-agricultural uses	2707
Area cultivable but not cultivated	1625
Net area	13005

Source: Block Office, Ollukkara

Fig. 1. TRICHUR DISTRICT MAP



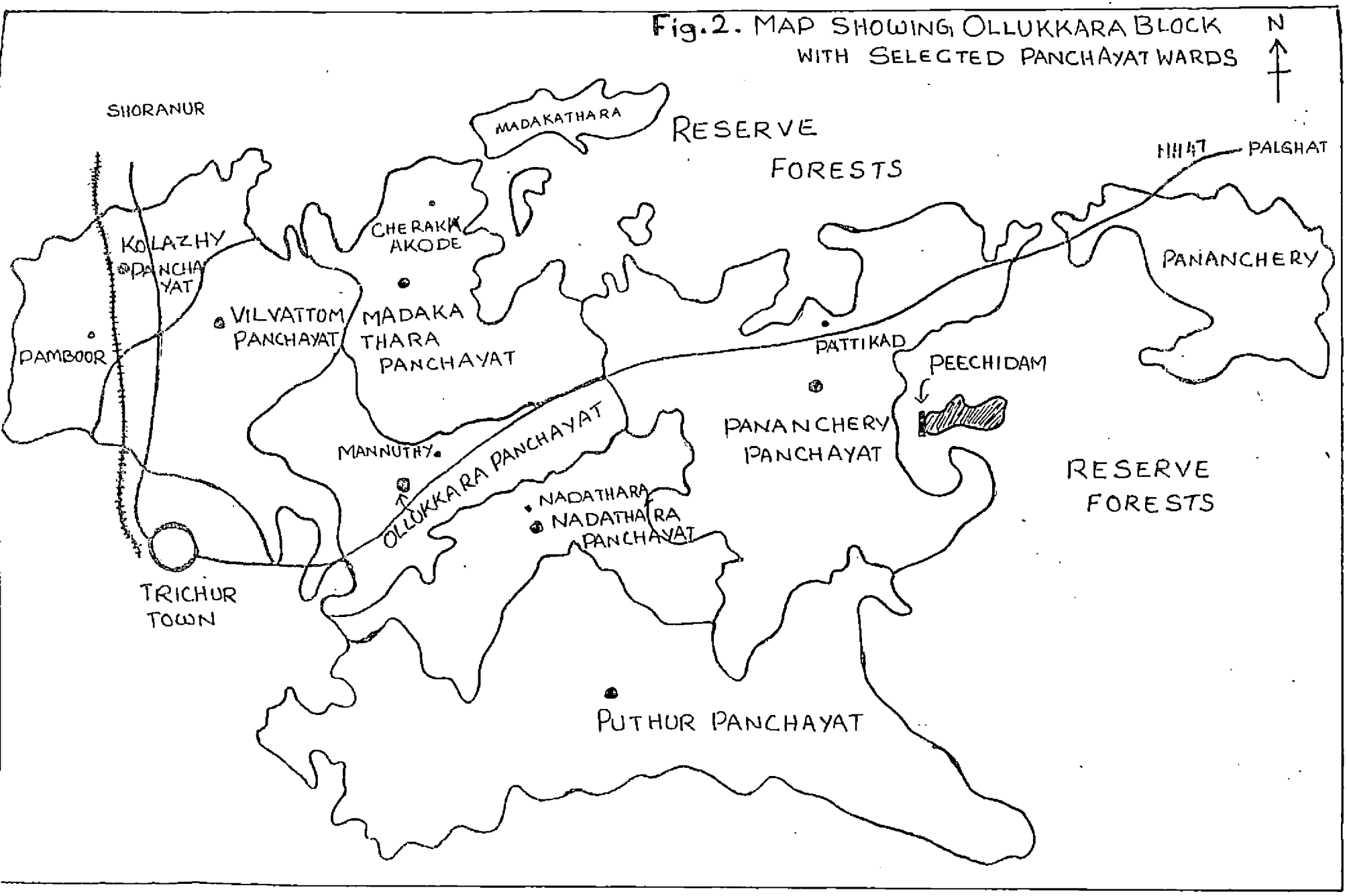


Fig.2. MAP SHOWING OLLUKKARA BLOCK
WITH SELECTED PANCHAYAT WARDS
N
SHORANUR
MADAKATHARA
RESERVE
FORESTS
NH47
PALGHAT
KOLAZHY
@PANCHA
YAT
CHERAKK
AKODE
PANANCHERY
VILVATTOM
PANCHAYAT
MADAKA
THARA
PANCHAYAT
PAMBOOR
PATTIKAD
PEECHIDAM
PANANCHERY
PANCHAYAT
MANNUTHY
OLLUKKARA PANCHAYAT
RESERVE
FORESTS
NADATHARA
NADATHARA
PANCHAYAT
TRICHUR
TOWN
PUTHUR PANCHAYAT

Materials and Methods

MATERIALS AND METHODS

Collection of data

Ollukkara Block in Thrissur district was purposively selected for conducting the present study. The district has seven N.E.S. Blocks. Block-wise area under vegetable cultivation showed that Ollukkara block has the highest area under vegetables. Hence this block was selected. A list of panchayats in Ollukkara block was obtained and they are arranged in descending order according to their area under vegetables. Of this the first two panchayats, viz., Puthur and Pananchery were selected. From each of the selected panchayat 50 vegetable farmers were randomly selected. Thus the total number of respondents from both the panchayats together came to one hundred.

Major vegetable crops grown in the area were bittergourd, ashgourd, pumpkin, pulses, amaranthus, snakegourd and cucumber. Of these data regarding cultivation and marketing of only two vegetables namely bittergourd and ashgourd were collected for the present study. These two vegetables were selected because they occupied a major portion of area under vegetables. The 100 selected farmers were further grouped into 3 classes based on area under selected vegetables cultivated by them.

Class	Area (in ares)
I	0-10
II	10-20
III	Above 20

The data on marketing aspects were collected from a sample of four wholesalers, three commission agents and ten retailers, besides the farmers. Data from the selected farmers and traders were collected with the help of well-structured and pre-trested interview schedules, through personal interview. Reference period of the study was the year 1990-1991. Since the farmers and traders did not maintain proper records, they gave the information from their memory. Therefore information gathered is likely to be subject to recall bias. However, every effort was made to get the data as accurate as possible. Specimens of interview schedules are attached as Appendices I and II.

Information collected included area under selected vegetables, the level of various inputs used, cost of production and returns, mode of marketing and costs associated etc.

Analytical framework

Costs and Returns

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

Cost concepts

In the farm management studies various concepts of costs viz., Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2 have been used.[1]

I. Cost A_1 approximates the actual expenditure incurred in cash and kind and it includes the following items of costs

1. Value of hired human labour (permanent and casual)

The actual paid wage labour engaged in crop production was considered as value of hired labour. The item human labour included the labour employed in land preparation, sowing, application of manures and fertilizers and crop protection chemicals, pandalling, irrigation and harvesting.

2. Value of seed (both farm produced and purchased)

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

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

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

---

[1] Dhondyal, S.P. (1989). Farm management. An economic analysis. Friends publications. 385.

4. Value of crop protection chemicals

Expenditure on fungicides and insecticides has been calculated by multiplying the physical quantities of different fungicides and insecticides used by their respective prices.

5. Depreciation of farm implements

Depreciation rates of 10 per cent for implements and 20 per cent for temporary dead stock such as iron wire and rope were used for the computation of cost. Depreciation on such items were worked out and allocated to bittergourd and ashgourd cultivation on the basis of relative area under these vegetables out of the total cropped area.

6. Interest on working capital

Interest on working capital was charged at the rate of 11.5 per cent per annum. This was the rate of interest charged by State Bank of Travancore for short term agricultural loans. Interest was charged for only half the duration of the crops, as all the costs are not incurred at the begining itself.

7. Land revenue

This was taken as the actual rate paid to the revenue department which was Rs.10 per acre in the area.

8. Miscellaneous expenses

This include items such as water charges and expenditure on bullock labour.

ii) Cost A_2: Cost A_2 is equal to Cost A_1 plus rent paid for leased in land. Leasing in and leasing out of land is illegal. However it was found that farmers do lease in land during the season for cultivation of vegetables. Based on the prevailing rent in the area, an amount of Rs.1500 per hectare per season was accounted as rent for leased in land.

iii) Cost B_1: It is equal to Cost A_1 plus interest on own fixed capital. The item fixed capital included iron and wooden implements, machineries such as diesel and electric motors and temporary dead stocks. There were no farm buildings used for agricultural purpose in the sample.

iv) Cost B_2: It is equal to Cost B_1 plus rent paid for leased in land plus rental value of owned land. Rent was imputed, in the case of owned land based on the prevailing rent of Rs.1500 per hectare.

v) Cost C_1: It is equal to Cost B_1 plus imputed value of family labour.

vi) Cost C_2: it is equal to Cost B_2 plus imputed value of family labour.

The cost of family labour was imputed based on the prevailing wage rates paid to hired labour in the area during the period. The wage rates were Rs.40 per day for men and Rs.35 per day for women.

Per hectare cost of cultivation was worked out for the two vegetables separately for the three size classes and for the sample as a whole. Cost of production and input output ratio were also worked out.

Measures of efficiency in production

Efficiency is defined 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.[2]

Income measures are used as one of the measures of efficiency in the present study. Different income measures are associated with different cost concepts. They are as follows:

1. Farm business income: It is Gross income minus Cost A_1
2. Owned farm business income: It is Gross income minus Cost A_2
3. Family labour income: It is Gross income minus Cost B_2
4. Net income: This is Gross income minus Cost C_2
5. Farm investment income: This is Farm business income minus imputed value of family labour

---

[2] Rajkrishna (1974). Some production functions for the Punjab. Indian Journal of Agricultural Economics, 19(3&4):87-97.

Bulkline cost

Bulkline cost is worked out for both bittergourd and ashgourd. Bulkline cost of production is that cost which covers cost of production of the majority of farmers, production or area. Conventionally, the bulkline cost is calculated so as to cover 85 per cent of farmers or production or area on cost C basis.[3] In the present study bulkline cost is calculated on cost C_2 basis.

According to Panse, possibility of use of cost figures in connection with the formulation of price and other agricultural policies were related to the frequency distribution of cost and the major portion of distribution of holdings accounted for 85 per cent of the frequency which was usually defined as the Bulkline cost.[4]

The price fixing commissions generally attempted to fix the price sufficiently high to cover the cost of production from 80 per cent to 90 per cent of the supply and refered to these as bulkline producers.[5]

Functional analysis

Cobb-Douglas production function have been fitted to the collected data in order to describe the relationship between the

---

[3] Kahlon, A.S., Tyagi, D.S. (1983). Agricultural price policy in India. Allied Publishers Private Ltd., New Delhi. 16.

[4] Panse, V.G. (1958). Problems and techniques in the study of the cost of production in agriculture. Indian J. agric. Econ., 13(3): 9-10.

[5] Dummier, E.F. (1934). Economics with application to agriculture. : 211-212.

output and various inputs used for the production of vegetables. From the production function, elasticities of production of inputs were worked out which, in turn, have been used to calculate their marginal value products at their geometric means. Marginal productivity is the measure of the increase in total product, for the addition of one unit of a particular resource above its mean level while other resources are held constant at their respective mean levels.[6] A significant difference between marginal value product and market price of individual inputs would indicate whether farmers are using, on an average, their factors of production inefficiently or efficiently.[7]

Specification of the model

Cobb-Douglas production function has been selected for functional analysis since this model provides a compromise between (a) adequate fit of the data (b) computation managability (c) sufficient degrees of freedom unused to allow for statistical testing.[8] For both bittergourd and ashgourd, the function has been fitted separately for the 3 size classes and for the sample as a whole.

---

[6] Heady, E.O. (1957). Economics of agricultural production and resource use. Englewood Cliffs N.J. Prentice Hall Inc., New York. 58.

[7] Thakur, D.R., Moorthi, T.V. and Sharma, H.R. (1990). Resource use, Farm size and Returns to scale on tribal farms of Himachal Pradesh. Agricultural Situation in India. 44(11):885-891.

[8] Heady, E.O. and Dhillon, L.J. (1961). Agricultural production functions. Kalyani publishers, Ludhiana. 228.

Specification of the model fitted for bittergourd is:

$$\text{Log } y = \text{Log } a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + u$$

and the model fitted for ashgourd is

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

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

Explanatory variables used in the function are

x_1 = Expenditure on human labour (Rupees)

x_2 = Expenditure on manures and fertilizers (Rupees)

x_3 = Expenditure on crop protection chemicals (Rupees)

x_4 = Expenditure on pandalling materials like rope, standards and iron wires (Rupees)

x_5 = Area in cents

Output and all inputs were given in absolute values.

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

$$F\ (k,\ n-k)\ df = \frac{R^2}{1-R^2} \times \frac{N - K}{K}$$

Returns to scale ($\leq b_1$) was tested by applying 't' and 'F' values for being significantly different from one.[9] The 't' and 'F' values were calculated as follows:

$$t(n-k)df = \frac{b_i}{S.E\ (b_i)}$$

$$F(1,n-k)df = \frac{(\leq b_i - 1)^2}{V(\leq b_i)} \times \frac{N - K}{1}$$

Marginal value products were calculated at their geometric mean levels.

Marginal value product $(x_1) = \frac{\bar{y}}{\bar{x}_i} \times b_i$

where

$\bar{y}$ = Geometric mean of y

$\bar{x}_i$ = Geometric mean of x_i

All inputs in physical terms except land were changed into values in functional analysis. Therefore marginal value product and marginal value productivity ratios to factor costs have the same value.

At optimum level of use of any of the resources (x_i) its marginal value productivity should be equal to one.

ie. $\frac{\bar{y}}{\bar{x}_i} \times b_i = 1$. From this optimum level of a resource (x_1) is $x_i = \bar{y} \times b_i$ in its geometric mean level

---

[9] Thakur, D.R., Moorthi, T.V., Sharma, H.R. op. Cit., 55.

At optimum level of use of land, its marginal value productivity to opportunity cost ratio should be equal to one.

ie. $\frac{\text{MVP (land)}}{\text{Opportunity cost of land}} = 1$

Marketing costs and margins

Marketing connotes a series of activities involved in moving the goods from the point of production to the point of consumption. In the present study important marketing channels in marketing of bittergourd and ashgourd were identified. Marketing efficiency was measured in terms of marketing costs and margins. Marketing margin is the difference between the price paid by consumer and the price received by the producer for an equivalent quantity of farm produce. The method of 'Concurrent Margin' is used in the present study for estimating marketing margin. Concurrent margin refers to the difference between the prices prevailing at successive stages of marketing at a given point of time.

Economic efficiency of marketing is measured as follows:

$ME = \frac{V}{I} - 1$ where 'ME' is marketing efficiency, 'V' is the total value of goods marketed and 'I' is the marketing cost including the marketing margins.[10]

---

[10] Shepherd, G.S. (1965). Marketing Farm Products - Economic Analysis, Iowa State University Press, Ames, Iowa, USA. 254.

General Economic and Social Condition of the Sample

GENERAL ECONOMIC AND SOCIAL CONDITIONS OF THE SAMPLE

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

Size of the family

Respondents in the two Panchayats from where samples were drawn viz., Puthur and Pananchery were classified based on their family size. Analysis showed that 55 per cent of the total sample farmers came under the family size group having four to six members. In both panchayats, the size group having four to six members had the highest concentration of sample farmers, 70 percentage in Puthur and 40 percentage in Pananchery panchayat Average size of the family of respondent farmers was 4.41. Distribution of respondents according to their family size is given in Table 5.1.

Age and sex

Classification of the respondent's family to age and sex is given in Table 5.2. As much as 45.35 per cent of the total members came under the age group of eighteen to thirty nine, 6.34 per cent was in the age group of 60 and above. Out of the total

Table 5.1. Classification of the respondents according to the size of the family

Name of Panchayat	Family size and number of families				Average size of family
	1 to 3	4-6	7 and above	Total	
Puthur	6 (12.00)	35 (70.00)	9 (18.00)	50 (100.00)	4.48
Pananchery	14 (28.00)	20 (40.00)	16 (32.00)	50 (100.00)	4.34
Total	20 (20.00)	55 (55.00)	25 (25.00)	100 (100.00)	4.41

(Figures in parentheses show percentages to total)

Table 5.2. Distribution of respondent's family according to age and sex

Name of Panchayat	Age group (years)										Total Members
	0-17		18-39		40-59		60 and above		Total		
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Puthur	23 (10.27)	30 (13.39)	59 (26.34)	40 (17.86)	30 (13.39)	29 (12.95)	8 (3.57)	5 (2.23)	120 (53.58)	104 (46.42)	224 (100.00)
Pananchery	23 (10.60)	28 (12.90)	54 (24.89)	47 (21.66)	25 (11.52)	25 (11.52)	9 (4.15)	6 (2.76)	111 (51.15)	106 (48.85)	217 (100.00)
Total	46 (10.43)	58 (13.17)	113 (25.62)	87 (19.73)	55 (12.47)	54 (12.24)	17 (3.85)	11 (2.49)	231 (52.38)	210 (47.62)	441 (100.00)

(Figures in parentheses show percentages to total)

family members 23.80 per cent was minors, ie. below 18 years of age. 52.38 per cent of the total members was male and 47.62 per cent females. Thus sex ratio was 1.1.

Literacy

Analysis of the educational status of the respondents showed that 93 per cent of sample farmers were literate. Percentage of illiterate farmers was only 7. Out of the total respondents 30 per cent was educated up to primary school, 20 per cent up to middle school, 39 per cent up to high school and 4 per cent got higher secondary education. Classification of the respondents according to their educational status is given in Table 5.3. Members of the respondent's family were also studied based on their educational status. About 40 per cent of the total members were educated up to high school, 22.45 per cent up to middle school, 28.34 per cent up to primary school and 5.67 per cent up to pre-degree. Out of the total respondents 1.59 per cent were graduates. Percentage of illiterate members was 2.04. Distribution of members of the respondent's family according to their educational status is given in Table 5.4.

Occupation

Agriculture was the sole occupation of 58 per cent of the sample farmers. Agriculture was the main occupation of 20 per cent

Table 5.3. Classification of respondents according to literacy

Name of Panchayat	Illiterate	Primary school	Middle school	High school	Pre-degree	Total
Puthur	1 (2.00)	17 (34.00)	11 (22.00)	19 (38.00)	2 (4.00)	50 (100.00)
Pananchery	6 (12.00)	13 (26.00)	9 (18.00)	20 (40.00)	2 (4.00)	50 (100.00)
Total	7 (7.00)	30 (30.00)	20 (20.00)	39 (39.00)	4 (4.00)	100 (100.00)

(Figures in parentheses show percentages to total)

Table 5.4. Distribution of family members of the respondents according to educational status

Name of Panchayat	Illiterate	Primary school	Middle school	High school	Pre-degree	Graduation	Total
Puthur	6 (2.68)	57 (25.45)	53 (23.66)	84 (37.50)	19 (8.48)	5 (2.23)	224 (100.00)
Pananchery	3 (1.38)	68 (31.34)	46 (21.20)	92 (42.40)	6 (2.76)	2 (0.92)	217 (100.00)
Total	9 (2.04)	125 (28.34)	99 (22.45)	176 (39.91)	25 (5.67)	7 (1.59)	441 (100.00)

(Figures in parentheses show percentages to total)

of respondents and it served as a suboccupation for another 22 per cent of total respondents. Distribution of respondents according to their occupation is shown in Table 5.5.

Land holding

The respondents were classified based on their holding size. It was found that 53 per cent of respondents were having area between 40 ares and 120 ares. The average size of holding in this group was 107.73 ares. Out of the total respondents 22 per cent were having an area below 40 ares and the average size of holding was 31.13. Another 19 per cent of farmers were having an area above 120 ares and below 200 ares and the average size of holding was 168.84 ares. The percentage of respondents who were having above 200 ares of land was found to be 6. Distribution of respondents according to their land holding is given in Table 5.6.

Cropping pattern

The major crops grown in the area were paddy, vegetables, rubber, coconut and banana. Gross cropped area of the total respondent farmers was 117.49 hectares. Paddy was grown in 10.35 per cent of the gross cropped area and is the important food grain crop in the area. Vegetables occupied 31.32 per cent of the gross cropped area. Rubber and coconut were grown in 21.84 and 12.91 per cent respectively of the gross cropped area. Cropping pattern of the respondent farmers is given in Table 5.7.

Table 5.5. Classification of the respondents according to their occupation

Name of Panchayat	Agriculture as the only occupation	Agriculture as main occupation	Agriculture as sub occupation	Total
Puthur	28 (56.00)	12 (24.00)	10 (20.00)	50 (100.00)
Pananchery	30 (60.00)	8 (16.00)	12 (24.00)	50 (100.00)
Total	58 (58.00)	20 (20.00)	22 (22.00)	100 (100.00)

(Figures in parentheses show percentages to total)

Table 5.6. Distribution of respondents according to ownership holding

Name of Panchayat	Area in Ares				
	0-40	40-120	120-200	Above 200	Total
Puthur	10 (20.00)	25 (50.00)	11 (22.00)	4 (8.00)	50 (100.00)
Pananchery	12 (24.00)	28 (56.00)	8 (16.00)	2 (4.00)	50 (100.00)
Total	22	53	19	6	100
Average size of holding in Ares	33.13	107.73	168.84	362.66	

(Figures in parentheses show percentages to total)

Table 5.7. Cropping pattern of respondent farmers

Crops	Area (in hectares)	Percentage to gross cropped area
Paddy	12.20	10.35
Vegetables	36.89	31.32
Rubber	25.72	21.84
Coconut	15.21	12.91
Other perennial crops	16.57	14.07
Annual crops	11.20	9.51
Gross cropped area	117.79	100.00

Area under bittergourd

Respondents were classified according to their area under bittergourd cultivation. Out of the total respondents, 48 per cent of respondents were having an area within 10 ares and 30 per cent were having an area between 10 and 20 ares. The percentage of respondents who were having more than 20 ares of land under bittergourd cultivation was 22. Distribution of respondents according to area under bittergourd cultivation is given in Table 5.8.

Area under ashgourd

Total number of sample farmers cultivating ashgourd was 75. Out of this 56 per cent were having an area within 10 ares and 25.33 per cent of respondents were having an area between 10 and 20 ares. The percentage of farmers who were having an area of above 20 ares under ashgourd cultivation was 18.67. Classification of respondents based on their area under ashgourd cultivation is given in Table 5.9.

It was found that 'leasing in and out' of land for vegetable cultivation for the duration of the cultivating season was a common practice in the study area. Out of the gross cropped area of 36.89 hectare under vegetables, 14.21 hectares (38.50 per cent) was leased in land. Rent paid for the leased in land varied according to the locality and the type of vegetable cultivated. Leasing out of paddy fields for vegetable cultivation was a common practice during the third crop season (December-March) where ever the punja (third crop rice) was not taken.

Results and Discussion

Table 5.8. Distribution of respondents according to area under bittergourd

Name of Panchayat	Area (in ares)			
	0-10	10-20	Above 20	Total
Puthur	20 (40.00)	18 (36.00)	12 (24.00)	50 (100.00)
Pananchery	28 (56.00)	12 (24.00)	10 (20.00)	50 (100.00)
Total	48	30	22	100

(Figures in parentheses represent percentages to total)

Table 5.9. Distribution of respondents according to area under ashgourd

Name of Panchayat	Area (in ares)			
	0-10	10-20	Above 20	Total
Puthur	22 (51.16)	13 (30.23)	8 (18.60)	43 (100.00)
Pananchery	20 (62.50)	6 (18.75)	6 (18.75)	32 (100.00)
Total	42 (56.00)	19 (25.33)	14 (18.67)	75 (100.00)

(Figures in parentheses represent percentages to total)

Results and Discussion

RESULTS AND DISCUSSION

In this chapter the results obtained from the study are presented and an attempt is made to interpret the results. As stated in Chapter 4 the data for the present study on economics of production and marketing of two vegetables, namely bittergourd and ashgourd were collected from selected vegetable farmers in Ollukkara Block during the year 1990-1991. The chapter is divided into two parts. Part I deals with production aspects and part II deals with marketing aspects.

Part I

Economics of production

Costs and Returns

The data on cost of production and returns are of special interest to farmers since they reveal the input-output relationships of their enterprises and bring out the differences in unit cost between the less efficient and more efficient farms and enterprises. Such information would also enable him to make choice among alternate enterprises open to him or in deciding the manner and proportion in which he should spread his resources on the various enterprises in which he is engaged. Adoption of technical innovation by farmers also increasingly demands precise and detailed information on costs and returns.

A brief account of the cultivation practices of both bittergourd and ashgourd will be helpful while studying the costs and returns incurred in the cultivation of these crops.

Bittergourd and ashgourd can be successfully grown during January-March and September-December. The former is an irrigated crop and the latter is rainfed. Generally, it was found that farmers in the study area used to take crops in both the seasons. However only the details regarding summer crop was collected for the study. Irrigation is not a problem during summer season, because of the availability of water from Peechi irrigation canal. For the rainfed crop, sowing starts after the receipt of the first few showers.

Farm produced or purchased seeds of local varieties are generally used in the area. Pits of about 85 cm diameter and 50 cm depth are taken at desired spacing. About 1750-2000 pits are taken in an area of one hectare in the case of bittergourd. Since ashgourd requires more area for spreading, the number of pits that can be taken in an area of one hectare is only 1000-1250. Basal dose of farm yard manure and fertilizers are mixed with top soil in the pits and seeds are sown at the rate of 4-5 per pit. Unhealthy plants are removed after 2 weeks and only 3-4 plants per pit are retained. For both bittergourd and ashgourd, top dressing of fertilizers are done in several split doses generally at fortnightly intervals. Bittergourd is trailed on pandals where as ashgourd spreads on the ground.

Cost concepts

The first step in attempting to study costs is to define cost concepts precisely. This has already been done in chapter four. As indicated there the cost concepts used in this study are, Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2.

Costs and returns have been worked out on per hectare basis for both bittergourd and ashgourd. For each crop costs and returns have been worked out separately for the three size classes and for the sample as a whole. However only the results obtained for the entire sample has been used for making comparisons of returns of the two crops.

Item wise cost of cultivation of bittergourd

Item wise cost of cultivation per hectare of bittergourd based on different cost concepts were worked out and is given in Table 6.1. Costs A_1, A_2, B_1, B_2, C_1 and C_2 per hectare were Rs.14,113.95, Rs.14,113.95, Rs.14,508.95, Rs.16,161.95, Rs.22,908.95 and Rs.24,561.95 respectively for Class I. For Class II the costs were Rs.13,112.59, Rs.13,112.59, Rs.13,495.09, Rs.15,112.89, Rs.19,018.99 and Rs.20,636.79 respectively in the same order and for Class III the costs were Rs.13,072.56, Rs.14,572.56, Rs.13,415.06, Rs.16,666.15, Rs.17,545.85 and Rs.20,796.94 respectively. For the sample as a whole the corresponding figures were Rs.13,584.53, Rs.13,914.53, Rs.13,964.23, Rs.15,958.24, Rs.20,562.37

Table 6.1. Item wise cost of cultivation of bittergourd (in Rs./hectare)

Sl.No.	Item	Size Class I	Size Class II	Size Class III	Aggregate
1	Hired human labour	2,269.11(9.23)	2,709.80(13.13)	3,269.12(15.73)	2,621.66(11.62)
2	Hired bullock labour	-	65.78(0.32)	177.40(0.85)	58.76(0.26)
3	Machine labour	-	-	285.99(1.37)	62.91(0.28)
4	Seeds	557.00(2.28)	508.35(2.46)	635.48(3.05)	559.67(2.48)
5	Manures	746.80(3.00)	697.26(3.38)	457.48(2.19)	668.06(2.96)
6	Fertilizers	4,568.90(18.60)	4,435.80(21.50)	3,298.08(15.85)	4.249.38(18.84)
7	Plant protection	2,671.50(10.86)	2,089.90(10.13)	1,651.99(7.99)	2,272.72(10.08)
8	Land revenue	25.00(0.10)	25.00(0.12)	25.00(0.12)	25.00(0.11)
9	Pandalling	2,878.80(11.72)	2,207.30(10.70)	2,956.40(14.21)	2,694.42(11.95)
10	Depreciation, repairs and hiring of implements	120.10(0.48)	116.30(0.56)	59.40(0.28)	105.60(0.47)
11	Interest on working capital	276.74(1.12)	257.10(1.24)	256.22(1.23)	266.35(1.18)
	Cost A_1	14,113.95	13,112.59	13,072.56	13,584.53
12	Rent-on-leased in land	-	-	1,500.00(7.21)	330.00(1.46)
	Cost A_2	14,113.95	13,112.59	14,572.56	13,914.53
13	Interest on own fixed capital	395.00(1.60)	382.50(1.85)	342.50(1.64)	379.70(1.68)
	Cost B_1	14,508.95	13,495.09	13,415.06	13,964.23
14	Rental value of own land	1,653.00(6.82)	1,617.80(7.84)	1,751.09(8.42)	1,664.01(7.38)
	Cost B_2	16,161.95	15,112.89	16,666.15	15,958.24
15	Imputed value of family labour	8,400.00(34.19)	5,523.90(26.78)	4,130.79(19.86)	6,598.14(29.25)
	Cost C_1	22,908.95	19,018.99	17,545.85	20,562.37
	Cost C_2	24,561.95	20,636.79	20,796.94	22,556.38

Figures in parentheses show percentages to the total

and Rs.22,556.38 respectively. From the table it is evident that per hectare cost of cultivation of bittergourd was highest for Class I on Cost C_2 basis. The high cost in Class I when compared to the other two classes could be explained by a relatively higher expenditure incurred on family labour in this class. The expenditure incurred on family labour was found to be the least in Class III when compared to the other two size classes.

Item wise cost of cultivation of ashgourd

Item wise break up of the cost of cultivation of ashgourd is given in Table 6.2. Costs A_1, A_2, B_1, B_2, C_1 and C_2 were Rs.7,670.53, Rs.7,670.53, Rs.8,065.53, Rs.9,545.53, Rs.11,061.46 and Rs.12,541.46 respectively for Class I. For Class II, costs in the same order were Rs.5,880.70, Rs.5,880.70, Rs.6,263.20, Rs.7,598.20, Rs.8,186.22 and Rs.9,521.26 respectively. For Class III corresponding figures were Rs.4,526.21, Rs.6,026.21, Rs 4,868.71, Rs.7,604.21, Rs.5,848.97 and Rs.8,584.52 respectively. For aggregate sample the costs were Rs.6,630.22, Rs.6,910.22, Rs.7,012.22, Rs.8,889.80, Rs.9,360.07 and Rs.11,037.67 respectively. The per hectare cost of cultivation was highest (Rs.12,541.46) for Class I and lowest (Rs.8,584.52) for Class III on cost C_2 basis. The share of family labour in the total cost of cultivation was highest (23.88 per cent) for Class I among the three classes, while it was only 11.41 per cent in Class III.

Table 6.2. Item wise cost of cultivation of ashgourd (In Rs./hectare)

Sl.No.	Item	Size Class I	Size Class II	Size Class III	Aggregate
1	Hired human labour	2,130.32(16.98)	1,817.50(19.08)	1,753.60(20.43)	1,980.75(17.95)
2	Hired bullock labour	177.40(1.42)	-	144.73(1.69)	126.36(1.14)
3	Machine labour	-	41.27(0.43)	148.66(1.73)	38.19(0.34)
4	Seeds	160.94(1.28)	145.40(1.52)	114.61(1.34)	148.35(1.34)
5	Manures	283.60(2.26)	442.60(4.64)	272.07(3.17)	321.73(2.92)
6	Fertilizers	2,812.10(22.43)	1,704.59(17.92)	1,128.09(13.14)	2,217.18(20.09)
7	Plant protection	1,828.17(14.58)	1,498.50(15.73)	800.36(9.32)	1,552.79(14.07)
8	Land revenue	25.00(0.20)	25.00(0.26)	25.00(0.29)	25.00(0.23)
9	Depreciation on implements and machinery	102.60(0.82)	90.54(0.96)	50.44(0.58)	89.87(0.81)
10	Interest on working capital	150.40(1.19)	115.30(1.22)	88.75(1.03)	130.00(1.18)
	Cost A_1	7,670.53	5,880.70	4,526.21	6,630.22
11	Rent on leased in land	-	-	1,500.00(17.48)	280.00(2.54)
	Cost A_2	7,670.53	5,880.70	6,026.21	6,910.22
12	Interest on own fixed capital	395.00(3.15)	382.50(4.02)	342.50(3.99)	382.00(3.46)
	Cost B_1	8,065.53	6,263.20	4,868.71	7,012.22
13	Rental value of own land	1,480.00(11.80)	1,335.00(14.03)	1,235.50(14.39)	1,397.60(12.66)
	Cost B_2	9,545.53	7,598.20	7,604.21	8,689.80
14	Family labour	2,995.93(23.89)	1,923.02(20.19)	980.36(11.42)	2,347.85(21.27)
	Cost C_1	11,061.46	8,186.22	5,848.97	9,360.07
	Cost C_2	12,541.46	9,521.26	8,584.57	11,037.67

Figures in parentheses show percentages to the total

Comparison of item wise cost of cultivation of bittergourd and ashgourd

From Table 6.1 and 6.2, it is clear that there is a good deal of variation in per hectare cost of cultivation between bittergourd and ashgourd. So a comparison of cost of cultivation based on costs of the aggregate sample was done and is given in Table 6.3. The total per hectare cost incurred on bittergourd was more and was twice the cost incurred on ashgourd. Costs A_1, A_2, B_1, B_2, C_1 and C_2 for bittergourd were 2.04, 2.01, 1.99, 1.83, 2.19 and 2.04 times the corresponding costs of ashgourd. The variation in total cost could be explained by analysis of each of the cost components separately.

Input wise cost per hectare of bittergourd

Input wise cost per hectare of bittergourd is given in Table 6.4. From the table it is clear that expenses on human labour is the largest single item of input for all classes. The percentage share of human labour to total cost steadily declined with increase in size. Out of the total labour cost percentage shares of family labour were 34.19, 26.76 and 19.86 respectively for the first (smallest), second (medium) and third (largest) size classes. The shares of hired labour was 9.25 per cent, 13.13 per cent and 15.73 per cent respectively for the first, second and third size classes. It is evident that the inverse relation between size and total cost

Table 6.3. Item wise cost of cultivation of bittergourd and ashgourd for the sample as a whole

Particulars	Bitter gourd Rs./ha	Ashgourd Rs./ha
Cost A_1	13584.53	6630.22
Cost A_2	13914.53	6910.22
Cost B_1	13964.23	7012.22
Cost B_2	15958.24	8689.80
Cost C_1	20562.37	9360.07
Cost C_2	22556.38	11037.65

Table 6.4. Input wise cost of cultivation of bittergourd (in Rs./ha)

Particulars	Size Groud			
	Class I	Class II	Class III	Aggregate
1. Human labour (hired and family labour)	10669.11(43.44)	8233.70(39.90)	7400.81(35.59)	9219.80(40.87)
2. Seeds	557.00(2.27)	508.35(2.46)	635.48(3.05)	559.67(2.48)
3. Manures and fertilizers	5315.70(21.64)	5133.06(24.87)	3754.56(18.05)	4917.44(21.80)
4. Plant protection chemicals	2671.50(10.88)	2089.90(10.13)	1651.99(7.99)	2272.72(10.07)
5. Miscellaneous expenses	2903.80(11.82)	2298.08(11.14)	3444.79(16.54)	2841.09(12.61)
6. Depreciation	120.10(0.49)	116.30(0.56)	59.40(0.28)	105.60(0.47)
7. Interest on working capital	276.74(1.12)	257.10(1.25)	256.32(1.23)	266.35(1.18)
8. Rental value of land (owned and hired)	1653.00(6.73)	1617.80(7.84)	3251.09(15.63)	1994.01(8.84)
9. Interest on fixed capital	395.00(1.61)	382.50(1.85)	342.50(1.64)	379.70(1.68)
Total	24561.95	20636.79	20796.94	22556.38

Figures in parentheses show percentages to the total

observed earlier was mainly due to the higher levels of use of labour in smaller size classes. The second largest single item of expenditure was manures and fertilizers. The percentage shares of manures and fertilizers in total cost were 21.64, 24.87 and 18.05 respectively in the first, second and third size classes while it was 21.80 for the sample as a whole. The absolute amount was comparable in the first two size classes while it was much less in the third size class. The item 'miscellaneous expenses' included the expenditure on pandalling materials like ropes, standards and iron wire. A relatively high contribution of the item 'miscellaneous expenses' to total cost in the case of bittergourd was due to additional item of expenditure for this crop on pandalling materials. The percentage shares of the item 'miscellaneous expenses' in total cost were 11.82, 11.14, 16.56 for the first, second and third size classes and 12.60 for the sample as a whole. The fourth largest single item of expenditure was plant protection chemicals. The percentage shares were 10.88, 10.13 and 7.94 for the three size classes and 10.07 for the sample as a whole.

Input wise cost of cultivation of ashgourd

The input wise cost of cultivation per hectare of ashgourd and the percentage shares of each input in total cost is given in Table 6.5. Here also human labour was the largest single item of expenditure and the percentage shares of this input in total cost were 40.87, 39.29 and 31.85 respectively for the classes I,

Table 6.5. Input wise cost of cultivation of ashgourd (in Rs./ha)

Particulars	Size Group			
	Class I	Class II	Class III	Aggregate
1. Human labour (hired and family labour)	5126.25(40.87)	3740.52(39.29)	2733.86(31.85)	4328.60(39.22)
2. Seeds	160.94(1.28)	145.40(1.53)	114.61(1.33)	148.33(1.34)
3. Manures and fertilizers	3095.70(24.69)	2147.19(22.55)	1400.16(16.32)	2538.91(23.00)
4. Plant protection chemicals	1828.17(14.58)	1498.50(15.74)	800.36(9.32)	1552.79(14.07)
5. Miscellaneous expenses	202.40(1.62)	66.27(0.70)	318.34(3.73)	189.55(1.71)
6. Depreciation	102.60(0.82)	90.58(0.96)	50.44(0.59)	89.87(0.81)
7. Interest on working capital	150.40(1.19)	115.30(1.21)	80.75(1.03)	130.00(1.18)
8. Rental value of land (owned and hired)	1480.00(11.80)	1335.00(14.02)	2735.50(31.84)	1677.60(15.21)
9. Interest on fixed capital	395.00(3.15)	382.50(4.00)	342.50(3.99)	382.00(3.46)
Total	12541.46	9521.26	8584.52	11037.67

Figures in parentheses show percentage to the total

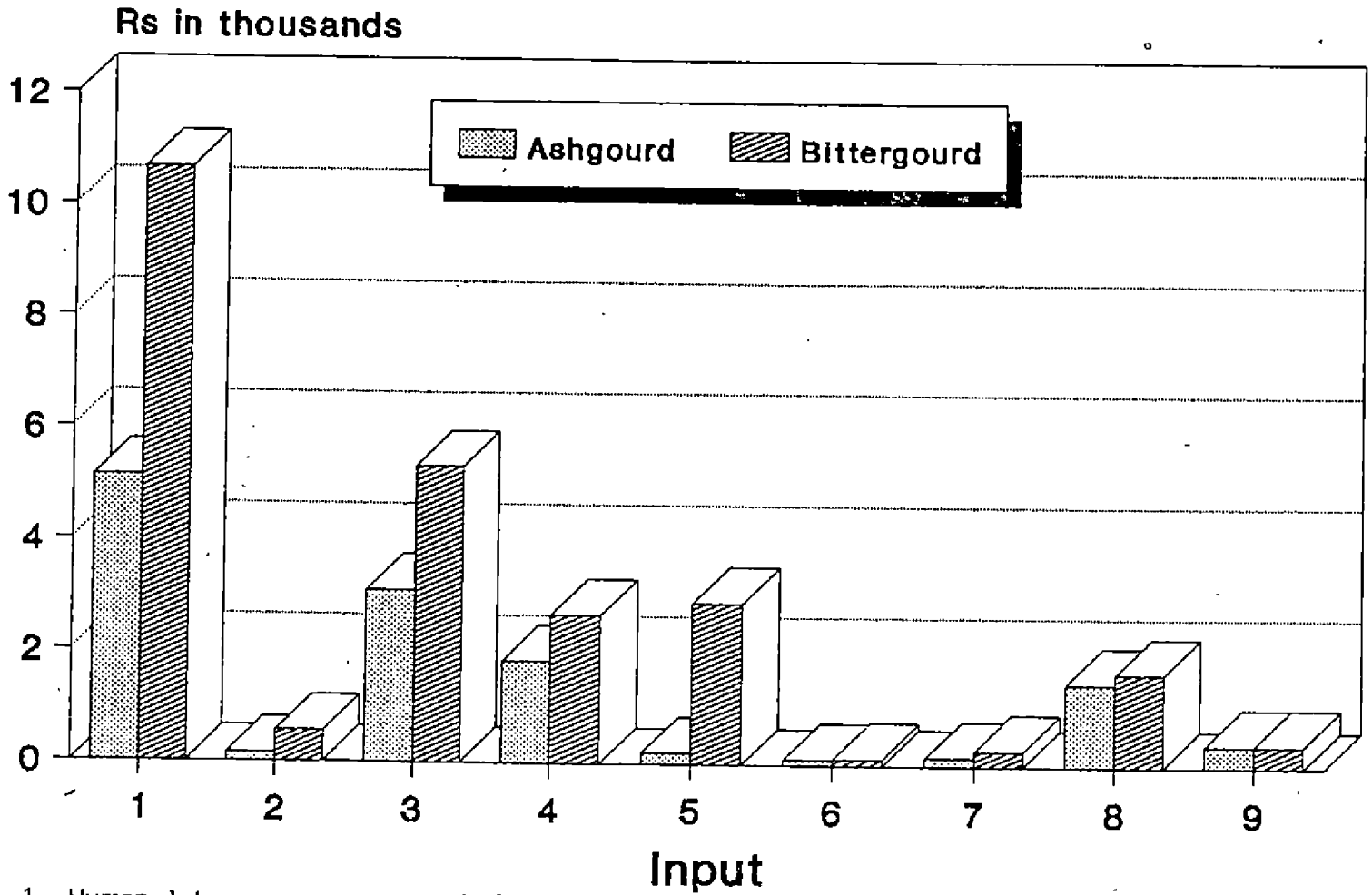
II, III and it was 39.22 for the aggregate sample. In absolute terms also this inverse relationship between size and use of human labour could be seen. The second largest single item of expenditure was manures and fertilizers for the classes I, II and for the aggregate and the percentage shares in total cost were 24.69, 22.55 and 23.00 respectively. But for class III, rental value of land (owned and hired) was the second largest item of expenditure and its share in total cost was 31.84 per cent. The third largest item of expenditure was expenditure on plant protection chemicals for classes I and II and its shares in total cost were 14.58 and 15.74 per cent respectively. Manures and fertilizers accounted for 16.32 per cent of total cost for class III and was the third largest single item of expenditure for this class. For the sample as a whole rental value of land (owned and hired) accounted for 15.20 per cent to total cost.

A comparison of the shares of various inputs to total cost for bittergourd and ashgourd revealed that human labour accounted the highest percentage to total cost for both the crops. Percentage shares of this input to total cost were 40.87 and 39.22 for bittergourd and ashgourd respectively. The percentage shares of family labour and hired labour to total labour cost were 71.56 and 28.44 respectively for bittergourd, and 54.24 and 45.76 respectively for ashgourd.

Actual days of labour employed in the production of bittergourd was 301, 165 and 113 mandays per hectare respectively for the first, second and third size classes. For the sample as a whole it was 218.8 mandays per hectare. The labour productivity for the three size classes were 0.49, 0.78 and 1.11 quintals per manday and 0.84 quintal per manday for the sample as a whole. For ashgourd the actual days of labour employed were 230, 124 and 73 mandays per hectare respectively for the first, second and third size classes, whereas it was 175 mandays per hectare for the sample as a whole. The labour productivity for the three size classes were 0.85, 1.10 and 1.43 quintals per manday and 0.99 quintals per manday for the sample as a whole.

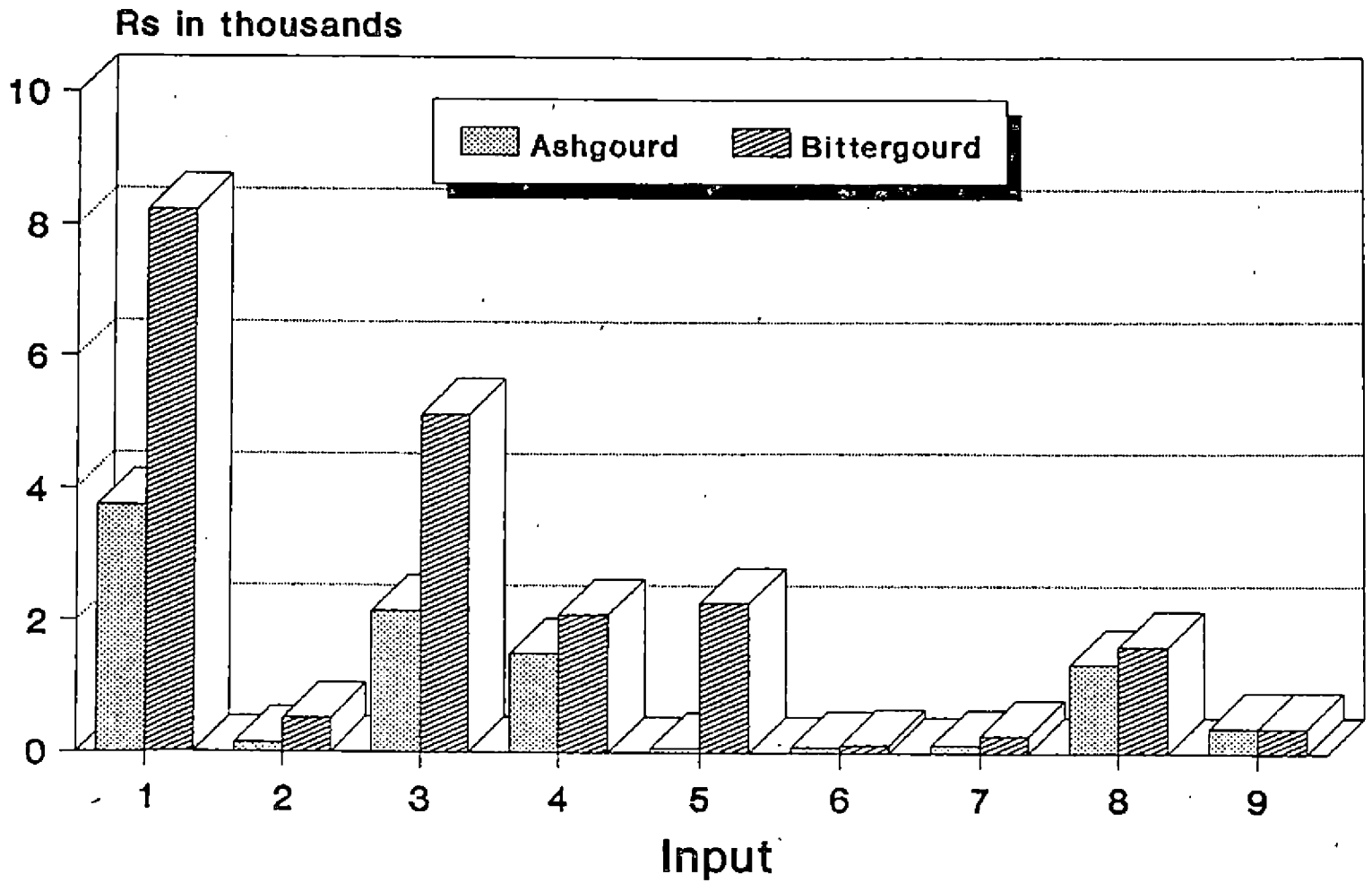
Manures and fertilizers constituted the second largest item of cost and its shares were 21.80 and 23.00 per cent respectively for bittergourd and ashgourd. The three major items of inputs such as human labour, manures and fertilizers and plant protection chemicals together accounted for 75.27 per cent of total cost in case of bittergourd and 76.29 per cent of total cost in case of ashgourd. Comparison of the per hectare input wise cost of cultivation of bittergourd and ashgourd separately for the three classes and the sample as a whole are presented in figures 3, 4, 5 and 6 respectively.

Fig.3. Input-wise total cost of cultivation per ha for *class I*



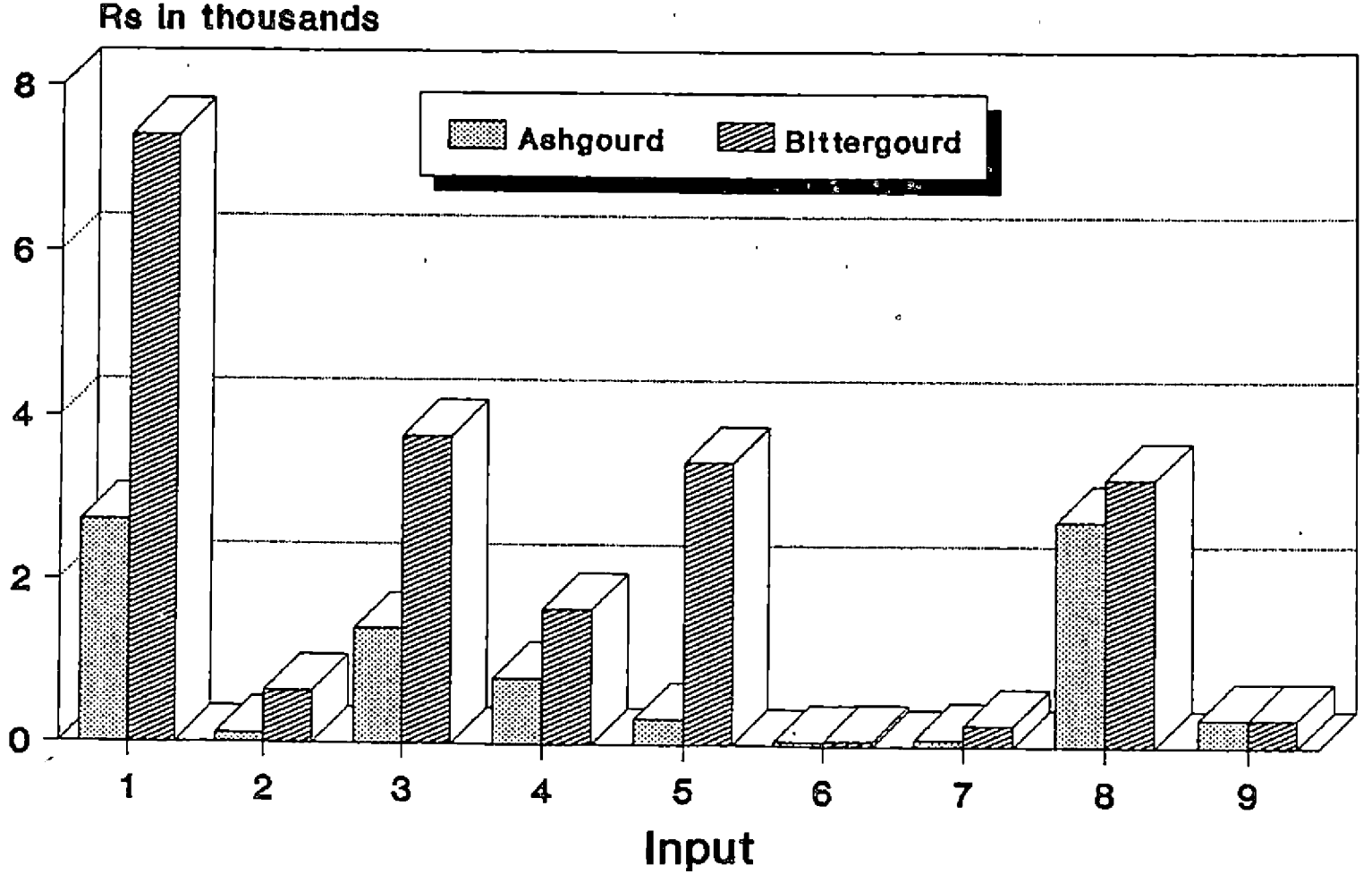
1. Human labour
2. Seeds
3. Manures and fertilizers
4. Crop protection chemicals
5. Miscellaneous
6. Depreciation on implements
7. Interest on working capital
8. Rental value of land (owned & leased)
9. Interest on fixed capital

Fig.4. Input-wise total cost of cultivation per ha for *class II*



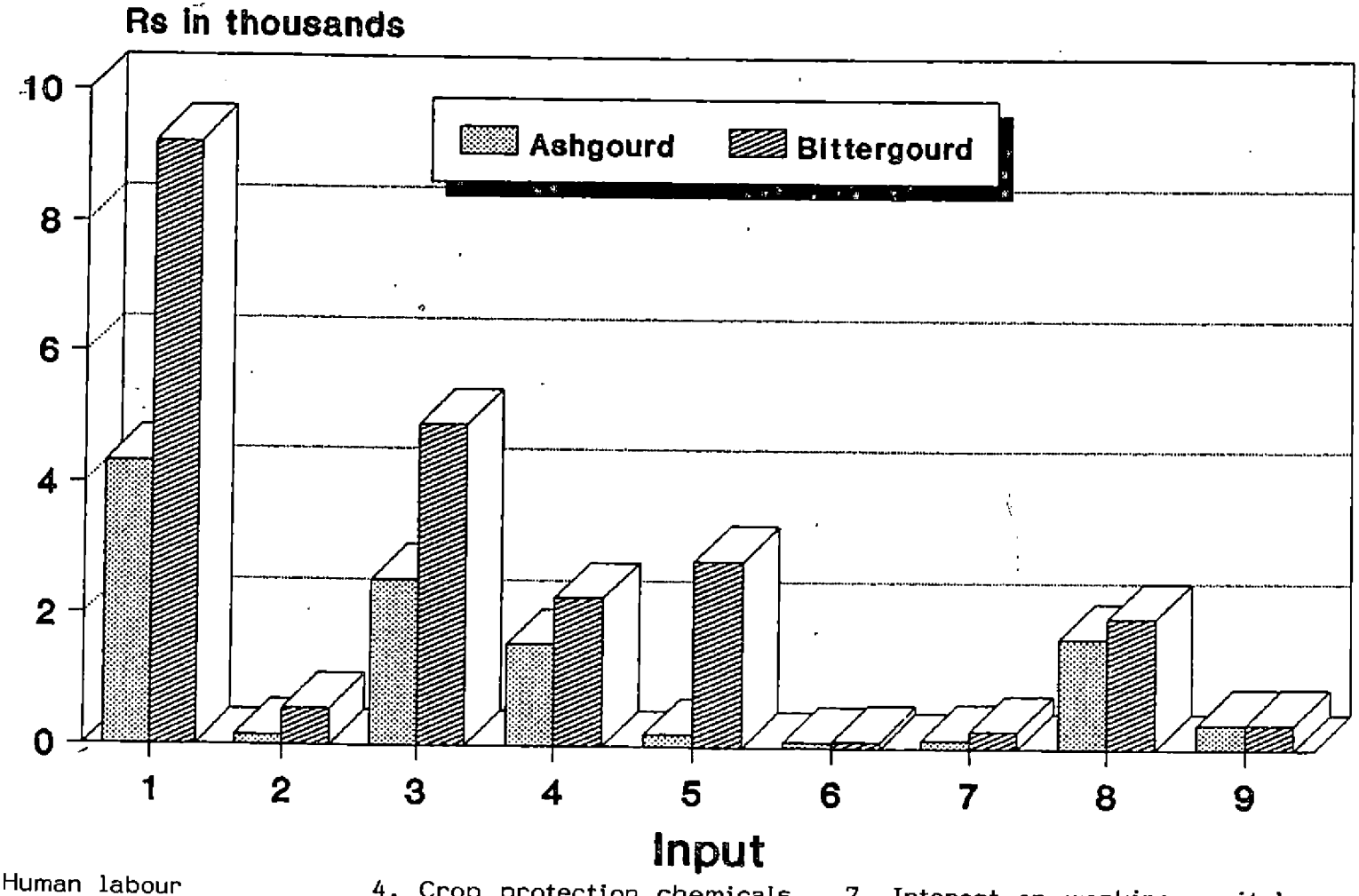
1. Human labour
2. Seeds
3. Manures and fertilizers
4. Crop protection chemicals
5. Miscellaneous
6. Depreciation on implements
7. Interest on working capital
8. Rental value of land (owned & leased)
9. Interest on fixed capital

Fig.5. Input-wise total cost of cultivation per ha for *class III*



1. Human labour
2. Seeds
3. Manures and fertilizers
4. Crop protection chemicals
5. Miscellaneous
6. Depreciation on implements
7. Interest on working capital
8. Rental value of land (owned & leased)
9. Interest on fixed capital

Fig.6. Input-wise total cost of cultivation per ha for *class IV*



1. Human labour
2. Seeds
3. Manures and fertilizers
4. Crop protection chemicals
5. Miscellaneous
6. Depreciation on implements
7. Interest on working capital
8. Rental value of land (owned & leased)
9. Interest on fixed capital

Production and value of output

The output and value of bittergourd and ashgourd on per hectare basis is given in Table 6.6. The average productivity of ashgourd was higher than bittergourd for the three size classes except in class III. The relevant figures for bittergourd were 14990 kg, 12914 kg, 12550 kg and 13830 kg respectively for the size classes I, II, III and for the aggregate. Correspondingly the values per hectare were Rs.45,918.00, Rs.39,516.84, Rs.38,403.00 and Rs.42,364.63. Value of unit output for bittergourd was Rs.3.06 where it was Rs.1.50 for ashgourd. The per hectare output of ashgourd for the three size classes were 19,730, 13,760, 10,579 and 16,509 kg respectively and corresponding values were Rs.29,595, Rs.20,640, Rs.15,868.50 and Rs.24,763.50 respectively. Yield of both bittergourd and ashgourd showed that there is an inverse relation exsisting between the size of holding and yield per hectare. The cost of cultivation details of these crops revealed that application of certain critical inputs like manures and fertilizers in production decreases as the size of holding increases. This is the reason why the per hectare yield showed a declining trend with increase in size of holding.

Cost of production per quintal of vegetables

Cost of production of bittergourd is given in Table 6.7. Cost of production in relation to various cost concepts showed that

Table 6.6. Output and value of bittergourd and ashgourd

Size group	Bittergourd		Ashgourd	
	Output/ha (Kg.)	Value/ha (Rs.)	Output/ha (Kg.)	Value/ha (Rs.)
Class I	14990	45,918.00	19730	29,595.00
Class II	12914	39,516.84	13760	20,640.00
Class III	12550	38,403.00	10579	15,868.50
Aggregate	13830	42,364.63	16509	24,763.50

Table 6.7. Cost of production of bittergourd (Rs./quintal)

Particulars	Size Group			
	Class I	Class II	Class III	Aggregate
Cost A_1	94.00	101.00	104.00	98.00
Cost A_2	94.00	101.00	116.00	100.60
Cost B_1	96.00	104.00	106.00	100.90
Cost B_2	107.00	117.00	132.00	115.00
Cost C_1	152.00	147.00	139.00	148.00
Cost C_2	163.00	159.00	165.00	163.00

cost of production per quintal was highest for class III. Cost of production per quintal on cost C_2 basis for the four classes were Rs.163.00, Rs.159.00, Rs.165.00 and Rs.163.00 respectively. Cost of production per quintal for the aggregate sample based on costs A_1, A_2, B_1, B_2, C_1 and C_2 were Rs.98.00, Rs.100.60, Rs.100.90, Rs.115.00, Rs.148.00 and Rs.163.00 respectively.

Cost of production per quintal of ashgourd based on various costs were found to be less than that for bittergourd for all the classes. Cost of production of ashgourd is given in Table 6.8. The cost incurred in producing 1 quintal of ashgourd on cost C_2 basis were Rs.63.00, Rs.69.00, Rs.81.00 and Rs.66.00 respectively for the four classes. Cost of production per quintal was highest (Rs.81.00) for class III and was 22 per cent higher than the cost for class I. Cost of production based on Costs A_1, A_2, B_1, B_2, C_1 and C_2 for the aggregate were Rs.40.00, Rs.42.00, Rs.42.00, Rs.53.00, Rs.56.00 and Rs.66.00 respectively.

A comparison of cost of production of bittergourd and ashgourd based on various cost concepts showed that cost incurred in producing 1 quintal of bittergourd was higher than the cost incurred in producing 1 quintal of ashgourd. Cost of production of bittergourd based on costs A_1, A_2, B_1, B_2, C_1 and C_2 were 2.45, 2.39, 2.40, 2.16, 2.64 and 2.46 times the respective costs of production of ashgourd. The higher cost of production of bittergourd than ashgourd could be explained by certain additional items

Table 6.8. Cost of production of ashgourd (Rs./quintal)

Particulars	Size Group			
	Class I	Class II	Class III	Aggregate
Cost A_1	38.00	42.00	42.00	40.00
Cost A_2	38.00	42.00	56.00	42.00
Cost B_1	40.00	45.00	46.00	42.00
Cost B_2	48.00	55.00	71.00	53.00
Cost C_1	56.00	59.00	55.00	56.00
Cost C_2	63.00	69.00	81.00	66.00

of expenditure such as expenditure on pandalling materials in bittergourd cultivation. Human labour employed in making pandals was also an additional expenditure in bittergourd cultivation. The expenditure on plant protection chemicals was higher in bittergourd than ashgourd because it was reported that in the study area attack of pests and diseases were comparatively more on bittergourd when compared to ashgourd.

Input-output ratio

Input-output ratio indicates value of output per rupee of input cost. This ratio will serve as a measure which would indicate as to whether the costs incurred commensurate with the returns obtained. Input-output ratio of bittergourd is given in Table 6.9. Returns generated from a rupee invested was found to be greater than one for the two crops in all the four classes. Input-output ratios based on costs A_1, A_2, B_1, B_2, C_1 and C_2 for the sample as a whole were 3.11, 3.04, 3.03, 2.65, 2.06 and 1.88 respectively. Input-output ratio for the sample as a whole showed that a rupee invested returned Rs.3.11, Rs.3.04, Rs.3.03, Rs.2.65, Rs.2.06 and Rs.1.88 based on costs A_1, A_2, B_1, B_2, C_1 and C_2 in bittergourd.

Input-output ratio of ashgourd is given in Table 6.10. Returns generated from a rupee invested was greater than one for all cases. Among the three classes, classes I, II and III, input-output ratio based on varies cost concepts were higher for class I

Table 6.9. Input-output ratio of bittergourd based on different cost concepts

Input-output ratio based on	Size Class I	Size Class II	Size Class III	Aggregate
Cost A_1	3.24	3.01	2.93	3.11
Cost A_2	3.24	3.01	2.63	3.04
Cost B_1	3.16	2.92	2.86	3.03
Cost B_2	2.84	2.61	2.30	2.65
Cost C_1	2.00	2.07	2.18	2.06
Cost C_2	1.86	1.91	1.84	1.88

Table 6.10. Input-output ratio of ashgourd based on different cost concepts

Input-output ratio based on	Size Class I	Size Class II	Size Class III	Aggregate
Cost A_1	3.85	3.50	3.50	3.73
Cost A_2	3.85	3.50	2.63	3.58
Cost B_1	3.66	3.29	3.25	3.53
Cost B_2	3.10	2.71	2.08	2.84
Cost C_1	2.67	2.52	2.71	2.64
Cost C_2	2.35	2.16	1.85	2.24

except for cost C_1. Input-output ratio for the sample as a whole showed that a rupee invested returned Rs.3.73, Rs.3.58, Rs.3.53, Rs.2.84, Rs.2.64 and Rs.2.24 based on costs A_1, A_2, B_2, B_2, C_1 and C_2.

Comparison of input-output ratio of bittergourd and ashgourd showed that returns generated from a rupee invested was always higher for ashgourd than for bittergourd. For ashgourd a rupee invested returned Rs.2.24 on cost C_2 basis while a rupee invested returned only Rs.1.88 in the case of bittergourd.

Bulkline cost

Bulkline cost of production is that cost which covers cost of production of the majority of farmers, production or area (Kahlon and Tyagi, 1983). In the case of price support, the price fixing authorities generally attempted to fix the price sufficiently high so as to cover the cost of production from 80 per cent to 90 per cent of the supply and refer to these as bulkline producers. Average cost per quintal on cost C_2 basis was arranged in ascending order and the cost at which 85 per cent of total output was supplied was selected as the bulkline cost. Bulkline cost has been worked out for both bittergourd and ashgourd and this is presented in Tables 6.11 and 6.12 respectively. In the case of bittergourd bulkline cost was estimated at Rs.220 per quintal. The bulkline output was supplied by 70 per cent of the cultivators. Bulkline cost of ashgourd was Rs.85 per quintal.

Table 6.11. Bulkline cost of bittergourd

(1) Average cost per quintal (Rs.)	(2) Percentage of total output supplied	(3) Percentage of cultivators producing at cost indicated under (1) and (2)	
Upto 70	3.48	2	
80	9.02	4	
90	16.70	9	
100	21.15	11	
110	30.80	18	
120	38.29	25	
130	39.37	26	
140	51.80	34	
150	61.06	42	
160	63.23	43	
170	65.62	48	
180	68.03	53	
190	74.35	58	
200	77.42	63	
210	79.50	66	
220	84.78	70	Bulkline
230	87.82	73	
240	87.82	73	
250	88.56	75	
260	91.00	77	
270	91.00	77	
280	92.24	79	
290	93.74	82	
300	95.15	84	
310	95.15	84	
320	97.20	88	
330	97.20	88	
340	97.20	88	
350	97.60	89	
360	98.00	90	
370	98.59	92	
380	99.13	93	
390	99.29	96	
400	99.78	97	
410 to 460	99.78	97	
470	99.88	98	
480	99.96	99	
490	100.00	100	

Table 6.12. Bulkline cost of ashgourd

(1) Average cost per quintal (Rs.)	(2) Percentage of total output supplied	(3) Percentage of cultivators producing at cost indicated under (1) and (2)	
Upto 25	0.70	1.33	
30	13.50	2.66	
35	19.60	7.99	
40	27.18	13.32	
45	28.60	15.98	
50	42.50	30.59	
55	53.90	38.60	
60	62.30	43.90	
65	67.90	50.50	
70	72.27	57.20	
75	79.00	63.00	
80	80.97	66.50	
85	84.46	71.80	Bulkline
90	86.04	75.81	
95	89.74	81.10	
100	91.49	83.79	
105	93.82	85.12	
110	95.39	89.11	
115	96.09	90.40	
120	96.67	91.77	
125	98.35	94.43	
130 to 140	98.35	94.43	
145	99.00	95.76	
150	99.35	97.09	
155	99.70	98.42	
160 to 185	99.70	98.42	
190	100.00	100.00	

Bulkline cost curve

Marshall gave the name of bulkline cost curve to a curve which represents the array of actual average costs of the different producers in an industry when the total output of an industry was a given amount and the individual costs being arranged in increasing order of size from left to right. Fig. 7 represents the bulkline cost curve of bittergourd and Fig. 8 that of ashgourd.

Measures of efficiency

Income measures in relation to various cost concepts were worked out. The profitability of crop production can be judged better from the income measures. Farm business income or profit at cost A_2 of bittergourd for the three classes were Rs.31,784, Rs.26,404 and Rs.25,330 respectively. The income for class I was 25 per cent (Rs.6,453) more than the income for class III. Family labour income or profit at cost B_2 was worked out as gross income minus total expenses of production, excluding imputed wages of unpaid family labour. Family labour income for class I was 36 per cent (Rs.8,019) more than the same for class III. The net income or profit at cost C_2 is calculated as the gross income minus total expenses of production. The net income was highest for class I and was 21 per cent (Rs.3,749) more than the net income for class III. The farm income depends not only on natural and human factors but also on quantitative and qualitative nature of farm

Fig.7.Bulkline cost of Bittergourd

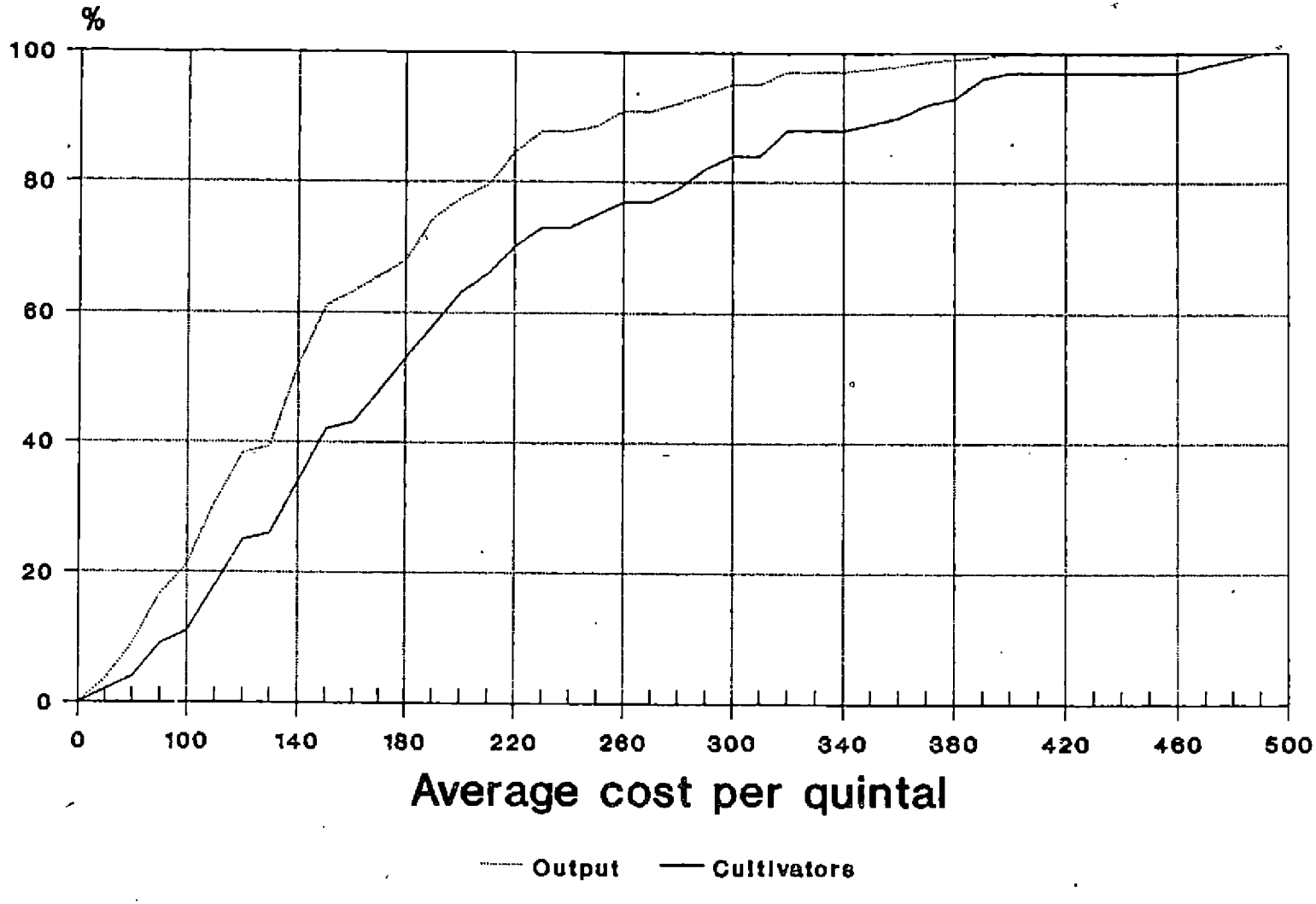
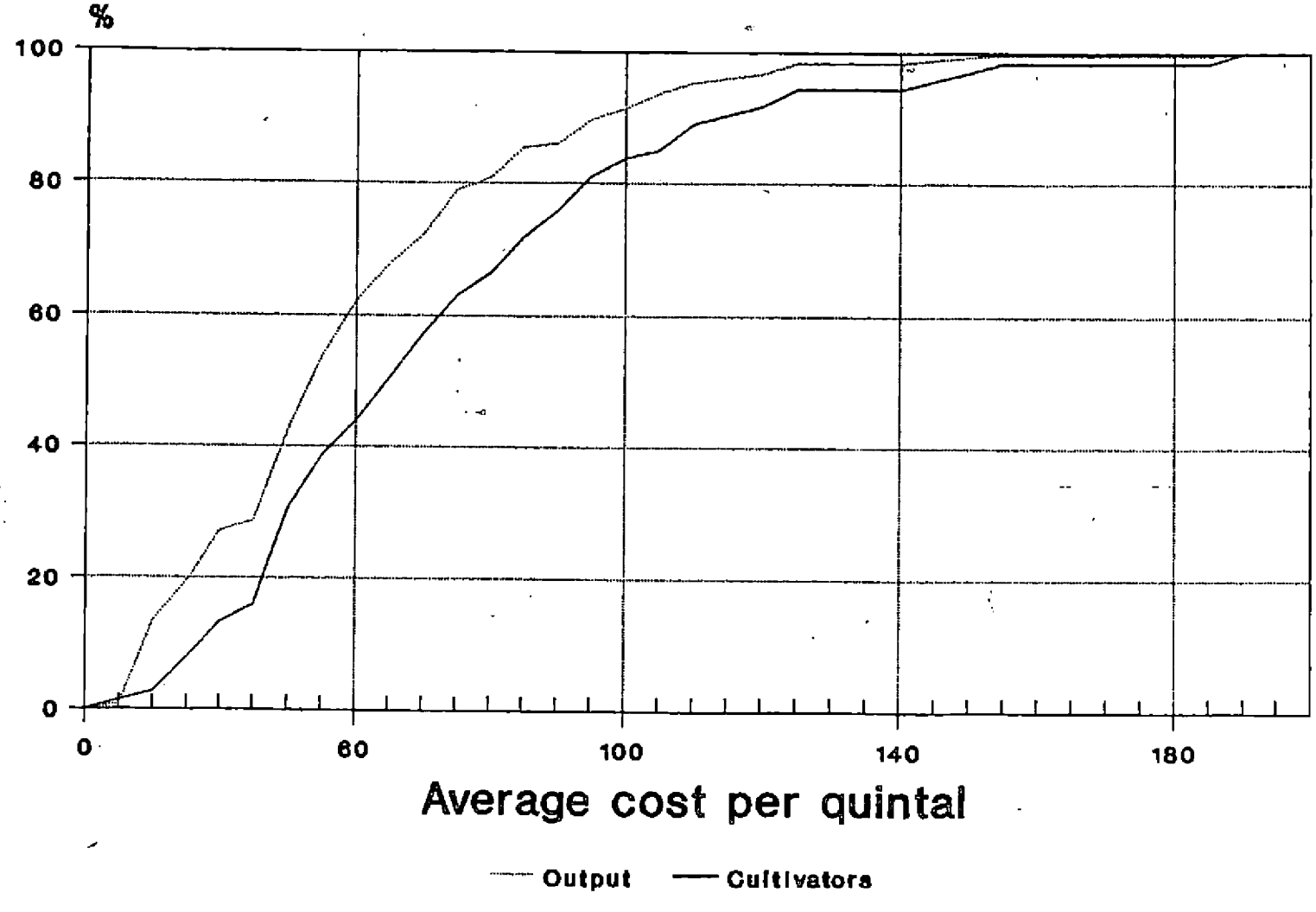


Fig.8.Bulkline cost of Ashgourd



investments. Capital can be invested in farm assets such as land, land improvement, farm implements and machinery etc., which has longstanding effects. In farm investment income, items such as interest on owned and fixed capital, rental value etc., have been considered. The farm investment income is calculated by deducting the wages of the family labour from the farm business income. The farm investment income was highest. (Rs.23,384) for class I and was lowest (Rs.20,880) for class II. Income measures in relation to different cost concepts for bittergourd is given in Table 6.13. Various income measures for ashgourd showed that farm business income, family labour income, net income and farm investment income were higher for class I than for classes II and III. The net income which is the most suitable income measure to judge the profitability of crop production was Rs.17,053, Rs.11,118 and Rs.7,284 for the classes I, II and III. The net income for class I was 134 per cent (Rs.9,769) higher than the net income for class III. Income measures in relation to different cost concepts for ashgourd is given in Table 6.14.

Various income measures for both bittergourd and ashgourd revealed an inverse relationship existing between income and size of holding. This declining trend in income could be explained by the inverse relation between yield and holding size.

A comparison of income measures of bittergourd and ashgourd showed that net income derived from bittergourd cultivation was

Table 6.13. Income measures in relation to different cost concepts for bittergourd (Rs./hectare)

Sl. No.	Particulars	Size Group			
		Class I	Class II	Class III	Aggregate
1	Farm business income	31784.05	26404.25	25330.44	28779.40
2	Own farm business income	31784.05	26404.25	23830.44	28450.10
3	Family labour income	29756.05	24403.95	21736.85	26406.40
4	Net income	21356.05	18880.05	17606.86	19808.25
5	Farm investment income	23384.05	20880.35	21198.74	22181.26

Table 6.14. Income measures in relation to different cost concepts for ashgourd (Rs./hectare)

Sl. No.	Particulars	Size Group			
		Class I	Class II	Class III	Aggregate
1	Farm business income	21924.47	14759.30	11342.29	18133.28
2	Own farm business income	21924.47	14759.30	9842.29	17853.28
3	Family labour income	20049.47	13041.80	8264.30	16073.70
4	Net income	17053.54	11118.70	7284.00	13725.83
5	Farm investment income	18928.54	12836.28	10362.03	15785.40

44 per cent (Rs.6082) more than the net income from ashgourd. Farm business income, own farm business income, family labour income, net income and farm investment income, derived from one hectare of bittergourd cultivation were Rs.28,779, Rs.28,450, Rs.26,406, Rs.19,808 and Rs.22,182 respectively. The incomes in the same order generated from ashgourd cultivation were Rs.18,133, Rs.17,853, Rs.16,073, Rs.13,725 and Rs.15,785 respectively.

Economic analysis of production of bittergourd and ashgourd showed that cost of production per quintal and cost of cultivation per hectare were low and input-output ratios were high for ashgourd when compared to bittergourd. But a conclusion based on this result that ashgourd is more profitable than bittergourd would not be correct. A comparison of profits derived at different costs showed that bittergourd derived more profit per hectare than ashgourd at different cost concepts. It could be explained by a relatively high value per unit output (Rs.3.06) for bittergourd when compared to ashgourd (Rs.1.50). Value of 1 kilogram of bittergourd is 104 per cent (Rs.1.56) higher than value of 1 kilogram of ashgourd.

The salient results of the economics of bittergourd and ashgourd are summed up in Table 6.15. The analysis on economics of vegetable cultivation has shown that there was considerable differences, in the cultivation costs per hectare, between bittergourd and ashgourd. Great differences also existed in cost per unit of

Table 6.15. Economics of bittergourd and ashgourd cultivation

Sl.No.	Particulars	Bittergourd	Ashgourd
1	Output (kg/ha)	13830	16509
2	Cost of cultivation (Rs./ha)		
	i) Cost A_1	13584.53	6630.22
	ii) Cost A_2	13914.53	6910.22
	iii) Cost B_1	13964.23	7012.22
	iv) Cost B_2	15958.24	8689.80
	v) Cost C_1	20562.37	9360.07
	vi) Cost C_2	22556.38	11037.67
3	Cost of production (Rs./quintal)		
	i) Cost A_1	98.00	40.00
	ii) Cost A_2	100.60	42.00
	iii) Cost B_1	100.90	42.00
	iv) Cost B_2	115.00	53.00
	v) Cost C_1	148.00	56.00
	vi) Cost C_2	163.00	66.00
4	Gross income (Rs./ha)	42364.63	24763.50
5	Net income (Rs./ha)	19808.00	13725.85
6	Input-output ratio		
	i) Cost A_1	3.11	3.73
	ii) Cost A_2	3.04	3.58
	iii) Cost B_1	3.03	3.53
	iv) Cost B_2	2.65	2.84
	v) Cost C_1	2.06	2.64
	vi) Cost C_2	1.87	2.24

output. Though the extent of net benefit differed for bittergourd and ashgourd cultivation, both crops resulted in net benefit to farmers.

Resource use efficiency

A scientific study of input-output relationship based on production function analysis will provide a sound basis for developing the economic aspect of crop production on a pattern that would guide the farmers to operate at the least cost and highest profit combinations (Dhondyal, 1958). The productivities of individual resources particularly marginal productivities or elasticities can be derived from the production function which would indicate the efficiency of individual resources when used in varying proportions.

In this study Cobb-Douglas production function was applied for studying the relationship between the output and the various input variables used. Cobb-Douglas production function is used since it is the best method of measuring the nature of resources used in agriculture and it allows diminishing marginal productivity, increasing or decreasing returns to scale. Estimation of parameters in Cobb-Douglas production function involve fewer degrees of freedom than other algebraic forms of production functions. The choice of the function is also based on its computation manageability. The function has been estimated by applying ordinary least square technique.

For both bittergourd and ashgourd Cobb-Douglas production functions were fitted separately for the three classes and also for the sample as a whole.

Specification of the model

For ready references, specifications of the functions are indicated here.

The specification of the function fitted for bittergourd is as follows:

$$\text{Log } Y = \text{Log } a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + U$$

The function fitted for ashgourd is:

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

where

Y = Value of output (Rupees)

x_1 = Expenditure on human labour (Rupees)

x_2 = Expenditure on manures and fertilizers (Rupees)

x_3 = Expenditure on plant protection chemicals (Rupees)

x_4 = Expenditure on pandalling materials (Rupees)

x_5 = Area in cents

a = Constant term

U = Error term

b_1, b_2, b_3, b_4 and b_5 are the elasticity coefficients of respective variables.

While selecting the explanatory variables to be used in the function, expenditure on irrigation was not considered, since irrigation was from the canals of Peechi irrigation project and the cost incurred is nominal. Value of seeds was also not selected as an explanatory variable, since the cost of cultivation studies on bittergourd and ashgourd showed that cost of seeds contributed only 2.5 per cent and 1.3 per cent to total cost in case of bittergourd and ashgourd respectively.

From the production function, coefficient of multiple determination (R^2), their 'F' ratios, regression coefficients, their standard errors and 't' values were determined. They are given in Tables 6.16 and 6.17.

The coefficient of determination (R^2) explains the proportion of variation in the dependent variable (Y) explained by the independent variables included in the function. The independent variables included in the fitted regression function for bittergourd could explain 68, 48, 55 and 81 per cent variations in the output for classes I, II, III and the sample as a whole respectively. In the case of ashgourd 43, 22, 71 and 74 per cent variations in the output could be explained by the fitted regression function.

The estimated regression coefficients (b_i) of independent variables are the production elasticities of the respective factors (x_i). The regression coefficient 'b_i' indicates the percentage by which the output 'Y' would change if input x_i changes by one unit

Table 6.16. The coefficients of Multiple Determination (R^2) and corresponding 'F' ratios for bittergourd

Class	R^2	'F' ratio
I	0.679	18.19**
II	0.481	4.67*
III	0.556	4.25*
Aggregate	0.809	80.47**

* Significant at 5 per cent level of probability.
** Significant at 1 per cent level of probability

Table 6.17. The coefficients of Multiple Determination (R^2) and corresponding 'F' ratios for ashgourd

Class	R^2	'F' ratio
I	0.425	8.839*
II	0.222	1.070
III	0.706	6.065*
Aggregate	0.740	50.51**

*Significant at 5 per cent level of probability
** Significant at 1 per cent level of probability

while all other factors remain constant at their geometric mean levels. The regression coefficients, their standard error and corresponding 't' values in the function fitted for bittergourd for the four classes are given in Tables 6.18, 6.19, 6.20 and 6.21. The elasticity coefficient for the input human labour was found negative in all cases except in class II. Similarly plant protection expenses in class II and pandalling in class III had a negative sign. The rest of the coefficients had positive sign indicating the positive effect on total output. The negative regression coefficient of human labour indicated that labour use is in excess and a cut in this expense will add to net returns (Y). Similarly negative regression coefficient associated with plant protection in class II indicated that, if farmers increase the use of crop protection chemicals, total returns (Y) would decrease. Total returns responded negatively to additional expenditure on pandalling in class III and responded positively to expenditure on pandalling in class I. Farmers having relatively more area under cultivation in class III were using high quality iron wires, rope and standards for making pandals. So their expenditure on pandalling was relatively high when compared to farmers in class I who were having relatively less area under cultivation. These farmers were using low quality iron wires, and standards brought from nearby forest for making pandals which can't withstand the heavy wind during the period of November to March. So they should make strong pandals to avoid crop loss during the wind.

Table 6.18. The regression coefficients of output on various inputs, standard error of regression coefficients and 't' values in the model fitted for bittergourd. Class I

	Regression coefficient (b_i)	Standard error S.E. (b_i)	't' values
X_1	-0.0702	0.2647	0.265
X_2	0.2542	0.1172	2.168*
X_3	0.0747	0.1257	0.594
X_4	0.2397	0.1447	1.656
X_5	0.4718	0.2408	1.959*

* Significant at 5 per cent level of probability

Table 6.19. The regression coefficients of output on various inputs, standard error of regression coefficients and 't' values in the model fitted for bittergourd. Class II

	Regression coefficient (b_i)	Standard error S.E. (b_i)	't' values
X_1	0.4302	0.2025	2.125*
X_2	0.1554	0.0956	1.625
X_3	-0.0965	0.1015	0.951
X_4	0.0456	0.0952	0.479
X_5	0.4291	0.2860	1.500

* Significant at 5 per cent level of probability

Table 6.20. The regression coefficients of output on various inputs, standard error of regression coefficients and 't' values in the model fitted for bittergourd. Class III

	Regression coefficient (b_i)	Standard error S.E. (b_i)	't' values
X_1	-0.2560	0.3086	0.830
X_2	0.2324	0.0619	2.697**
X_3	0.1650	0.1986	0.831
X_4	-0.0748	0.1841	0.406
X_5	0.6250	0.2546	2.455*

* Significant at 5 per cent level of probability
** Significant at 1 per cent level of probability

Table 6.21. The regression coefficients of output on various inputs, standard error of regression coefficients and 't' values in the model fitted for bittergourd. Sample as a whole.

	Regression coefficient (b_i)	Standard error S.E. (b_i)	't' values
X_1	-0.0231	0.1390	0.165
X_2	0.250	0.0527	4.365**
X_3	0.0535	0.0733	0.730
X_4	0.0527	0.0736	0.716
X_5	0.5692	0.0913	6.235**

** Significant at 1 per cent level probability

The positive regression coefficients associated with manures and fertilizers indicated that there was a positive response of total returns to expenditure on manures and fertilizers for all the classes. A rupee of additional expenditure on manures and fertilizers would increase the total returns by 25 per cent, 15 per cent, 23 per cent and 25 per cent for the four classes when all other factors were held constant at their geometric mean levels.

The elasticity coefficients associated with land were found to be positive for the four classes and was significant except in class II. Its magnitude varied from 0.4718 for class I to 0.6478 for the aggregate.

The regression coefficients, their standard error and their significance in the model fitted for ashgourd are given in Tables 6.22, 6.23, 6.24 and 6.25 respectively. Negative regression coefficients associated with plant protection indicated that any additional expenditure on plant protection would reduce the total returns (Y) from the cultivation of ashgourd. A positive and significant elasticity coefficient for manures and fertilizers in class I and the sample as a whole indicated that any additional expenditure on manures and fertilizers, would increase the total returns (Y) and one rupee of additional expenditure on manures and fertilizers would increase the total returns by Rs.22 when all other inputs were held constant at their geometric mean levels.

Table 6.22. The regression coefficients of output on various inputs, standard error of regression coefficients and 't' values in the model fitted for ashgourd. Class I

	Regression coefficient (b_i)	Standard error S.E. (b_i)	't' value
X_1	0.1013	0.2604	0.389
X_2	0.2390	0.1371	1.746*
X_3	-0.1358	0.1717	0.791
X_5	0.5694	0.2342	2.431*

* Significant at 5 per cent level of probability

Table 6.23. The regression coefficients of output on various inputs standard error of regression coefficients and 't' values in the model fitted for ashgourd. Class II

	Regression coefficient (b_i	Standard error S.E. (b_i)	't' value
X_1	0.1497	0.2829	0.5290
X_2	0.1781	0.2071	0.8600
X_3	-0.0567	0.2231	0.254
X_5	0.5790	0.6057	0.957

Table 6.24. The regression coefficients of output on various inputs, standard error of regression coefficients and 't' values in the model fitted for ashgourd. Class III

	Regression coefficient (b_i)	Standard error S.E. (b_i)	't' value
X_1	-0.288	0.4067	0.710
X_2	0.207	0.1443	1.441
X_3	-0.1146	0.1809	0.616
X_5	0.6818	0.2185	3.120**

** Significant at 1 per cent level of probability

Table 6.25. The regression coefficients of output on various inputs, standard error of regression coefficients and 't' values in the model fitted for ashgourd. Sample as a whole.

	Regression coefficient (b_i)	Standard error S.E. (b_i)	't' value
X_1	0.0695	0.1519	0.458
X_2	0.2153	0.0832	2.586**
X_3	-0.0942	0.1027	0.917
X_5	0.6061	0.1123	5.395**

** Significant at 1 per cent level of probability

It emerges from the foregoing analysis that both in the cases of bittergourd and ashgourd, contribution of two inputs namely manures and fertilizers and land towards total income were found to be significant and positive explaining there by the possibility of further increase in the total income by the use of these inputs.

Negative regression coefficients associated with two variable inputs namely human labour in the case of bittergourd and plant protection chemicals in the case of ashgourd indicated that total income (Y) responded negatively to the increase in these inputs. The involvement of human labour especially family labour in the production of bittergourd was found to be high. This indicated the need of alternative employment opportunities for family labour. The attack of pest and diseases on ashgourd was reported to be much less when compared to bittergourd in the study area. But the farmers were indiscriminately using pesticides without proper identification of disease or pest attack. So the farmers should reduce the application of plant protection chemicals on ashgourd and should be done only after proper identification of the disease or pest attack.

Returns to scale

By returns to scale is meant the behaviour of production or returns when all the productive factors are increased or decreased simultaneously and in the same ratio. In Cobb-Douglas production

function regression coefficients are the production elasticities of each variable input. Therefore, the summation of regression coefficients (Σb_i) of all the input variables provides us directly with a ready estimate of returns to scale. If sum of b_is is not significantly different from one, constant returns to scale is indicated. If sum of b_is is less than one, decreasing returns to scale is indicated, and if it is greater than one, increasing returns to scale is indicated. Returns to scale (Σb_i) were tested by applying 'F' values for being significantly different from one and the results are presented in Table 6.26.

The sum of regression coefficients (Σb_i) were found to be significantly less than one indicating decreasing returns to scale for bittergourd in class III. For the aggregate also Σb_i was found to be less than one indicating decreasing returns to scale. In class I and class II a sum of b_is not significantly different from one indicated constant returns to scale. In the case of ashgourd, for all the classes sum of regression coefficients were less than one and indicated decreasing returns to scale, in these classes.

The study of input-output relationships in the production of bittergourd and ashgourd based on functional analysis indicated that farmers can increase the total returns from both the crops by increasing the use of certain inputs like manures and fertilizers and land. The expenditure on human labour and plant protection

Table 6.26. Returns to scale ($\leq b_i$) and their significant difference from one in the model fitted for bittergourd and ashgourd

Crop	Returns to scale ($\leq b_i$)			
	Class I	Class II	Class III	Aggregate
Bittergourd	0.9702	0.9638	0.6916*	0.9023*
Ashgourd	0.7739*	0.8501*	0.4860*	0.7967*

* Significant at 5 per cent level of probability

should be reduced so that there will be an increase in net returns to farmer. In these circumstances the resource use efficiencies and existing and optimum allocation of these inputs in the present production situation could be studied from marginal productivity analysis.

Marginal productivity analysis

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

In the present study all the inputs in physical terms except land were changed into values. Therefore, marginal value products and marginal value productivity ratios at factor costs have the same value except for land. In the case of land, the opportunity cost of land was taken as Rs.1,000 per acre and marginal value productivity to factor cost ratio was worked out accordingly.

Marginal value products of all inputs were worked out at their geometric mean levels. For efficient and optimum use of one input in the existing production situation, marginal value productivity to factor price ratio $\frac{MVP\ x_i}{P\ x_i}$ should be equal to one or in other words MVP x_i should be equal to price of x_i. Marginal value productivity to factor cost ratios significantly different from unity would indicate whether the resources are used efficiently or not. When resources are used inefficiently, a reallocation of the resources in the existing production situation would increase efficiency of production. For this optimum level of resources were worked out at their geometric mean levels.

Marginal value products and marginal value products to factor cost ratios for bittergourd can be seen from Table 6.27. A negative marginal value product of human labour for bittergourd in classes I, III and for the sample as a whole showed that this factor was used in excess quantities. By reducing the use of human labour, production could be shifted from a stage of negative returns (third stage of production) to a stage of diminishing returns (2nd stage of production). Marginal value productivity to factor cost ratio greater than one for a factor would indicate sub-optimum level of use of the particular input. Thus marginal value productivity of manures and fertilizers (x_2) in all classes indicated these state of affairs in the use of this resource in the production of bittergourd. Marginal value productivity to factor cost ratios of crop

protection (x_3) showed a sub-optimum level of use in classes I and III and an excess use in class II and for the sample as a whole. Marginal value productivity of pandalling (x_4) indicated that farmers in class I, who were having least area under bittergourd cultivation as compared to class II and III should use better quality materials for making pandals instead of using low quality materials. Only strong pandals can withstand the heavy wind and can avoid crop losses in the area. Farmers coming under class III who were having largest areea of cultivation were using high quality materials for making pandals and it is found that any additional expenditure on pandalling would reduce the total returns (Y). Irrespective of classes, land showed high marginal value product which could be explained as 'output increases in proportion to the area' if other factors remain constant.

Existing and optimum levels of inputs such as manures and fertilizers, crop protection chemicals and pandalling in the production of bittergourd are presented in Table 6.28. Expenditure on manures and fertilizers could be increased from the existing level of Rs.266.68 to Rs.631.21 in class I, from Rs.635.33 to Rs.935.70 in class II, from Rs.1,000 to Rs.2643.80 in class III. For the aggregate sample expenditure could be increased from Rs.464.51 to Rs.1,132.24. A significant difference between existing and optimum levels of crop protection chemicals were found in class III. In this class, farmers should increase their expenditure from

Table 6.27. Marginal value products ($MVPx_i$) and Marginal value products and factor price ($MVPx_i/Px_i$) ratio in production of bittergourd

Variables	Category							
	Class I		Class II		Class III		Aggregate	
	$MVPx_i$	$MVPx_i/Px_i$	$MVPx_i$	$MVPx_i/Px_i$	$MVPx_i$	$MVPx_i/Px_i$	$MVPx_i$	$MVPx_i/Px_i$
X_1	-0.23	-0.23	2.50	2.50	-1.71	-1.71	-0.11	-0.11
X_2	2.36	2.36	1.47	1.47	2.64	2.64	2.44	2.44
X_3	1.22	1.22	1.96	1.96	2.04	3.04	0.96	0.96
X_4	2.80	2.80	0.83	0.83	0.96	0.96	0.72	0.72
X_5	77.43	7.74	62.75	6.27	72.60	7.26	83.61	8.36

Table 6.28. Existing and optimum levels of inputs at their geometric mean levels in the production of bittergourd (in Rs.)

Particulars	Class I		Class II		Class III		Aggregate	
	Existing	Optimum	Existing	Optimum	Existing	Optimum	Existing	Optimum
Manures and fertilizers (X_2)	266.68	631.21	635.33	935.70	1000.00	2543.80	464.51	1132.24
Crop protection (X_3)	152.05	185.48			618.01	1877.07	252.90	242.20
Pandalling (X_4)	211.83	595.20	331.13	274.88			231.80	238.60

an existing level of Rs.618.01 to an optimum level of Rs.1,877.01. Land had highly significant marginal value productivity to factor cost ratios, in all classes. Since supply of land is inelastic, its level in the existing production situation is assumed to be fixed and that optimum levels of land is not worked out. Optimum levels of human labour is also not worked out since its marginal value productivity was negative. A negative marginal value product indicated that production was taking place in a stage of negative returns (third stage of production) and reallocation of resource would be meaningless in this stage.

Marginal value products and marginal value products to factor cost ratios for ashgourd are given in Table 6.29. Marginal value products of human labour was less than one in class I, II, III and aggregate. This indicated excess use of human labour in the production of ashgourd. Existing and optimum level of inputs in the production of ashgourd is given in Table 6.30. From this table it is clear that expenditure on human labour should be reduced from its existing level of Rs.405.50 to Rs.104.60 in class I, from Rs.736.20 to Rs.395.50 in class II, from Rs1510.08 to Rs.1254.27 in class III and from Rs.602.50 to Rs.119.10 in aggregate.

Marginal value productivity to factor cost ratios of manures and fertilizers (x_2) were found to be greater than one indicating sub-optimum use of this resource in all classes. Existing and

Table 6.29. Marginal value products ($MVPx_i$) and Marginal value products and factor price ($MVPx_i/Px_i$) ratios in production of ashgourd

Variables	Category							
	Class I		Class II		Class III		Aggregate	
	$MVPx_i$	$MVPx_i/Px_i$	$MVPx_i$	$MVPx_i/Px_i$	$MVPx_i$	$MVPx_i/Px_i$	$MVPx_i$	$MVPx_i/Px_i$
X_1	0.26	0.26	0.54	0.54	0.83	0.83	0.19	0.19
X_2	1.76	1.76	1.39	1.39	1.79	1.79	1.66	1.66
X_3	-1.52	-1.52	-0.67	-0.67	-1.14	-1.14	-1.04	-1.04
X_5	44.51	4.45	35.53	3.55	29.22	2.92	39.86	3.98

Table 6.30. Existing and optimum levels of inputs at their geometric mean levels in the production of ashgourd (in Rs.)

Particulars	Class I		Class II		Class III		Aggregate	
	Existing	Optimum	Existing	Optimum	Existing	Optimum	Existing	Optimum
Human labour (X_1)	405.50	104.60	736.20	395.50	1510.08	1254.27	602.50	119.10
Manures and fertilizers (X_2)	140.28	246.82	339.62	470.61	503.50	901.50	222.84	369.00

optimum level of use of manures and fertilizers is given in Table 6.30. From the table it is clear that expenditure on this input could be increased from Rs.140.28 to Rs.246.82 in class I, from Rs.339.62 to Rs.470.61 in class II, Rs.503.50 to Rs.901.50 in class III and from Rs.222.84 to Rs.369.00 in aggregate.

Marginal value productivity to factor cost ratios of crop protection chemicals (x_3) were negative in ali classes. This indicated excess of this input in production of ashgourd. In the particular area of study, it was reported by the farmers that attack of pest and diseases on ashgourd was comparatively very less when compared to bittergourd. So application of insecticides and fungicides should be reduced in the cultivation of ashgourd.

Marginal value productivity to factor cost ratios of land (x_5) were very high in all classes indicating sub-optimum use of this resources. Total returns (Y) would increase if farmers would increase the area under cultivation of ashgourd. But optimum levels of this resource are not worked out since supply of land is inelastic and its level is assumed to be fixed in the existing production situation, eventhough the scope of increasing area under cultivation cannot 'be ruled out where ever leasing in of land is practiced.

It emerges from the ultimate analysis that utilisation of various resources in the production of bittergourd and ashgourd

were not efficiently done. These was also a good deal of variation in the utilisation of resources in the four size classes. The contribution of two variables namely manures and fertilizers and land towards total income from bittergourd and ashgourd were found to be significant and positive, explaining thereby further increase in the total income from both the crops by the use of these inputs. Vegetable farmers were not using manures and fertilizers optimally, thus they should be advised to use this critical input efficiently. The marginal value productivity ratios also indicated that the scope of augmenting the production of both bittergourd and ashgourd by increasing the use of these inputs.

Elasticity coefficient of inputs, particularly labour, indicated an excess use of this input for both bittergourd and ashgourd. Negative marginal value productivity of labour supported the hypothesis that in agriculture marginal product of labour is negative or zero. Yet it would be surprising that apart from family labour, a lot of hired labour is also used in vegetable cultivation. One reason for this is that for certain relatively difficult operations, hired labour is generally used. It should also point to the low out-turn of work of hired labour. Negative marginal value productivity of crop protection in the case of ashgourd suggested that farmers should shift their expenditure from crop protection chemicals to manures and fertilizers if they want to increase their income from ashgourd.

Part II

Marketing

Marketing is as critical to better performance in agriculture as farming itself (Acharya and Agarwal, 1987). An efficient marketing system always pays dividend to the producers and safeguards interests of the consumers as well. Quite often than not, it is complained that the growers, more so the vegetable growers, do not get remunerative prices for their produce while consumers have to pay higher prices for the same. This, it is said is so because, a large number of intermediaries reap the maximum share of consumers' price and the producers get only a marginal benefit over the costs incurred by them in producing these commodities. The problem is further aggravated by high marketing costs and frequent price variations in vegetable marketing due to the seasonal nature of production and variations in quality and size.

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

Before marketing and immediately after harvest certain functions have to be performed by the farmers. Harvested vegetables should be cleaned, in order to remove soil, dust or spray residues on them. After cleaning, they should be packed in gunny bags.

Usually gunny bags which can hold 60 or 70 kg are used for packing purpose. The produce is then transported to the market.

So the vegetables immediately after harvest have to be transported either to the wholesale market or to the retail shops. Transportation of vegetables is generally done in bus, jeep, tempovan or lorry. When only small quantities of vegetables are to be transported, transportation is done in bus, whenever large quantities are to be transported, farmers in nearby areas hire a jeep or tempovan and vegetables are transported in this. Transportation cost varied according to the mode of transportation and distance to the market from farm gate. Sample farmers generally sold their vegetables at the Thrissur wholesale vegetable market.

Market structure

The term 'market structure' refers to those organizational characteristics of the market which influence the nature of competition and pricing, and effect the conduct of business firms (George and Singh, 1970). It also includes the manner of the operations of the market (Acharya and Agarwal, 1987).

Vegetable farmers of Puthur and Pananchery Panchayats in general take their produce to Thrissur vegetable market. There are no village buyers or pre-harvest contractors for vegetables in these panchayats but there are several retail vegetable shops

in both the panchayats. The method of direct selling of vegetables to consumers is found to be very rare in the study area. Consumers in general can buy vegetables either from the wholesale dealers in Thrissur vegetable market or from the retailers in the area.

Marketing channels

Marketing channels are the routes through which products move from producers to consumers. The different marketing channels identified in the marketing of bittergourd and ashgourd in the study are given below.

1. Producer - Consumer
2. Producer - Retailer - Consumer
3. Producer - Wholesaler - Consumer
4. Producer - Wholesaler - Retailer - Consumer
5. Producer - Commission agent - Wholesaler - Consumer
6. Producer - Commission agent - Retailer - Consumer
7. Producer - Commission agent - Wholesaler - Retailer - Consumer

The most important marketing channel identified is Producer - Commission agent - Wholesaler - Retailer - Consumer.

Distribution of the farmer respondents according to the type of buyers is given in Table 6.31. Out of the total sample farmers 75 per cent of farmers sold their vegetables to wholesalers through commission agents. Five per cent sold their produce to

Table 6.31. Distribution of the farmer respondents according to the type of buyers

Product sold to	Puthur	Pananchery	Total
Wholesalers through commission agents	37 (74.00)	38 (76.00)	75
Wholesalers and retailers	1 (2.00)	1 (2.00)	2
Wholesalers and consumers	2 (4.00)	3 (6.00)	5
Retailers and consumers	3 (6.00)	3 (6.00)	6
Retailers	2 (4.00)	2 (4.00)	4
Wholesalers, retailers and consumers	3 (6.00)	2 (4.00)	5
None	2 (4.00)	1 (2.00)	3
Total	50 (100.00)	50 (100.00)	100

Figures in parentheses show the percentages to the total

both wholesalers and consumers, another six per cent to both retailers and consumers and four per cent exclusively to retailers.

Marketing efficiency

There are two aspects to marketing efficiency. One is technical efficiency and the other is economic efficiency. The latter can be assessed by different methods such as marketing costs and marketing margins, degree of market integration and temporal and spatial price differences. In the present study marketing efficiency is assessed on the basis of marketing costs and margins. In the marketing of agricultural commodities, the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of farm produce is often known as farm retail spread or price spread (Acharya and Agarwal, 1983).

There are two concepts of marketing margins such as concurrent margin and lagged margin. The concept of 'concurrent margins' is used in the present study in which the prices prevailing at successive stages of marketing at a given point of time are compared. In this study average prices received by the vegetable farmers are compared with prices which prevailed in Thrissur wholesale and retail vegetable markets. Marketing margins for bittergourd and ashgourd is given in Table 6.32.

Table 6.32. Marketing margins and costs (in paise per kilogram) for bittergourd and ashgourd in Thrissur market

Sl. No.	Shares	Bitter-gourd	Percent-age	Ashgourd	Percent-age
1	Producers sale price or price paid by wholesaler	358	65.45	150	49.50
2	Transportation cost incurred by the producer	6	1.09	6	1.98
3	Commission charges paid by the producers to the commission agents	28	5.18	28	9.24
4	Net price received by producer	324	59.23	116	38.28
5	Fixed cost on investment for wholesaler	12	2.19	12	3.96
6	Working cost of wholesaler	10	1.83	10	3.30
7	Wholesaler's net margin	90	16.45	72	23.76
8	Price received by wholesaler or price paid by retailer	470	85.92	244	80.53
9	Fixed cost on investment for retailer	8	1.46	8	2.64
10	Transport cost incurred by retailer	4	0.73	4	1.32
11	Other cost incurred by retailer	3	0.55	3	0.99
12	Retailers' net margin	62	11.33	44	14.52
13	Retailers' sale price or consumers' price	547	100.00	303	100.00

In the case of bittergourd out of Rs.5.47 per kilogram paid by consumer Rs.3.58 (65.45 per cent) went to the producer seller and in the case of ashgourd producers' share was only Rs.1.50 per kilogram (49.50 per cent) out of Rs.3.00 per kilogram paid by the consumer. The wholesalers reaped a net margin of Rs.0.90 per kilogram (16.45 per cent) for bittergourd and Rs.0.72 (23.76 per cent) for ashgourd. The retailers' net margin was Rs.0.62 per kilogram (11.33 per cent) for bittergourd and Rs.0.44 per kilogram (14.52 per cent) for ashgourd.

Both in the case of bittergourd and ashgourd wholesalers' margins were higher than the retailers' margins. Marketing costs incurred by the intermediaries were very low. The wholesalers' margin accounted for 16.45 per cent of the consumers' price of bittergourd and 23.76 per cent of the consumers' price of ashgourd whereas marketing costs incurred by wholesalers accounted for 4.02 per cent and 7.26 per cent of the consumers' price respectively for bittergourd and ashgourd. So it was evident that the middle men took away a substantial share from consumers' rupee.

The producers' net share in consumers' rupee was Rs.3.24 per kilogram (59.23 per cent) for bittergourd and Rs.1.16 per kilogram (38.28 per cent) for ashgourd. Marketing margins accounted for the rest.

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

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

The index of marketing efficiency was 1.45 for bittergourd and 0.62 for ashgourd. The higher the ratio, the higher the efficiency of the marketing system. The ratio which was higher for bittergourd indicated that the economic efficiency of marketing of bittergourd was more when compared to ashgourd.

A high marketing margin could be justified only when good services are rendered, and low net margins were realised by the intermediaries. But in the present study it was evident that the net margins realised by the intermediaries were unduly high, and the marketing cost incurred were low. Thus we can conclude that the efficiency of marketing of two vegetables namely bittergourd and ashgourd in Thrissur market was low. This is the reason why the producers do not get remunerative prices for their produce while consumers have to pay higher price for the vegetables.

Summary

SUMMARY

The present study on the production and marketing of two vegetables namely bittergourd and ashgourd in Ollukkara block in Thrissur district was undertaken during the year 1991-92. The study aimed at estimation of cost of cultivation, cost of production, resource use efficiency, marketing cost and margins and to identify the marketing channels.

The study is based on a sample of farmers and traders. Multistage random sampling was adopted for selection of farmers and data were collected by personal interview method with the aid of a well structured interview schedule. Another well structured schedule was used to collect data from traders.

The total cost of cultivation on per hectare basis calculated on various cost concepts revealed that costs were higher for bittergourd than ashgourd. The cost A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 for bittergourd were Rs.13,584.55, Rs.13,914.53, Rs.13,964.23, Rs.15,958.24, Rs.20,562.37 and Rs.22,556.38 respectively where as the corresponding figures for ashgourd were Rs.6,630.22, Rs.6,910.22, Rs.7,012.22, Rs.8,689.80, Rs.9,360.07 and Rs.11,037.67 respectively.

The input-wise costs incurred for bittergourd and ashgourd showed that human labour was the largest single item of expenditure

in both cases. Percentage shares of this input to total cost were 40.87 for bittergourd and 39.22 per cent for ashgourd. The percentage shares of family labour and hired labour to total labour cost were, 41.56 and 28.44 for bittergourd and 54.24 and 45.76 respectively for ashgourd. The actual days of labour employed were 218 mandays per hectare for bittergourd and 175 mandays per hectare for ashgourd. Labour productivity for bittergourd and ashgourd were 0.84 quintals per manday and 0.94 quintals per manday respectively. Manures and fertilizers constituted the second largest single item of expenditure and its shares were 21.80 per cent (Rs.4,917.44) for bittergourd and 23 per cent (Rs.2,538.91) for ashgourd. In the case of bittergourd the item 'miscellaneous expenses' which included the cost of pandalling materials was the third largest item of expenditure and its share was 12.61 per cent (Rs.2,841.09). The rental value of land (owned and hired) was Rs.1,677.60 in the case of ashgourd and it was the third largest single item of expenditure for ashgourd.

A comparison of the yield of bittergourd and ashgourd on per hectare basis showed that the yield obtained from a hectare of land of bittergourd was less but the corresponding value of bittergourd was high. This is due to the reason that the value of unit output of bittergourd is 2.4 times the value of unit output of ashgourd. Yield obtained from hectare of bittergourd and ashgourd also showed that there is an inverse relation existing between the

size of holding and yield per hectare. This could be explained by a relatively lesser amount of application of certain critical inputs like manures and fertilizers as holding size increases.

Cost of production per quintal of bittergourd based on costs A_1, A_2, B_1, B_2, C_1 and C_2 were Rs.98.00, Rs.100.60, Rs.100.90, Rs.115.00 Rs.148.00 and Rs.163.00 respectively corresponding figures for ashgourd were Rs.40.00, Rs.42.00, Rs.42.00, Rs.53.00, Rs.56.00 and Rs.66.00 respectively. Cost of production of bittergourd based oon costs A_1, A_2, B_1, B_2, C_1 and C_2 were 2.45, 2.39, 2.40, 2.16, 2.64 and 2.46 times the respective costs of production of ashgourd. The higher costs of production of bittergourd could be explained as due to certain additional items of expenditure such as costs of pandalling which includes both the cost of pandalling materials and also the cost of labour incurred in making pandals. Since the attack of pests and diseases was reported to be more on bittergourd when compared to ashgourd, costs of plant protection materials was higher in bittergourd.

Input-output ratio for both bittergourd and ashgourd showed that returns generated from a rupee invested was always greater than one. In bittergourd a one rupee invested returned Rs.3.11, Rs.3.04, Rs.3.03, Rs.2.65, Rs.2.06 and Rs.1.88 based on costs A_1, A_2, B_1, B_2, C_1 and C_2, whereas the corresponding figures for ashgourd were Rs.3.73, Rs.3.58, Rs.3.53, Rs.2.84, Rs.2.64 and Rs.2.24 respectively for the corresponding costs.

Bulkline cost per quintal on cost C_2 basis was Rs.220 for bittergourd and Rs.85 for ashgourd. This was the cost at which 85 per cent of total output was supplied by 70 per cent of the cultivators.

Farm business income or profit at cost A_2 of bittergourd for the three size classes were Rs.31,784, Rs.26,404 and Rs.25,330 respectively and for ashgourd the corresponding figures were Rs.21,924.47, Rs.14,759.30 and Rs.11,342.29. The farm business income of bittergourd were 50, 78.8, 123.3 per cent higher than that for ashgourd. Own farm business income of bittergourd were Rs.31,784.05, Rs.26,404.25 and Rs.23,830.44 respectively for the three size classes and were Rs.21,924.47, Rs.14,759.30 and Rs.9,842.29 for ashgourd. Family labour income in the production of bittergourd were Rs.29,756.05, Rs.24,403.95 and Rs.21,736.85 for the three size classes. The corresponding income for ashgourd were Rs.20,049.47, Rs.13,041.80 and Rs.8,264.30. Family labour income for bittergourd were found to be 48.4, 87.1 and 163.02 per cent higher than that of ashgourd.

Net income also showed that production of bittergourd always returned a higher income than ashgourd. Net income from the production of bittergourd were 25.2, 69.8 and 141.7 per cent higher than that of ashgourd for the three size classes.

Production function analysis was done for both bittergourd and ashgourd. Area in cents, expenditure on human labour, cost of manures and fertilizers, cost of plant protection chemicals and cost of pandalling materials were the independent variables considered for bittergourd. The independent variables in the function, explained 68, 48, 55 and 81 per cent variations in the output for the different size classes. In the case of ashgourd the independent variables explained 43, 22, 71 and 74 per cent variations in the output for the different size classes.

The regression analysis revealed that both in the case of bittergourd and ashgourd contribution of two variable inputs namely manures and fertilizers and land towards total income were found to be significant and positive explaining there by the possibility of further increase in the total income by the use of these variable inputs. A one rupee additional expenditure on manures and fertilizers in the case of bittergourd would increase the total returns by 25 per cent, 15 per cent, 23 per cent and 25 per cent for the three classes and for sample as a whole respectively and in the case of ashgourd by 23 per cent, 17 per cent, 20 per cent and 21 per cent when all other factors were held constant at their geometric mean levels. Negative regression coefficients associated with two variable inputs namely human labour in the case of bittergourd and plant protection chemicals in the case of ashgourd indicated that total income (Y) responded negatively to the increase in these inputs.

Marginal value productivity to factor cost ratios of bitter-gourd showed that expenditure on manures and fertilizers could be increased from the existing level of Rs.266.68 to Rs.631.21 in class I, from Rs.635.33 to Rs.935.70 in class II, from Rs.1,000 to Rs.2,643.80 in class III and from Rs.464.51 to Rs.1,132.24 for the sample as a whole.

In the case of ashgourd expenditure on this input could be increased from Rs.140.28 to Rs.246.82 in class I, from Rs.339.62 to Rs.470.61 in class II, Rs.503.50 to Rs.901.50 in class III and from Rs.222.84 to Rs.369.00 for the sample as a whole. Marginal value productivity to factor cost ratios of land were very high in all classes indicating sub-optimum use of this resource. Negative marginal value productivity of labour supported the hypothesis that in agriculture marginal product of labour is negative or zero. Negative marginal value productivity of crop protection in ashgourd suggested that farmers should shift their expenditure from crop prtoection chemicals to manures and fertilizers if they want to increase their income from ashgourd.

Vegetable farmers of Puthur and Pananchery panchayats in general take their produce to Thrissur vegetable market. Out of the total sample farmers 75 per cent of farmers sold their vegetables to wholesalers through commission agents. Five per cent sold their produce to both wholesalers and consumers, six per cent to both retailers and consumers and four per cent exclusively to retailers.

In the case of bittergourd out of Rs.5.47 per kilogram paid by consumer Rs.3.58 (65.45 per cent) went to the producer seller and in the case of ashgourd producers' share was only Rs.1.50 per kilogram (49.50 per cent) out of Rs.3.00 per kilogram paid by the consumer. The producers' net share on consumers rupee was Rs.3.24 per kilogram (59.23 per cent) for bittergourd and Rs.1.16 per kilogram (38.28 per cent) for ashgourd. The percentage of price received by the farmer were 52.79 and 102 respectively for bittergourd and ashgourd.

The index of marketing efficiency ($\frac{V}{I}$ - 1) was 1.45 for bittergourd and 0.62 for ashgourd. The higher the ratio, higher is the economic efficiency of marketing system. Thus the marketing efficiency was more for bittergourd when compared to ashgourd.

References

REFERENCES

Abraham, T.P. and Bokil, S.D. (1966). Resource productivity in agriculture with special reference to labour. Indian J. agric. Econ., **21**(1): 91-103.

Acharya, S.S. and Shukla, G.C. (1976). Economic analysis of small scale farming in Southern Rajasthan. Indian J. agric. Econ., **30**(3):234.

Acharya, S.S. and Agarwal, N.L. (1987). Agricultural Marketing in India. Oxford and IBH Publishing Co., New Delhi, 380p.

Agarwal, N.L. and Sharma, R.N. (1984). Marketing of sesamum oilseed and state intervention in Rajasthan. Indian J. agric. Econ., **39**(4):243.

Anandamoysen (1984). The problems of potato marketing - A case study in West Bengal. Indian J. agric. Econ., **39**(4):239.

Babar, V.S. and Waghmare, R.K. (1985). Onion cultivation in Maharashtra. Resource use and productivity. Agricultural Situation in India, **39**(10):757-764.

Balarayan, N. (1981). Economics of production and marketing of cabbage in Gudiyattam Taluk, North Arcot District. Unpublished M.Sc.(Ag.) thesis submitted to Tamil Nadu Agricultural University, Coimbatore.

Bhatia, G.R. and Ram, G.S. (1977). Marketing efficiency in retail vegetable markets in Delhi. Agricultural Marketing, **19**(4): 13-18.

Bhatia, G.B. (1988). Agricultural marketing in India - some important issues. Agricultural Marketing, **31**(3):14-17.

Dhondyal, S.P. (1958). Input-output relation in Indian agriculture. Indian J. agric. Econ., **13**(1):31-35.

Dhondyal, S.P. and Rajkrishna (1959). Price programme for agricultural produce in India. Indian J. agric. Econ., **14**(3):23-30.

Dhondyal, S.P. (1989). Farm Management - An Economic Analysis. Friends Publication, :334.

*Dummier, E.F. (1934). Economics with applications to agriculture: 211-212.

Gaarg, J.S. and Prasad, V. (1974). Comparative profitability of vegetable crops in the vicinity of Kanpur city. Indian J. agric. Econ., **29**(2):169-170.

George, M.V. and Singh, A.J. (1970). Structure, conduct and performance of wholesale vegetable markets in Punjab. Agricultural Marketing, **13**(1):1-8.

Gill, K.S., Chahal, S.S. and Singh, B. (1989). Price spreads in Vegetables in Punjab. Journal of Research. Punjab Agricultural University, Ludhiana, **26**(1):125-134.

Govardhana, H.L. (1979). Changes in the structure of marketing dry chilli in Karnataka. A study of selected regulated market. Mysore J. agric. Sci., **13**(2):223.

Gupta, A.K. and Ram, G.S. (1979). Behaviour of marketing margins and cost of vegetables in Delhi. Indian J. agric. Econ., **34**(4):210.

Gupta, S. (1987). Investment pattern of increased income of vegetable growers in North Indian hills. Wld. agric. Econ. rur. Social abstr., 30(5):264.

Heady, E.O. (1946). Production Function for a random sample of farms. J. Fm. Econ., 28:989-1004.

Heady, E.O. and Shaw, R. (1954). Resource returns and productivity coefficients in selected farming areas. J. Fm. Econ., 36(2): 243-257.

Heady, E.O. (1957). Economics of agricultural production and resource use. Prentice Hall Inc., New York: 58.

Heady, E.O. and Dhillon, L.J. (1961). Agricultural production functions. Kalyani Publishers, Ludhiana : 228.

Hugar, L.B., Surya Prakash, S. and Lokamanya, D.S. (1983). A study of costs and margins in marketing of Brinjal in Belgaumcity. Agricultural Marketing, 26(1):23-26.

Jasdanwalla, Z.Y. (1966). Marketing efficiency in Indian agriculture. Allied Publishers, New Delhi : 2.

John D'Silva (1982). An analysis of marketing of Coorg mandarin Oranges in Mysore, Karnataka State. Mysore J. agric. Sci., 16(1):381-38

Joshi, B.D. (1968). Recent advances in marketing, standardisation, storage and transportation of fruits and vegetables in India. Agricultural Marketing, 9(1):1-7.

Kahlon, A.S. and Tyagi, D.S. (1983). Agricultural Price Policy in India. Allied Publishers, New Delhi. : 15.

Khan, B.A. and Alam, S.N. (1988). Effect of land reforms on resource use efficiency in Jammu and Kashmir. Agricultural Situation in India, 43(1):33-37.

Kiresur, V.R. and Kumar, M.N. (1988). Impact of regulation on vegetable marketing in India. A case study of Dharwad district of Karnataka State. Indian J. Agricultural Marketing, 2(1):23-30.

Latha Bastine, C. and Radhakrishnan, V. (1988). Economics of Banana cultivation in Irinjalakkuda Block in Trichur District. Indian J. agric. Econ., 43(3):514-515.

Mital, S.P. and Srivastava, G. (1975). Onion is a cash crop. Financing Agriculture 7(2):18-20.

Muraleedharan, P.K. (1987). Resource use efficiency in Kole lands in Trichur District. Indian J. agric. Econ., 42(4):579-586.

Nagaraj, N., Chandrakanth, M.G. and Ramanna, R. (1985). Market appraisal for a few fruits and vegetables. Indian J. Marketing, 16(4):13-20.

Nahatkar, B.S. and Pant, S.P. (1984). Farm profitability, resource productivity in cultivation of chillies in Chhindwara district of Madhya Pradesh. Agricultural Situation in India, 39(6): 421-424.

Naidu, M.R. and Rao, A.T. (1977). A study on costs, returns and marketing of brinjal crop in Tenali area of Guntur district, Andhra Pradesh. Financing Agriculture, 9(2):12-14.

Nirmal Singh and Bal, H.S. (1967). Economics of commercial crops in Punjab. Indian J. agric. Econ., 22(1):115.

Ojha, G.D., Anand Kumar, V. and Samba Murthy, M. (1983). Role of middlemen in Agricultural Marketing - An empirical assessment. Indian J. Marketing, 13(5):3-12.

Pandey, R.M. (1990). Horticultural crops - New vistas for growth. Survey of Indian Agriculture. Kasturi and Sons, Madras: 177-187.

Panse, V.G. (1958). Problems and techniques in the study of the cost of production in agriculture. Indian J. agric. Econ., 13(3):9-10.

Patel, R.K., Sirohi, A.S. and Sharma, B.M. (1968). Productivity and allocation of resources in the production of hybrid Bajra in Delhi territory. Indian J. agric. Econ., 23(3):146.

Peter, D. (1974). Input-output relations of Banana plantations in Kanyakumari district. Indian J. agric. Econ., 31(2):59-62.

*Prasad, G.B.R. (1979). Price spread for selected vegetables in Bangalore city. Indian J. agric. Econ., 34(4):211.

Puttaswamy, N. (1979). Cost structure and production pattern of potato. Madras agric. J., 66(2):130-133.

Rahman, M.M. and Islam, M.M. (1988). Resource use and farm efficiency in Bangaladesh - An emperical investigation. Economic Affairs India, 30(7):477.

Rajkrishna (1974). Some production functions for the Punjab. Indian J. agric. Econ., 19(3&4):87-97.

Ram, G.S. and Gupta, A.K. (1980). A comparative analysis of business structure of vegetable traders in Delhi. Agricultural Marketing, 23(3):9-12.

Ramamoorthy, K., Rajagopalan, V. and Varadarajan, S. (1984). Structure, conduct and performance of Tomato marketing in Coimbatore. Indian J. Marketing, 14(5):19-22.

*Ramasamy, C. (1981). Problems in production and marketing of major vegetables in Coimbatore district. (i) Brinjal and (ii) Bhindi. Res. Rpt.:19, Department of Agricultural Economics, Centre for Agricultural and Rural Development Studies, Tamil Nadu Agricultural University, Coimbatore.

Randev, A.K., Sharma, R.K. and Tewari, S.C. (1990). Resource use efficiency in Almond crop in tribal areas of Himachal Pradesh. Agricultural Situation in India, 44(11):893-897.

Rathori, M.S., Bhati, J.P. and Swarup, P.R. (1973). Economic analysis of some vegetable crops in temperate regions. Agricultural Situation in India, 31(2):178.

Rao, S.B. (1985). Factors affecting milk production - A study. Indian J. agric. Econ., 40(2):169.

Raut, R.C., Rao, J.R., Pawar and Mazire, E.A. (1984). Price spread in the marketing of vegetables grown in the vicinity of Pune city. Indian J. agric. Econ., 34(4):242.

Reddy, T.C., Reddy, S.S. and Sastri, T.V.N. (1990). Resource use efficiency in Betelvine cultivation in Cuddappah district of Andhra Pradesh. Agricultural Situation in India, 44(12): 1003.

Saraf, G.P. and Mishra, R.S. (1987). Costs and returns, labour employment and marketing of vegetable crops in Jabalpur city of Madhya Pradesh. Indian J. agric. Econ., 42(3): 462-463.

Sastri, R.K.N. (1977). Resource use and productivity in sugarcane cultivation in Krishnarajasagar area. Mysore J. agric. Sci., 11(1):117.

Selvin, J.N. (1982). Production and marketing of vegetables in Malappuram district. Unpublished M.Sc(Ag.) thesis submitted to Kerala Agricultural University, Vellanikkara, Trichur.

Shepherd, G.S. (1965). Marketing Farm Products - Economic Analysis. Iowa State University Press, Ames, Iowa, USA. 254.

Shete, V.R., Patil, R.G., Pawar and Rao, J.R. (1980). Measurement of price spread of tomatoes. Indian J. Marketing, 10(6):3-6.

Shukla, P.C. (1976). Input price effect on agricultural production and farm business income. Indian J. agric. Econ., 32(2): 135-138.

Sidhu, D.S. (1988). New thrusts in agricultural marketing in Punjab. Agricultural Situation in India, **43**(7):575-578.

Singh, K. and Mann, G.S. (1971). Determinants of marketing margins and their economic significance. Agricultural Marketing, **14**(2):1-8.

Singh, I.J., Gangwar, A.C. and Chhikara, P. and Singh, O.P. (1974). Production functions for commercial crops in Haryana. Indian J. agric. Econ., **32**(5):143-147.

Singh, K. (1975). Price spread and marketing margins for Potato. Agricultural Marketing, **18**(1):13-15.

Singh, G.N., Kushwaha, R.K.S. and Singh, S.S.D. (1980). Economics of production and marketing of green chillies in district Ghazipur, U.P. Agricultural Marketing, **23**(3):25-28.

Singh, B., Singh, A.J. and Dhawan, K.C. (1980). A study in to price spreads for wheat and paddy in Punjab State. Agricultural Marketing, **23**(1):7-11.

Singh, G.N. and Gupta, B.K. (1983). Economics of production, marketing and storage of potato in district, Farukhabad (U.P). Indian J. Marketing, **26**(2):7-12.

Singh, R. and Bhatia, J.P. (1988). Role of vegetables in increasing employment and income in hill agriculture - case of Himachal Pradesh. Indian J. agric. Econ., **43**(3):516.

Singh, R. and Rizvi, S.M.A. (1988). Comparative economics of production of soyabean and its competing crops in Uttar Pradesh. Indian J. agric. Econ., **43**(3):515.

Sivakumar, A. (1981). Economics of production and marketing of vegetables in Tiruchirappalli. Unpublished M.Sc.(Ag.) thesis submitted to Tamil Nadu Agricultural University, Coimbatore.

Srivastava, G.C. (1984). Dynamics of vegetable marketing - A micro study. Indian J. agric. Econ., 39(4):229-231.

Subrahmanyam and Doss, M.V. (1981). Credit needs and its adequacy for vegetable cultivation in Karnataka. Financing Agriculture, 13(4):15-18.

Subrahmanyam, K.V. (1988). Marketing of vegetables. An inter-state comparison of practices and associated costs. Indian J. Hort., 45($\frac{1}{2}$):153-159.

Suresh, K.M. (1980. Resource use and productivity in grape cultivation in Bangalore North Taluk of Bangalore District. Mysore J. agric. Sci., 14(3):454.

Suryaprakash, S., Venkataram, J.V. and Ramanna, R. (1979). A comparative study of price spread of selected agricultural commodities in Karnataka. Indian J. agric. Econ., 34(4):142-149.

Swarup, R., Sikka, B.S., Nadda, C.S. and Vaidya, C.S. (1985). Price spread and marketing margins for Himachal apples. Temporal and spatial analysis. Indian J. agric. Econ., 40(2):376-381.

Tej Bahadur, Parthasarathy, P.B. and Reddy, S.K. (1988). Resource use efficiency in dry farming. Agricultural Situation in India, 43(1):29-31.

Thakur, D.R., Moorthi, T.V. and Sharma, H.R. (1990). Resource use, farm size and returns to scale on tribal farms of Himachal Pradesh. Agricultural Situation in India, 44(11): 885-891.

Thomas, E.K. and Gupta, S.K. (1987). Economics of Banana cultivation: A case study in Kottayam district of Kerala. Indian J. agric. Econ., 42(3):458.

Tyade, B.M. and Patil, S.D. (1981). Price structure in marketing of selected vegetables in Maharashtra Phule market, Pune. Indian J. Agricultural Marketing, 12(3):26-39.

Venkatanarayanan (1990). Economics of chilli cultivation in Khammam district of Andhra Pradesh. Unpublished M.Sc(Ag.) thesis submitted to Andhra Pradesh Agricultural University, Hyderabad.

Vigneshwar, V. (1986). Dynamics of fruit and vegetable marketing in India. Indian J. Marketing, 17(4):29-32.

Waghmare, R.E. and Pathak, N.N. (1988). Impact of commercial crops on farm income and employment in Maharashtra. A case study of Solapur district. Indian J. agric. Econ., 43(3):516-517.

* Originals not seen

Appendices

APPENDIX-I

PRODUCTION AND MARKETING OF VEGETABLES IN OLLUKKARA BLOCK (TRISSUR DISTRICT)

Date of interview

1. Identification

1.1. Name of the village :

1.2. Name of the panchayat :

1.3. Name of the block :

1.4. Name of the farmer :

1.5. Address of the farmer :

1.6. Actual or approximate location of the house :

1.7. Name of the nearest vegetable market :

1.8. Distance to the nearest vegetable market :

2. Code No.:

3. Family size and composition

Name	Sex	Relation to the head of the household	Age	Literacy	Occupation			Annual income		
					Main	Sub	Other	M	S	C

4. Fixed Assets

4.1. Particulars of land holding (in cents)

Sl.No.		Particulars	Total	Wet	Garden	Dry	Others
1.	i	Area owned					
	ii	Area leased in					
	iii	Area leased out					
	iv	Operational area (1+2)-3					
2.	i	Value of own land					
	ii	Rent of leased out land					
	iii	Rent of leased in land					
3.	i	Land tax					
	ii	Water tax					
	iii	Panchayat tax					
	iv	Income tax					
	v	Others					

4.2. Implements and machineries

Sl. No.	Particulars	No.	Value in Rs.	Expected life	Maintenance cost
Implements					
1.	Ploughs - Wooden				
	Iron				
2.	Sprayers				
3.	Dusters				
4.	Mammutties				
5.	Crowbars				
6.	Sickles				
7.	Spades				
8.	Pickaxe				
9.	Carts				
10.	Others				

Machineries

Sl. No.	Particulars	No.	Values Rs.	Expected life	Maintenance cost

4.3. Temporary Dead Stock

Item	No.	Value	Expected life
1. Coir rope			
2. Baskets			
3. Bamboo sticks			
4. Bags			
5. Muram			
6. Others			

5. Cropping pattern

Name of crop	Season	Area in cents		No. of fragments
		Total area	Irrigated area	

Cost of cultivation of vegetables (including harvesting)

Name of crop: Variety: Area in cents:

Details of operation	Materials used			Labour used													
				Family labour						Hired labour							
				Male			Female			Child			Male			Female			Child		
	Name	Qty.	Value	No.	Hrs.	Cost	No.	Hrs.	Cost	No.	Hrs.	Cost	No.	Hrs.	Cost	No.	Hrs.	Cost	No.	Hrs.	Cost

Particulars of sales

Details of harvest	Total qty.	Actual or approximate date	Mode of sale (in percentage)					Price received per quintal				
			Sale to pre-harvest contra-ctor	Sale to village traders	Sale to consu-mers	Sale at the market	Others	Pre-harvest contr-actors	Village traders	Consumers	Sale in market	Others

Borrowings outstanding

1.a. Total amount outstanding at the beginning of the period :

1.b. Of which overdue :

1.c. Total amount repaid during the period :

1.d. Durationwise breakup of the total amount outstanding at the beginning of the period

1. Longterm Rs. Purpose

2. Mediumterm Rs. Purpose

3. Short term Rs. Purpose

1.e. Sourcewise and securitywise breakup of the above

Nature of loan	Amount	Source	Purpose	Security	Rate of interest	Repaying terms
1. L.T.						
2. M.T.						
3. S.T.						

MARKETING ASPECTS AT THE PRODUCER'S LEVEL

1. Total quantity produced :
2. Quantity retained for home consumption :
3. Quantity spoiled
   a) During physical handling :
   b) Due to perishability :
4. Method of sale:

Sl.No.	Method of sale	Quantity	Price
1	Pre-harvest contract		
2	Village merchant		
3	Direct sale to consumer		
4	Sales in wholesale market		
5	Others (specify)		

5. Cost of marketing (per quintal)

A. Cost incurred by the farmer from farm to market:

   a. Preparation for market :
   b. Loading and unloading :
   c. Transport
      i) Mode of transport :
      ii) Distance from the market :
      iii) Transport/unit/trip :
      iv) Total charges :
   d. Cleaning and grading charges:

B. Cost incurred by the farmer at the market:

a. Gate fee :

b. Stall fee :

c. Commission :

d. Brokerage :

e. Taxes :

INTERMEDIARIES

1. Type of intermediary - :

2. Name and address :

3. Type of vegetables handled :

4. Fixed costs

Sl.No.	Particulars	Amount per month	Present value	Depreciation
1	Rent paid			
2	Furniture used			
3	Permanent staff			
4	Licence fee			
5	Other items (specify)			

Working cost

Sl.No.	Particulars	Expenditure
1	Casual labour charges	
	1. Wages paid	
	2. Perquisites, if any	
2	Electricity/month	
3	Water charges/month	
4	Taxes	
	1. Sales tax	
	2. Income tax	
	3. Local tax	
	4. Professional tax	

Volume of business per year (monthwise)

Total purchase			Total sales		
Qty.	Price/unit (Rs.)	Value (Rs.)	Qty.	Price/unit (Rs.)	Value (Rs.)

Source of funds for business:

a) Total amount (Rs.)

b)

c) Borrowings (Rs.)

d) From other sources if any (Rs.)

e) Terms on which money is borrowed

****

ECONOMICS OF PRODUCTION AND MARKETING OF VEGETABLES IN OLLUKKARA BLOCK IN THRISSUR DISTRICT

By

SANDHYA V.

ABSTRACT OF A THESIS

Submitted in partial fulfilment of
the requirement for the degree of

Master of Science in Agriculture

Faculty of Agriculture
Kerala Agricultural University

Department of Agricultural Economics
COLLEGE OF HORTICULTURE
Vellanikkara - Thrissur

1992

ABSTRACT

The present investigation on the production and marketing of vegetables (bittergourd and ashgourd) in Ollukkara block in Thrissur district was undertaken during the year 1990-91. The study aimed at estimating the cost of cultivation, cost of production, input-output ratio, resource use efficiency and marketing efficiency of the two vegetables. The study also aimed at identifying the important marketing channels.

Multistage random sampling was adopted for the study.

Cost A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 per hectare were Rs.13,584.55, Rs.13,914.53, Rs.13,964.23, Rs.15,958.24, Rs.20,563.37 and Rs.22,556.38 respectively for bittergourd and Rs.6,630.22, Rs.6,910.22, Rs.7,012.22, Rs.8,689.80, Rs.9,360.07 and Rs.11,037.67 respectively for ashgourd. The largest single item of input was human labour for both bittergourd and ashgourd.

The output of bittergourd was 13830 kg per hectare and 16509 kg per hectare for ashgourd. The gross value of output at the prevailing price was Rs.42,364.63 for bittergourd and Rs.24,763.50 for ashgourd.

Cost of production per quintal of bittergourd based on cost A_1, cost A_2, cost B_1, cost B_2, cost C_1 and cost C_2 were Rs.98.00,

Rs.100.60, Rs.100.90, Rs.115.00, Rs.148.00 and Rs.163.00 respectively. For ashgourd they were Rs.40.00, Rs.42.00, Rs.42.00, Rs.53.09, Rs.56.00 and Rs.66.00 in the same order.

Input-output ratios based on cost A_1, cost A_2, cost B_1, cost B_2, cost C_2 and cost C_2 were 3.11, 3.04, 3.03, 2.65, 2.06 and 1.88 for bittergourd and 3.73, 3.58, 3.53, 2.84, 2.64 and 2.24 for ashgourd respectively.

Bulkline cost per quintal for bittergourd was Rs.220 and Rs.85 for ashgourd.

Farm business income for bittergourd and ashgourd were Rs.28,779.40 and Rs.18,133.28 respectively for the aggregate sample. Own farm business income for bittergourd and ashgourd were Rs.28,450.10 and Rs.17,853.28. Family labour income was Rs.26,406.40 for bittergourd and Rs.16,073.70 for ashgourd. Net income for bittergourd and ashgourd were Rs.19,808.25 and Rs.13,725.83 respectively. Farm investment income was Rs.22,181.26 and Rs.15,785.40 respectively for bittergourd and ashgourd.

The Cobb-Douglas production function fitted with returns (rupees) as dependent variable and area, expenditure on inputs such as human labour, manures and fertilizers, plant protection chemicals and pandalling as independent variables revealed that both in the case of bittergourd and ashgourd additional expenditure in two variable inputs namely manures and fertilizers and land

can increase the total returns. A one rupee additional expenditure on manures and fertilizers would increase the total returns by 25 per cent and 21 per cent respectively for bittergourd and ashgourd. Marginal value productivity to factor cost ratios indicated that expenditure on manures and fertilizers should be increased from the present level of Rs.464.51 to Rs.1,132.24 for bittergourd and from Rs.222.84 to Rs.369.00 for ashgourd.

The major marketing channel identified in Thrissur market for marketing of bittergourd and ashgourd was Producer - Commission agent - Wholesaler - Retailer - Consumer. The producers' net share on consumers' rupee was Rs.3.24 per kilogram (59.23 per cent) for bittergourd and Rs.1.16 per kilogram (38.28 per cent) for ashgourd. The index of marketing efficiency was 1.45 for bittergourd and 0.62 for ashgourd. The analysis of marketing efficiency revealed that the efficiency of marketing of bittergourd was higher when compared to ashgourd.