

**AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING
OF SMALL CARDAMOM IN IDUKKI DISTRICT OF KERALA**

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TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE – 641003**

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Thesis submitted in part fulfilment of the requirements for the degree of
MASTER OF SCIENCE (AGRICULTURE) IN AGRICULTURAL ECONOMICS
to the Tamil Nadu Agricultural University, Coimbatore-3.

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2010

CERTIFICATE

This is to certify that the thesis entitled “**AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF SMALL CARDAMOM IN IDUKKI DISTRICT OF KERALA**” submitted in part fulfilment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE) IN AGRICULTURAL ECONOMICS** to the Tamil Nadu Agricultural University, Coimbatore is a record of bonafide research work carried out by **Miss RASHMI RAMACHANDRAN** under my supervision and guidance and that no part of this thesis has been submitted for the award of any degree, diploma, fellowship or other similar titles and that the work has not been published in part or full in any scientific or popular journal or magazine.

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(Rashmi Ramachandran)

ABSTRACT

AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF SMALL CARDAMOM IN IDUKKI DISTRICT OF KERALA

By

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Small Cardamom (*Elletaria cardamomum*), the “Queen of spices” enjoys a unique position in the international spice market. It is the highly expensive spice after Saffron. India is the second largest producer with a significant contribution of 31.43 per cent of the world production. The high cost of production of Indian small cardamom has reduced the competitiveness of the commodity in the export market, although India produces much better quality cardamom than Guatemala. This has resulted in continuous decline in exports. Besides, the varying nature of demand pattern in the internal market also tends to affect the quantity and price in export market. Due to the increase in population most of the people have small holdings. This has an effect on the production and marketing of cardamom. To make the cultivation of Indian cardamom more economical, it is essential to improve the efficiency of resources, used in plantations and reduce the cost, taking care of the production as well as the quality of the produce. Even though cardamom has a good marketing system, there is wide fluctuation in prices. The fall in price of this crop affects the lives of thousands of farmers. In view of the economic importance of cardamom in both national and farm economy and the problems faced by farmers in production and marketing of cardamom, the present study was taken up with the following specific objectives: a) to estimate the cost associated with cultivation and maintenance of cardamom, b) to analyze the technical use efficiency in cardamom cultivation, c) to identify the marketing channel and to estimate the price spread for the

same, and d) to find out the constraints in production and marketing of cardamom to suggest suitable policy measures for its promotion.

Kerala state which occupies first position in both area and production of cardamom in India was selected for the study (Spices Board, 2008-09). Out of the 14 districts in Kerala, Idukki, known as spice village of the world, with maximum area and production under cardamom was selected for the economic analysis. Cardamom is the second major crop grown after pepper in Idukki district.

For the purpose of selecting samples, Udumbanchola taluk, having largest area and production under cardamom, was purposively selected. Within the taluk, four villages were selected randomly. A sample of 25 farmers from each of the four villages were drawn and hence the total number of sample size was fixed at 100.

For the market analysis, different intermediaries involved in cardamom marketing were studied. The primary data were collected through personal interview with the help of a pre-tested comprehensive interview schedule.

Two separate interview schedules were used *viz.*, one for the farmers and the other for the market functionaries. The survey was conducted during the months of January 2010 to February 2010. The data collected were tabulated, processed and subjected to statistical analysis.

Majority of the farmers were in the age group of 36 to 50 years. All the sample farmers were literates. The farmers had a fairly good experience in cardamom cultivation with an average of 18 years. In the district, almost all the farmers were small and marginal land holders with an average size of holding of 1.37 hectares. Most of the farmers in the study area had the cardamom plants with the age group of 3 to 5 years.

The total establishment cost (cost incurred during the first two years) was Rs. 1, 29,521.98. The major input items for which establishment cost has been incurred were labour, planting materials, manures, fertilizers, plant protection chemicals. The labour cost worked out to be Rs. 59,507.46 accounting 45.94 per cent of the total establishment cost. This was followed by planting material, manures, fertilizers and plant protection chemicals with percentage share of 19.67, 17.07, 10.12 and 6.03 respectively. Among the operations carried out by the labour, weeding and mulching operations was in

need of extensive labour force accounting around 21.03 per cent, followed by pit taking (12.87), irrigation (12.64), plant protection operations (11.14) and land preparations (9.66).

The annual maintenance cost of cardamom was worked out to be Rs. 1, 10,875.34. More than 50 per cent of total variable cost was incurred on labour. The total labour cost was Rs. 55,932.65. The other major cost items were plant protection chemicals, fertilizers and manures accounting Rs. 17, 404.81, Rs. 12, 350.90 and Rs. 10, 848.68 respectively. The respective percentage share values were 15.70, 11.14 and 9.78. Another important item was drying cost amounting to Rs. 4613.34, which accounted for 4.16 per cent.

The total variable cost was Rs. 1, 10,875.34 accounting 62.73 per cent of the total cost. The fixed cost was at Rs. 47,435.56 accounting 26.84 per cent of the total cost. Among the fixed cost items, rental value of land had huge share of 79.05 per cent of total fixed cost and other items were far below. The annualized establishment cost was Rs. 18,441.99 accounting 10.43 per cent of total cost. The average yield (dry cardamom) obtained was 576.76 kg per hectare. The cost of production worked out to be Rs. 306.47 per kg. The average price realized during 2008-09 was Rs. 550 per kg. The annual gross income was Rs. 3, 17, 217.73. The net return per hectare received from cardamom (ie., Rs. 2, 06,342.39 over the variable cost and Rs. 1, 40,464.84 over the total cost) were relatively high. So, cardamom cultivation is profitable for the farmers.

The estimates of Cobb-Douglas production function indicated that the variables like labour (mandays), irrigation (number), quantity of fertilizer and manure (kgs) were significantly influencing the yield. The R^2 value (0.8518) indicated that 85.18 per cent of the variation in the dependent variable was explained by the selected independent variables. The variable namely labour and irrigation were significant at one per cent level of probability. The variables, fertilizer and manure were significant at five per cent level of probability. The results revealed that one per cent increase in the labour and irrigation will increase the yield by 0.20 per cent, 0.09 per cent respectively, *ceterius paribus*. In the same way one per cent increase in the quantity of fertilizers and manures will increase the yield by 0.26 per cent and 0.38 per cent, *ceterius paribus*.

The technical efficiency in cardamom cultivation was worked out using stochastic frontier production function through Maximum Likelihood Estimates. Cardamom yield

was found to be 19.51 per cent less than the maximum possible output. This would indicate the scope for increasing the yield by way of reorganizing the use of existing resources given the current level of technical knowledge.

Educational status and experience of the farmers were the main socio-economic variables that significantly affect the technical inefficiency of farmers. Both the variables had negative significant effect on technical inefficiency. This showed that the farmers who were more educated and those who had good experience in cardamom cultivation tend to be more efficient in cardamom production. This may be due to their knowledge, both from education and experience, about the uses of resources in an efficient manner.

Four types of market channels were identified for cardamom in the study area and price spreads were estimated for each of the four marketing channels so as to understand the comparative efficiency in cardamom marketing through different channels of marketing. Marketing efficiency of the different marketing channels was estimated using the Shepherd's method, Acharya's approach and Calkin's index.

The analysis revealed that the price spread was lower (Rs. 116.52) in the market channel II and the share received by the farmer was 82.52 per cent of the consumer's price in this channel. Marketing efficiency analysis revealed that marketing efficiency was relatively higher at marketing channel II in both the approaches, i.e., 4.19 in Acharya's approach and 9.98 in Shepherd's method. The Calkin's index is low for the marketing channel II, which is indicative of higher efficiency. Thus the results revealed that the marketing channel II, which worked within the state with the involvement of the auction centre, had the highest efficiency.

Labour shortage during peak season, especially during harvesting time coupled with high labour cost, pest and diseases, high cost of inputs, water scarcity, delay in getting the payment from auction centre, price fluctuation and higher grading cost were some of the production and marketing constraints faced by the sample farmers. In auction centre, there was a delay in getting the payment, i.e., 21 to 23 days after the day of auction. Even if payment was made on the day of auction interest for the above said period had to be borne by the producer. For immediate disposal and cash realization, most of the farmers preferred selling their produce to local village merchants. Delay in getting the payment

from upcountry wholesalers and importers, high handling cost and lack of quality of cardamom were the major problems faced by the intermediaries.

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CHAPTER I

INTRODUCTION

The richness of the culture and the fragrance of the spices were the major sources of glory of the ancient India. It is really amazing to see that India could maintain her supremacy in the production and trade of spice even from the Vedic ages dating back to 6000 BC, to the modern era of the third millennium. The significance of the spices in the history of the world is evident from the fact that even the discovery of American continent by Columbus was accidental during the search for spices. It was the taste of “King of Spices” Pepper and flavour of the “Queen of Spices” Cardamom, which attracted Arabs and Europeans to this country and ultimately led to the foreign domain (Philip, 2003).

The term ‘Spice’ covers an extremely wide array of products. Over hundred plants are used world over as spices. Many are highly localized in their production and use. India known as the “Spice Bowl of the World” possess a wide range of agro climatic regions specially suited for the cultivation of superior quality spices. As per the Bureau of Indian Standards, 63 spices are produced in India. But Spices Board (Government of India) has listed only 52 spices. However, the International Organisation of Standards (ISO) has approved 70 spices and condiments (Jose and Joy, 2004). Indian spices are highly preferred in the global market. A glance at the contribution by different spices in export value terms during 2008-09 revealed that, chilli continues to be number one with 20 per cent share followed by cumin 10 per cent, pepper 8 per cent and turmeric 5 per cent. Mint products and spice oil and oleoresin contribute 27 per cent and 14 per cent respectively. In the export basket of spices and spice products, spice oils and oleoresins including mint products like mint oils, menthol crystals, and menthol powder contributed 40 per cent of the total export earnings (Spices Board, 2008-09).

History of cardamom

The world does not know the actual time period when cardamom originated but it is considered that the cardamom plants first came into existence in the monsoon forests of Western Ghats in southern India as a wild herb. A medicinal literature summary written in between 2nd century BC and 2nd century AD in India named Charaka Samhita

provides us with the first ever written inscriptions about cardamom. It says that cardamom is a significant constituent in many medicines and preparations. Some more books written in sanskrit language of that time mentioned about cardamom being used in some rituals and ceremonies. Greeks when initiated their exploration at this time, started importing cardamom as a digestive medicinal herb. It started to get used vastly in a number of recipes and drinks due to its heavenly flavour and fragrance. Most of the countries started to import this spice from India with the emergence of 16th century. Till 19th century, cardamom grew in the wild and was searched for in the monsoon forests. But the British colonies suggested the establishment of plantations and domesticated the crop.

About cardamom

Small Cardamom (*Elletaria cardamomum*), the “Queen of spices” enjoys a unique position in the international spice market. Cardamom is called as a versatile spice because of its usage in both sweet and salty foods. It is also referred as “Grain of Paradise”. The cardamom of commerce is the dried fruit (capsule) accounting 90 per cent of its world trade. Cardamom is a low volume, high value crop. The crop belongs to ginger family Zingiberaceae. Cardamom is a widely used spice and encompasses variety of uses. Cardamom is used in adding flavours in both foods and drinks and also used as cooking spice. It is used to treat infections in teeth and gums, digestive disorders, throat troubles, skin conditions *etc.* The oil from the seeds of cardamom and also from the left over resin is used in processed foods, tonics, liquor and perfumes. In Arabia, cardamom is used in the preparation of 'Gahwa'- a strong cardamom coffee, which shows hospitality among Arabs. In Northern Europe it is an essential ingredient in sweet foods (www.nmce.com)

Elettaria cardamomum var Major (includes wild indigenous types of Sri Lanka or Greater oblong cardamom or long cardamom) and *Elettaria cardamomum* var Minor (comprises the cultivar like Malabar, Mysore and Vazhukka) are the two varieties of cardamom identified based on size of the fruit. Various research institutions working on the crop improvement aspects of cardamom have released a number of elite location specific high yielding clones having yield potential of above 450 kg per ha and superior capsule characters. In addition to this, there are several high yielding clones grown by

cardamom farmers. The most popular and widely cultivated farmer variety is “Njallani Green Gold”, which has high yielding potential and good quality character. Other prominent selections are Palakkudy, Panikulangara-1, Vally green bold, Elarani, PNS Vaigai, Cardamom vander, Kalarickal white etc. (Anonymous, 2009)

From time immemorial India is known as the “Home of Cardamom”. In India, the natural habitat of small cardamom is the evergreen forest of Western-Ghats on the Malabar Coast of South-West India. This area is commonly known as the Cardamom Hills. It is cultivated in the southern parts of Kerala, Karnataka and Tamil Nadu. In India we have another type of cardamom, namely, the large cardamom, (*Amomum subulatum*) grown in Sikkim state and Darjeeling district of West Bengal. Small cardamom is one of the most exotic, important cash crops and second most expensive spice after saffron. The high price reflects the high reputation of this most pleasantly scented spice. In the following pages the term small cardamom will be simply referred as cardamom.

World Scenario

Cardamom crop is generally produced in the tropical regions of the world. The world’s total production relating to cardamom is around 35,000 Metric Tonnes (MT) annually. In early 1970’s India has contributed nearly 65 per cent of the total world cardamom production. A phenomenal increase in price of cardamom took place due to oil boom in the consuming sector between 1976-80 which is considered as the “growth period”. By this time Guatemala stepped up its production and became the major competitor to India. Now Guatemala is the world’s largest producer and exporter, offering stiff competition to Indian cardamom in the international market. Tanzania, Sri Lanka, El Salvador, Vietnam, Laos, Cambodia and Papua New Guinea are the other cardamom growing countries. The major producer, Guatemala records an average annual production of about 20,000-23,000 MT, which accounts 66 per cent of the global production. Its production has increased significantly from 16,694 MT in 2002 to 24,500 MT in 2006 (Thomas and Kuruvilla, 2007). India is the second largest producer with an average production of 11,500 MT. The area and production of cardamom in India and Guatemala is presented in Appendix I.

About 60 per cent of the world production is exported to Arab (South West Asia, North Africa) countries. The consumption of cardamom has sharply increased throughout the world during the last two decades. The major cardamom consuming countries are Saudi Arabia, India, Pakistan, United Arab Emirates, Norway, Sweden, Denmark, Finland, Iceland, Germany, Russia, England, United States and Japan. The percentage share of cardamom consuming countries in the world is given in Appendix II. Saudi Arabia claims to be the single largest importer of cardamom. Kuwait follows Saudi Arabia in the importing list. The other major importing countries are United Arab Emirates, China, Japan, Hong Kong, Netherlands, Singapore, and United States of America.

Indian scenario

Kerala, Karnataka and Tamil Nadu are the major cardamom producing states in India. The total area under small cardamom in India during 2008-09 was estimated to be around 71,170 ha, out of which Kerala accounts for 58.43 per cent of the total area, followed by Karnataka (35.16%) and Tamil Nadu (6.41%) (Spices Board 2008-09). The area under cardamom in India and percentage share of different states in India is shown in Appendix III. The total production of cardamom in India during 2008-09 was 11,000 MT, with Kerala accounting 77.82 per cent, Tamil Nadu 15.36 per cent and Karnataka 6.82 per cent (Spices Board, 2008-09). The national average productivity was estimated to 218 kg per ha. The production of cardamom in India and percentage share of states is given in Appendix IV. The state wise break up of area, production and productivity of cardamom for the period 2000-01 to 2008-09 is furnished in Appendix V. It is estimated that there are nearly 50,000 farmers engaged in cardamom cultivation in India. Out of them nearly 90 per cent are small and marginal farmers. About 1, 50,000 regular workers and an equal number of casual workers depend upon the cardamom plantation industry for their sustenance (Devasia, 2007).

The domestic consumption in India is more than 90 per cent of the total production in India. The share of cardamom in industrial segment is around 35 per cent. Industrial consumption of cardamom particularly by the pharmaceutical, ayurvedic formulations and cosmetics is the highest and accounts for over 45 per cent of the total

consumption. In India the share of the retail market size is highest in the West India (45%) followed by the North India (35%) and South India (30%). The demand for cardamom is increasing due to its requirement in garam masala, pan masala, sweets and in food preparation by households in the rural and urban areas (Thomas and Kuruvilla, 2007).

Indian cardamom is considered as superior quality but in the international markets India has always been out priced by Guatemala which has negligible domestic consumption, *i.e.*, 2-5 per cent, responsible for low pricing. India exports only 5-8 per cent of its total production. Exports of value added products from cardamom like cardamom oil and oleoresins to Germany, Netherlands and UK are increasing. The particulars on export quantity, value and unit value realisation of export cardamom for the period 2000-01 to 2008-09 are furnished in Appendix VI. During 2008-09 India exported 750 MT of cardamom valued Rs. 47.27 crores. This was against 500 MT valued Rs. 24.75 crores during 2007-08. Saudi Arabia accounts for 520 MT of our exports followed by Malaysia (30 MT), Japan (25 MT) and UAE (20 MT). Our exports mainly consist of high quality grades like Alleppey Green Extra Bold (AGEB) and Alleppey Green Bold (AGB) to Middle East markets especially to Saudi Arabia. The better production in India and the low production in Guatemala have resulted in the increase in our cardamom exports during 2008 (Spices Board, 2008-09).

Cardamom production in India mainly depends on rainfall. Prices go up sharply on account of lower production and huge demand. Mostly the cardamom is sold at auction centre. Now e-auction is introduced by Spices Board, Government of India at Vandanmedu (Kerala) and also in Bodinayakanur (Tamil Nadu) to ensure transparency and to assure fair market price. Cardamom is also traded in Indian commodity exchanges namely, National Multi Commodity Exchange of India and Multi Commodity Exchange of India Ltd

Kerala scenario

Kerala is the maximum contributor of cardamom to the country. Kerala occupies first position in both area and production of cardamom. Out of the 14 districts in Kerala, Idukki covers the maximum area and production. Idukki is usually called as spice village of the world. Other than Idukki district, cardamom is grown in some places of Wayanad and Palakkad district. The total area under cardamom in Kerala was 41,588 ha and the

production was 8560 MT respectively during 2008-09. The district wise area and production in Kerala is shown in Appendix VII.

Cardamom is the second major crop grown after pepper in Idukki district. It is cultivated in 33078 ha of land during the year 2008-09. The yielding area was estimated to be 26,000 ha during the year. It registered a total production of 7815 MT and productivity of 301 kg per ha in 2008-09 (Spices Board, 2008-09). Most of the cardamom farmers are of small and marginal category. The area, production and productivity of cardamom in Idukki district is given in Appendix VIII. In Idukki, out of the four taluks, the cardamom cultivation is in three taluks- Udumbanchola, Peerumedu and Devikulam. Udumbanchola taluk is the biggest and main taluk in cardamom production. Most of the farmers in Idukki cultivate the new high yielding farmer variety- “Njallani Green Gold”. This variety covers about 88.7 per cent of the total area in Idukki.

Problem focus

Cost of production is one of the important factors which determine the competitiveness of the commodity in the market. The high cost of production of Indian small cardamom has reduced the competitiveness of the commodity in the export market, although India produces much better quality cardamom than Guatemala. This has contributed to the continuous decline in exports. Besides, the varying nature of demand pattern in the internal market also tends to affect the quantity exported and the unit price. Due to the increase in population most of the people have small holdings. This has an effect on the production and marketing of cardamom. Under this situation, the cardamom producers in India have to compete with their counter parts across the world for meeting both domestic and export demand at competitive prices. Therefore, in order to make the Indian cardamom cultivation more economical, it is quite essential to improve the efficiency of resources used in plantations and reduce the cost taking care of the production as well as the quality of the produce. Even though cardamom has a good marketing system, there is wide fluctuation in prices. The price fall of this crop impacts the lives of thousands of farmers. There could be some physical, technological, economical and institutional constraints that hamper the cultivation and marketing process. In this context, a study on production and marketing of cardamom in Kerala

would enable to understand the issues and in turn to devise suitable measures to overcome the problems of the farmers.

Hypotheses

The above background had led to hypothesise the following

1. Cost associated with cultivation and maintenance of cardamom is high.
2. Technical use efficiency in the production of cardamom is low.
3. The marketing efficiency for cardamom is high.

To test, these hypotheses, the following objectives were set forth for the present study.

Objectives

The specific objectives of the study were:

- i) To estimate the cost associated with cultivation and maintenance of cardamom,
- ii) To analyze the technical use efficiency in cardamom cultivation,
- iii) To identify the marketing channel and to estimate the price spread for the same, and
- iv) To find out the constraints in production and marketing of cardamom to suggest suitable policy measures for its promotion.

Scope of the Study

The study would provide a clear understanding about cost structure, how the resources are used in the cultivation/production of cardamom, and also an overall view of cardamom marketing. The results of the price spread analysis would throw light on the extent of marketing efficiency in the present marketing system. The results, would thus, help the policy makers in formulating suitable programmes and strategies towards the development of production and marketing of cardamom in Kerala state.

Limitations of the Study

The study is confined to a particular region *viz.*, Idukki district and the conclusions drawn need to be used with caution, while generalising the findings for the state or country as a whole. This study is based on primary data, collected from sample farmers and the market intermediaries by survey method. Since many of the farmers are not maintaining proper records about farming operations, they furnished the required information from their memory and experience and hence the collected data are subjected to recall bias. However, efforts have been taken to minimize the bias by including in the interview schedule, the questions that would facilitate cross checking. Hence the findings of the study may be considered appropriate for similar situations as the one prevailing in the study area.

Organization of the Study

The study is organized under the following six chapters:

Chapter I: Introduction - Describes the importance of the topic, problem focus, hypothesis, objectives, scope and limitations of the study.

Chapter II: Concepts and Review - Concepts used in the study and a brief review of the past work done are discussed.

Chapter III: Design of the study - Explains the sampling design, data collection and tools of analysis used in the study.

Chapter IV: Description of the study area - A brief account of the agro-climatic conditions, land use and other information relevant to the present study are given.

Chapter V: Results and Discussion - A detailed discussion of the results of the study is made to draw specific inferences.

Chapter VI: Summary and Conclusion - A brief summary of work done, the salient findings, and policy implications are presented.

CHAPTER II

CONCEPTS AND REVIEW

For a better and clear understanding of concepts, one need to be aware of what they actually refer to and how various economists have preferred to look at it. Moreover, review of related concepts and past studies will give us a holistic picture that will in turn help in analyzing and understanding the problems in proper perspective.

With this background, this chapter has been divided into two sections. Section I deals with review of concepts used in the study as viewed by different authors and section II covers the review results of related studies conducted in the past.

2.1 Concepts reviewed

- i) Production
- ii) Production function
- iii) Cost concepts
- iv) Farm returns
- v) Technical efficiency
- vi) Marketing
- vii) Agricultural marketing
- viii) Marketing channel
- ix) Marketing cost
- x) Marketing margin
- xi) Price spread
- xii) Marketing efficiency

2.2 Review of previous research studies

- i) Economics of production of perennial crops
- ii) Economics of production of cardamom
- iii) Technical efficiency in production
- iv) Marketing of perennial crops
- v) Marketing of cardamom

2.1 Concepts reviewed

2.1.1 Production

According to Bhange (1962), production in economics is any activity directed towards the satisfaction of other people's wants through exchange.

Nerin (1971) defined production as the application of land, labour, capital and enterprises to the creation of new wealth.

Hansen (1972) defined production as the activities of changing form of a good at any stage from raw material to the finished product, changing the situation of a good, changing the position of a good in times and provision of some kind of services such as retailing, banking, entertaining, *etc.*

According to Seth (1985), production would be the result of blending various factors of production, *viz.*, land, labour, capital and organisation.

Pande and Mithani (1990) defined production as the creation of outputs or goods and services and considered as essential means of transformation of one set of goods into another.

Johl and Kapoor (1996) pointed out that production is a process of transformation of certain resources or inputs like land, labour, seeds, fertilizers, irrigation water into products like wheat, paddy and milk.

According to Ahuja (1997), production in economics is not merely confined to effecting physical transformation but also covered rendering of services such as transportation, financing, wholesaling and retailing.

Dewett and Chand (2001) defined production as the transformation of inputs into outputs.

Salvatore (2003) defined production as the transformation of resources or inputs into outputs of goods and services.

According to Jhingan (2004), production is an activity directed towards satisfaction of other people's wants. It excludes the work done by family members, production of articles as hobby and any voluntary help.

In the present study, production is defined as a process of converting the resources or inputs into outputs.

2.1.2 Production function

According to Koutsoyiannis (1994), production function is purely a technical relationship between factor inputs and outputs. It would describe the transformation of factor inputs into products at any particular time period.

Johl and Kapoor (1996) defined production function as a mathematical relationship describing the manner and extent to which a particular product would depend on the quantities or services of inputs used.

According to Samuelson (1998), production function would indicate maximum amount of output capable of being produced by each and every set of specified input.

Earl (2003) summarises production function as the relationship between inputs and output, given the technical capabilities of the firm.

In the present study, the production function is defined as the mathematical relationship between the inputs used in production of cardamom to the output produced.

2.1.3 Cost concepts

2.1.3.1 Fixed cost

Prasher *et al.* (1996) opined that fixed cost would include land revenue, depreciation on machinery and implements, interest on fixed capital and rental value of owned land.

Ahuja (1997) identified fixed costs as those, which were incurred in hiring the fixed factors of production whose amount would not be altered in the short run.

Maheswarappa *et al.* (1998) referred fixed cost in terms of land revenue and rental value of owned land.

Samuelson and Nordhans (1998) defined fixed costs as those costs, which do not vary with the output in the short run. They were often called overhead costs and committed for rental, maintenance, depreciation, overheads, salaries, wages, etc.

Dewett and Chand (2001) stated fixed costs were those costs that would be paid even though production had stopped temporarily and would not vary with the level of output. It included rent for buildings, interest on capital invested in machinery and salaries of the permanently employed staff.

Goswami and Challa (2007) referred fixed cost in terms of rental value of land, interest on fixed capital, depreciation, annual share of establishment cost, land revenue and plantation tax.

In the present study, fixed cost includes rental value of land, land revenue, depreciation of fixed assets, interest on fixed capital and annual share of establishment cost.

2.1.3.2 Variable cost

Prasher *et al.* (1996) opined that variable cost include costs on labour, manures and fertilizers, plant protection chemicals and interest on working capital.

Johl and Kapur (1996) defined the variable cost as the cost of using variable inputs, which would vary with the level of production.

According to Ahuja (1997), variable costs were those costs that increased on the employment of variable factors of production whose amount could be altered in the short run.

Maheswarappa *et al.* (1998) referred variable cost in terms of human labour, bullock labour, tractor power, seed, manures and fertilizers, plant protection chemicals, irrigation, repair and maintenance cost and interest on working capital.

Goswami and Challa (2007) included cost of manures and manuring, cost of labour for weeding, pruning, tapping, plant protection, watch and ward; other input cost, processing and marketing cost and interest on working capital in rubber plantations.

In the present study variable cost includes cost of labour for shade regulation, trashing and pruning, weeding and mulching, forking or earthening up, irrigation, application of manures and fertilizers, application of plant protection chemicals and harvesting, cost of manures, fertilizers and plant protection chemicals, drying cost, miscellaneous cost and interest on working capital.

2.1.4 Farm Returns

Returns refer to the income realised from crop, livestock, off-farm and non farm sources of the farm households. Here the farm income includes both the gross income and the net income.

2.1.4.1 Gross income

Singh (1975) defined the gross income as the gross value of output (main product plus by-product) of crops evaluated at harvest price in the reference year irrespective of being consumed or sold or maintained in the stock, less the value of seed.

Chauhan *et al.* (1976) referred gross farm income as the value at prevailing prices, of retained as well as marketed crop output plus the income from allied activities such as dairying, goat farming and poultry farming.

Herd (1978) defined gross family income as income received by the operator and it was calculated as the residual after making actual payments for all expenditures incurred for production inputs, excluding unpaid returns to family owned resources (land, labour or capital).

Sadhu and Mahajan (1981) defined gross output as the value of output (main product and by-product) in rupees of different crops grown on the farms.

Johl and Kapoor (1996) defined gross returns as total production times the price. Returns to fixed farm resources were equal to gross returns minus variable cost.

In the present study, gross returns is the total value of dry cardamom sold.

2.1.4.2 Net income

Forster (1973) defined net income of the farm as gross income minus variable cost of the farm business as a whole.

According to Dahiya (1976), net return could be arrived by deducting the cash and kind expenses (variable cost) incurred in the cultivation of all crops in that year from the gross income realised by the farmer from his farm produce, both the main product and by-products.

Herd (1978) calculated net family income by subtracting depreciation from gross farm family income. It is a measure of income remaining with the farm family as a return to all resources they own, adjusted to account for differences in capital endowments.

Johl and Kapoor (1996) defined net returns as gross returns minus all costs i.e., fixed and variable cost in cash or kind.

Singh *et al.* (2000) stated that the net income was the return pertaining to all factors of production over and above all charges for such factors in the cost analysis.

In the present study, net income was gross income minus total cost, where total cost was the sum of variable cost and fixed cost.

2.1.5 Technical Efficiency

Schmidt and Lovell (1979) explained technical inefficiency as the inability to produce the maximum (*i.e.*, frontier) output from given inputs and allocative inefficiency as the inability to combine inputs in optimum proportions given the input price.

Kalirajan (1990) defined technical efficiency as the greatest output that could be obtained from any given set of inputs in a technical production function.

According to Kumbhakar (1994), a producer is said to be technically efficient, if the observed output was maximum, given the input quantities and a failure on the part of the farm to produce the frontier level of output, given the input quantities is attributed to technical inefficiency.

According to Shanmugham and Palanisami (1993), technical efficiency refers to the proper choice of production function among all those activities in use by farms.

Kalirajan and Shand (1997) measured technical efficiency as the ratio of observed output to potential output. Although there is no *a priori* theoretical reasoning in the stochastic framework of measuring technical efficiency, potential output is defined as the natural shift from the observed output.

Belen and Manuel (1997) referred technical efficiency as the achievement of the maximum potential output from a given quantity of inputs, taking into account physical production relationships.

In the present study, technical efficiency is the ability of a farm to achieve maximum possible output with available resources.

2.1.6 Marketing

Sarawat and Vaidya (1995) in their study defined marketing system as the mix of activities in the transfer of produce from growers to final consumers.

Sherlekar (1996) opined that marketing is a continuous process of discovering and translating consumer wants into appropriate products and services, creating demand for these products under keen competition and serving the demand with the help of channels of distribution such as wholesalers and retailers.

Kumar *et al.* (1997) viewed marketing as the chain of various functions performed by the market functionary in order to transfer the produce from the producer to the ultimate consumer.

According to Elzel *et al.* (2001), marketing is a total system of business activities designed to plan, price, promote and distribute want satisfying products to target markets in order to achieve organizational objectives.

Ramasamy and Namakumari (2002) defined marketing as a process of creating and delivering value. The marketer delivers value to the customer, through his market effects.

Suresh Reddy (2003) defined marketing as one of the business function most dramatically affected by emerging information technologies.

Earl (2003) defined marketing as a group of buyers and sellers linked together by trade in the sale or purchase of the particular commodity or service.

Townsend *et al.* (2004) conceptualized marketing as a complex set of functions that involves tactics or the act of demand stimulation and selling, culture that provides a

means to implement a customer orientation and strategy, which translates the marketing concept into actions that create competitive advantage.

Pride and Ferrell (2005) referred to marketing as a process of creating, distributing, promoting and pricing goods, services and ideas to facilitate satisfying exchange relationship with consumers in a dynamic environment.

Kotler and Keller (2005) viewed marketing as a human activity directed at satisfying needs and wants through the process of exchange. Marketing is the analysis of planning, implementation and control of programmes designed to bring about desired exchanges with target audience for the purpose of mutual or personal gain. It relies heavily on the adaptation and coordination of product, price, promotion and place for achieving effective response.

According to Varshney and Gupta (2005), marketing is the process carried out to satisfy customer needs by providing form utility, exchange utility, place utility and time utility.

In the present study, marketing of cardamom is defined as the chain of various functions performed by the market functionaries in order to transfer the cardamom from the producer to the consumer.

2.1.7 Agricultural Marketing

Sivakumar (1996) referred agricultural marketing as one, which included all business activities that would help in the flow of agricultural commodities from the point of initial production until it reaches the exporters in the desired form, at the desired place and time.

According to Varma and Agarwal (1997), agricultural marketing is the study of all activities, agencies and policies involved in the procurement of farm inputs by the farmers and the movement of rural products from the farms to the consumer.

Selvaraj and Gandimathi (2003) viewed agricultural marketing as the combination of activities by which the agricultural raw materials are processed and are made ready for consumption in suitable form.

According to Thomson (2004), agricultural marketing comprises all the operations and the agencies involved in the movement of farm-produced foods, raw materials and their derivatives, from the farms to the final consumers and the effects of such operations on farmers, middlemen and consumers.

Acharya and Agarwal (2004) viewed agricultural marketing as a set of all activities involved in supply of farm inputs to the farmers and movement of agricultural products from farms to consumers. It also includes the assessment of demand for farm-inputs and their supply, post-harvest handling of farm products, performance of various activities required in transferring farm products from farm gate to processing industries and (or) ultimate consumers, assessment of demand for farm products and public policies and programmes relating to the pricing, handling and purchase and sale of farm inputs and agricultural products.

According to Indian Council of Agricultural Research (2005), agricultural marketing involves functions of buying and selling of agricultural produce.

In the present study, agricultural marketing is referred to the business activities that are involved in transferring cardamom from the primary producer to the ultimate user that offered time, place, form and possession utilities to the user.

2.1.8 Marketing channel

Saini and Bhathi (1995) referred marketing channel as the sequence of agencies through which a commodity would pass during the process of marketing.

Stern *et al.* (1998) explained marketing channel as a set of inter-dependent organization involved in the process of making a product or service available for consumption or use. Not only the marketing channel satisfy demand by supplying goods and services at a right place, quantity, quality and price, but they also stimulate demand through the promotional activities of the units constituting them. The channel is an orchestrated network that creates value for end users by generating form, possession, time and place utilities.

Pelton *et al.* (2002) defined marketing channel as exchange relationships that create customer value in the acquisition, consumption and disposition of products and services.

Acharya and Agarwal (2004) viewed marketing channels as routes through which agricultural products move from producers to consumers. The length of the channel varies from commodity to commodity, depending on the quantity to be moved, the form of consumer demand and degree of regional specialization in production.

Coughlan *et al.* (2005) defined marketing channel as a set of interdependent organizations involved in the process of making a product or service available for use or consumption.

In the present study, the marketing channel is defined as a path traced in the movement of cardamom from the primary producer to ultimate consumer.

2.1.9 Marketing cost

Jain (1971) stated that marketing cost as the actual expenses required in bringing goods and services from the producers to the consumers

According to Moore *et al.* (1973), marketing cost would denote the actual expenses incurred in the marketing process. They included not only the cost of performing the various marketing functions but taxes and other assessments as well.

According to Singh *et al.* (1994), marketing cost would indicate the difference between the price received by the producer and the price paid by the consumer in a more or less perfect market. It included the cost of transportation, labour, taxes; such as octroi, market fee and sales tax, commission and brokerage deductions and other storage and insect damages.

According to Sivakumar (1996), marketing cost would include all those expenditure incurred by the farmers and all the intermediaries in bringing out the produce from the farm gate to the exporters. It included commission charges, transport, storage cost, loading, unloading and weighing and establishment charges.

According to Mukherjee and Shahjahan (1998), the marketing cost included market tax, transport, wastage, rent etc.

Rajoo (2002) defined marketing cost as the expenses incurred by farmers and other agencies such as pre-harvest contactors, wholesalers, secondary wholesalers and retailers for performing their functions in the movement of produce from the farmers to the final consumers.

Acharya and Agarwal (2004) stated marketing cost as the cost involved in moving the commodities from the producers to consumers *i.e.*, the cost of performing the various marketing functions and of operating various agencies.

Kumaravel (2005) referred marketing cost as the actual expenses incurred by farmers, wholesalers, vendors and retailers for performing their functions in the movement of produce from the farmers to the consumers.

In the present study, marketing cost is defined as the actual expenses incurred by farmers and other agencies, for performing their functions in the movement of cardamom from the farmers to the final consumer.

2.1.10 Market Margin

Saraswat and Vaidya (1995) explained that the marketing margin will include all the costs of picking, assembling, grading, transport, processing, storage, wholesaling and retailing.

According to Kerur *et al.* (1998), marketing margins would measure the gap between the net price received by the cultivator and the price paid by the consumer.

Acharya and Agarwal (2004) stated that marketing margin includes the cost involved in moving the product from the point of production to the point of consumption, *i.e.*, the cost of performing the various marketing functions and of operating various agencies and profits of the various market functionaries involved in moving the produce from the initial point of production till it reaches the ultimate consumer. The absolute value of the marketing margin varies from channel to channel, market to market and time to time.

In the present study, marketing margin is defined as the profit earned by each agency in the marketing of cardamom.

2.1.11 Price Spread

According to Sharma and Tewari (1995), described price spread in relation to the agricultural commodities as the difference between the price paid by the ultimate consumer and price received by the grower for an equivalent amount of farm produce. This spread would consist of marketing cost and marketing margin of intermediaries.

According to Bhatia (1996), price spread of a commodity would be the magnitude of difference between the price received by the primary producer and the price paid by the ultimate consumer.

Venkataramana and Gowda (1996) explained that price spread is one of the important measures of market efficiency which will indicate the share of the producer in the consumer's rupee. It will also indicate the shares of various market intermediaries in the consumer's rupee for the services rendered by them in channelling the commodity from the producer to the consumer.

According to Kumar *et al.* (1997), the price spread would refer to the difference between the price paid by the consumer and the price received by the producer per unit of a commodity.

Rajoo (2002) considered price spread as the difference between price paid by the consumer and net price received by the producer.

Acharya and Agarwal (2004) defined price spread as the difference between the price paid by consumer and the price received by the producer for an equivalent quantity of farm produce.

In the present study, price spread is defined as the difference between the price paid by the final consumer and received by the producer.

2.1.12 Marketing Efficiency

Khols and Uhl (1980) defined marketing efficiency as the ratio of market output (satisfaction) to the marketing input (cost of resources). An increase in this ratio would represent improved efficiency and vice-versa. A reduction in the cost for the same level of satisfaction or an increase in satisfaction at a given cost would mean an improvement of efficiency.

According to Kumar *et al.* (1997), marketing efficiency would be referred in terms of average price received on per quintal basis as well as the share in consumer's rupee.

Bilonikar *et al.* (1998) defined marketing efficiency as the effectiveness of the marketing system with which it operates.

According to Verma (2004), marketing efficiency indicates to what extent the marketing agencies are able to move the goods at the minimum cost, extending maximum service from producer to final consumer.

In the present study, marketing efficiency of cardamom is referred in terms of average price received per unit output as well as the share in consumer's rupee.

2.2 Review of previous research studies

2.2.1 Economics of cultivation of perennial crops

Santhosh (1984) in his study on the cost of cultivation and marketing of pepper in Cannanore district of Kerala found that the per ha aggregate cost for a production of 7 years was Rs.28,465. The expenditure was minimum during 2nd year and from 3rd year onwards it went on increasing till it reached the maximum in the 7th year. Labour input contributed the maximum expenditure with low family labour contribution.

In a study on the economics of coconut cultivation in Calicut district in Kerala, Premaja (1987) reported that the total cost of cultivation for 16years was Rs.91,311per ha. The average annual returns from production of nuts was estimated to be Rs.10,049 per ha and cost of production to be Rs.1.12 per nut.

Sekar and Karunakaran (1992) estimated the cost and returns for cashew plantations intercropped with groundnut and bajra in Udayarpalayam taluk of Tiruchirapalli district of Tamil Nadu and found that the establishment cost was Rs. 6333.02 per ha. The total maintenance cost over 15 years was Rs. 18,724.80 per ha. The total harvesting cost was estimated to be Rs. 6095.50. The total maintenance and harvesting cost included the respective costs from the intercrops for 1st and 2nd year.

Alagappan and Manoharan (2001) estimated the cost of production, returns and productivity of pepper cultivation in Idukki district of Kerala. It was found that the total

cost per acre reached a maximum of Rs. 14,930.03 at the age of 12 years. The unit cost of production was estimated to be Rs.58.16 per kg.

John (2003) reported that the cost of cultivation and processing of vanilla for a bankable project as assessed by the NABARD, during the late 1990's worked out to be Rs.50,000 per ha over a period of 3 years and its annual maintenance cost was Rs.12,000 per ha.

Madan (2004) estimated the cost of cultivation of spices and tested the economic viability of recommended management practices. The cost of cultivation of vanilla from the first year to the seventh year was estimated using the farm budgeting approach. The establishment cost per acre (700 vines) for three years was estimated to be Rs. 46,438. The maintenance cost per acre per year was Rs. 21,084. Among the inputs, compost formed the major item of costs (66 %) followed by labour charges (21%). The average net return for a seven year crop per acre was Rs. 62,933 with a benefit cost ratio of 3.28.

Deepa (2005) in her study in production and marketing of vanilla, stratified 120 farmers into three groups based on the age of vanilla vines, viz., establishment stage (1-3 years old vines), steady yield stage (5-9 years old vines) and declining yield stage (10-15 years old vines). The farmers were also post stratified into three classes on the basis of the number of vines under vanilla, viz., class I (farmers with 300-499 vines), class II (500-699 vines) and class III (more than 700 vines). The total establishment cost at the aggregate level was Rs. 1, 45, 102 per ha and it ranged from Rs. 1, 37, 455 per ha in small holdings to Rs. 1, 54,776 per ha in medium sized holdings. The annual maintenance cost during the stabilized yield period worked out to be Rs. 57, 829 per ha at the aggregate level ranging from Rs. 55,456, Rs. 58,577 and Rs. 58,577 per ha for small, medium and large holdings respectively. The annual maintenance cost during the declining yield period worked out at Rs. 57,313 per ha.

Francis (2006) in her study totalled the total investment for the first two years (pre-bearing period) to get the establishment cost and for maintenance cost included operational and material costs in maintaining vanilla during its bearing stage. The establishment cost for marginal farmers was Rs. 1, 07,541 per ha, Rs. 1, 06,463.24 and Rs. 1, 05,884.58 per ha for small and large farmers of Ernakulam district respectively.

The maintenance cost was Rs. 44,105.97, Rs. 42,837.66 and Rs. 39,623.26 per ha for marginal, small and large farmers of Ernakulam district respectively.

Baksh *et al.* (2006) studied the cost of growing mango orchards in Multan district of Pakistan and reported that the average annual maintenance cost for the establishment year came to be Rs. 19,820 per acre. The capital cost for trees of age 2 to 6 years, 7 to 12 years and 13 to 45 years were Rs. 69,270, Rs. 47,190 and Rs. 2, 34,920 per acre respectively. The crucial constituents of the total cost were irrigation, labour, miscellaneous and fertilizers and manures respectively.

Hassan *et al.* (2006) analysed the economics of growing date palm in Punjab of Pakistan and reported that the total establishment cost was worked out as Rs. 37,146 per acre which included planting material, planting cost, fertilizers and manures, plant protection chemicals, irrigation, labour and other miscellaneous cost. Planting material and transportation cost were the major items of the establishment cost. The maintenance cost during 2 to 4 years was worked out to be Rs. 14,926, for 5 to 10 years the cost Rs. 41,406 and Rs. 41,725 per acre during 11 to 15 years.

Chand and Jangid (2007) analysed the cost and returns in henna plantation in semi- arid Rajasthan. The total establishment cost worked out was Rs. 30,787 per ha. In this cost, variable cost took a major share of 93.63 per cent. Among various components of variable cost, material cost accounted for 38.18 per cent followed by labour 23.25 per cent and field preparation 13.38 per cent of the total establishment cost. The maintenance cost was worked to be Rs. 16,482 per ha and it varied from Rs. 14, 938 (in less than 4 years group) to Rs. 16, 920 per ha (in 4 to 15 year group).

Goswami and Challa (2007) analysed the economics of small holders rubber plantations in west garo hills and opined that establishment cost for rubber includes all the expenses incurred during the first six years till the plantation come to commercially yielding stage and the maintenance cost includes expenditure on fertilizers, manures, tapping, manures, tapping, latex processing and others. The total establishment cost per hectare for rubber plantation amounted to Rs.22,548.00 and the maintenance cost amounted to Rs.6113.75.

2.2.2. Economics of cultivation/ production of cardamom crop

While evaluating the cost of production of cardamom, Muniraj (1968) assessed the efficiency of resources in a case study on the economics of production in cardamom plantations in Bodinayakanur area in Tamil Nadu. The average cost of cultivation per acre was Rs.259.59 with a unit cost of production of Rs. 6.83 per kg.

Studies in certain pockets in Idukki district, Wayanad district and Nelliampathy hills in Palakad district in Kerala, Jose (1976) discussed about need for enhanced cardamom production. The production cost of cardamom was arrived at Rs.58 per kg, while the cost of maintenance was Rs.1200 per acre per year during 1975. The cost of establishment of one acre plantation was estimated as Rs.2765.

Mahabala *et al.* (1990) studied the resource use efficiency and age return relationship in cardamom plantations in Chickmangallur district in Karnataka and recorded the peak returns in cardamom cultivation during the 7th year. The annuity value worked for the returns at the rate of 15 per cent discount rate for pure and intercropped cardamom was the highest during 10th year suggesting that it would be ideal to replace cardamom after 10 years of planting.

Koshy (1993) in his study on economics of cardamom cultivation in Idukki district of Kerala showed that in small size group, *i.e.*, less than 2 ha, cost per ha during the first four years respectively were annually Rs.9248, Rs.6427, Rs. 12,101 and Rs.13,495 respectively. While during the period of 5th to 12th year, it was annually Rs. 15,075 and during 13th to 15th year, it was Rs.10,840. In large size group (greater than 2 hectare) for the first four years, annual cost per ha were Rs. 10,432, Rs.6561, Rs.12,016 and Rs.13,396 respectively. It was Rs.14,480 and Rs.11,330 during the period from 5th to 12th year and from 13th to 15th year respectively per annum. It was also noted that more than 30 per cent of the total cost of cultivation was accounted for hired labour during bearing period.

The performance and economics of plantings of cardamom was analysed by Korikanathimath (2000) at Chittali in Karnataka. The results revealed that a total investment of Rs. 56,697.82 per ha was incurred towards replanting of cardamom.

The results revealed that the total annual maintenance cost during the bearing period was Rs.82,411.09 per ha. The labour charges accounted for 69.45 per cent of the total cost.

Korikanthimath and Rajendra (2002) in their study in Uttar Kannada district of Karnataka and Wyanad district of Kerala reported that it was highly compatible and profitable to grow cardamom as mixed crop with arecanut as nearly 70 per cent of the space remains unutilized in the sole crop of arecanut. Since the effective root spread of arecanut is of 75 cm radius, the root competition in the mix crop system was minimum. The total cost of raising a new garden (13 years) was estimated to be Rs.1,40,000 per ha.

According to NABARD's model scheme for organic cultivation of small cardamom in Kerala the unit cost for organic cultivation was estimated to be Rs. 71,800 per ha for first year, Rs. 60,700 per ha for second year and Rs. 80,100 per ha for third year. In this model, a stabilised yield of 400 kg per ha has been considered from 7th year onwards. A conservative sale price of Rs.400 was considered for working out the economics for organic small cardamom.

According to Spices Board, the unit cost of small cardamom for 1st year was estimated to be Rs. 71,289 per ha and Rs. 59,090 per ha for 2nd year. The maintenance cost was estimated to be Rs. 58,700 per ha with the total life span of 15 years.

Varghese (2007) studied the economics of cardamom cultivation in Kerala and reported that cost per acre was higher in large size groups (above 2 acres) followed by medium (0.5- 2 acres) and small groups (less than 0.50 acres). The cost per acre under small, medium and large was Rs. 27,685, Rs. 37371.28 and Rs. 38,668.44 respectively. But the yield per acre under small size was far below than the two counter parts. When compared with the medium and large size groups, the estimated unit cost of production was very high. The unit cost of production under small, medium, large size groups were Rs. 251.69, Rs. 214.19 and Rs. 230.01 respectively.

2.2.3 Technical efficiency in production

Kutaula (1983) analysed the efficiency of farmers who cultivated wheat in reclaimed soil by applying frontier technique. The technical efficiency was estimated to be 0.7636 and hence concluded that the yield could be increased up to 23.64 per cent by

adoption of technically efficient production plan. This increase in production could be achieved without involving any additional cost

Jayaraman *et al.* (1992) referred technical efficiency as the maximum possible yield achievable with a given level of input use. They analyzed the technical efficiency among the rice-growing farmers in Mandya district of Karnataka by using the frontier production function. The study revealed that there existed an over use of resources in the production of rice and it was found to be highly inefficient. The large farmers were found to be more efficient than the small farmers. The highly inefficient use of resources particularly in the case of small farmers suggested improper pricing of resources such as fertilizer and irrigation, leading to wastage.

Shanmugham and Palanisami (1993) applied frontier production function to measure the efficiency of rice farmers in Kamarajar district of Tamil Nadu. The Ordinary Least Square estimates (OLS) implied that fertilizer, irrigation and plant protection were the significant factors of production in rice farms. The study also implied that the average farm yield could be increased by 26 per cent by adopting the technology followed by best practice farmers and there existed a scope to raise output by 5 per cent, through optimum resource allocation. The economic inefficiency revealed that the production could be raised by 29.7 per cent, if technology gaps between average and best practice farmers were narrowed down.

Battese and Tessema (1993) used stochastic frontier production function with time-varying technical efficiencies using panel data from ICRISAT's village level studies in three Indian villages. The variables used were total value of output in rupees as dependent variable, and total land under irrigated and unirrigated under production, labourers used in hours, bullock labour used in hours were independent variables.

Sasmal (1993) used generalized stochastic formulation for production function estimation. The production functions were estimated empirically for HYV paddy by a field survey in 14 villages in Midnapore district of West Bengal. It was found that the marginal effects of inputs on mean output and variance of output were independent. The inputs like fertilizers, pesticide and labour had significant impact on mean output of HYV paddy both in the rainy and dry seasons. Mean output was higher and variance of

output was lower in the dry season than in the rainy season because the physical environment and the weather conditions in the dry season were more appropriate for the cultivation of HYV paddy.

Banik (1994) used Cobb-Douglas form of stochastic frontier model with cross sectional data of 99 paddy farms in Bangladesh to estimate the technical efficiency of individual farms. The variables included in the analysis were value of output per acre as dependent variable and human labour as labour hours per acre, total expenditure per acre on attached human labour etc as independent variables. Maximum Likelihood Estimation was used to estimate the parameters. A very interesting finding of the study was that ten out of 13 most efficient farms belonged to the category of small farms. It was also observed that the average technical efficiency of owner-tenant farms was higher than that of owner farms.

Rajasekharan and Krishnamoorthy (1998) measured the technical efficiency and analysed pesticide use in rice production in the Thrissur Kole lands of Kerala. The technical efficiency in production was estimated by using the Cobb-Douglas form of stochastic frontier production function. They concluded that 88 per cent of the differences between the observed and the maximum production frontier outputs were due to differences in farmers' level of technical efficiency and not related to random variability. The individual technical efficiencies varied between 0.49 and 0.92.

Singh and Naresh (1998) analysed the efficiency of farmers in rice crop in Punjab, using frontier production function. The levels of technical efficiency achieved by the individual farmers were worked out using Timmer's indices. Technical efficiency was very high in Ludhiana district and least in Hoshiarpur district. The results showed that 20 per cent of the farmers had technical efficiency below 60 per cent and 40 per cent had 60 to 70 per cent efficiency and same proportion had 70 to 80 per cent efficiency in Hoshiarpur. In Ludhiana 94 per cent of farmers showed a technical efficiency of 80 to 90 per cent and remaining 6 per cent had technical efficiency of 90 to 100 per cent. And there was a considerable diversity in technical efficiency within the groups of small, medium and large farmers. Average technical efficiency for medium and large farmers was 78 per cent and it was 73 per cent for small farmers. They concluded that there was a considerable variation in efficiency across regions and size categories.

Hazarika and Subramanian (1999) analysed the technical efficiency of the tea industry in Assam using the stochastic frontier production function model. It was found that 29.41 per cent of the total farms operated large estates belonged to the most efficient category (96 to 99 %) and 8.82 per cent in the least efficient group (64 to 70 %). It was also observed that the farm specific technical efficiency varied between 0.64 and 0.99 with mean technical efficiency of 0.88.

Mythili and Shanmugham (2000) estimated the technical inefficiency of individual farmers using an unbalanced panel data of 234 rice farms in Tamil Nadu. The Maximum Likelihood Estimate showed that the technical efficiency varied widely (ranging from 46.5 to 96.7 %) across the sample farms and it was time invariant. The mean technical efficiency was computed as 82 per cent, which indicated that on an average, the realized output could be increased by 18 per cent without involving additional resources.

Pillai (2001) estimated the level of technical efficiency using stochastic frontier model. Her study focused on the role of input utilization in paddy cultivation in the eighties and the early nineties, for West Bengal and Orissa. The study revealed that input productivity has indeed played an important role in the growth performance in the 1980's and early 1990's. While growth in inputs and total factor productivity together contributed significantly to the output growth in both the states and performance of West Bengal was better than that of Orissa. The improvement in the input productivity in West Bengal was brought about both by efficiency and technology in the presence of variations across seasons and seed varieties. Although the use of inputs and technical efficiency increased over time, it was not as dramatic as the improvement in the state of production technology. Over time, the farmers in this state have not only moved closer to their frontier, but have also been operating with respect to a higher frontier or production technology.

Prabodh and Yanagida (2004) estimated the technical efficiency of small holding rice farms in Sri Lanka by using stochastic frontier production approach. It was found that the mean technical efficiency of rice farms was 0.74 (ranging from 0.34 to 0.95). Factors such as farm size, inorganic fertilizers and method of planting showed significant effect on rice yield. The major factors influencing technical inefficiency were farmer's age, education, experience

and extension assistance. Education and extension assistance were identified as mechanisms to improve the technical efficiency of rice farms.

Idiong (2007) estimated farm level technical efficiency in small scale swamp rice production in Cross river state of Nigeria using stochastic frontier approach. The results indicated that the, rice farmers were not fully technically efficient. The mean technical efficiency obtained was 77 per cent indicating that there was a 22 per cent allowance for improving efficiency. The results also showed that, farmer's education level, membership of cooperative and access to credit significantly influenced the farmer's efficiency.

Nchare, Amadou (2007) analysed the factors that influence the technical efficiency of Arabica coffee farmers in Cameroon. The translogarithmic stochastic frontier production function was estimated using Maximum Likelihood Estimation method. The inefficiency effects were specified to be functions of the age, educational level and experience of the farmer, membership in a mutual aid group, family size, the contact of the coffee plantation with extension workers, access to credit, use of the Java variety and mono-cropping system. The mean technical efficiency index was estimated at 0.896 and 32 per cent of the farmers have technical efficiency indices below 0.91. The estimated value of the variance parameter for the stochastic frontier production function is not only close to one, but also significantly different from zero. These results showed the existence of technical inefficiencies in Arabica coffee production. On the average, coffee farmers could increase their output by 10 per cent provided they operate along their efficient frontier.

In this study, stochastic frontier production function was used to study the technical efficiency among cardamom producing farmers.

2.2.4 Marketing of perennial crops

Arshad (1983) evaluated the efficiency of coconut marketing system by small holders in Malaysia and observed that the efficiency suffered from various inefficiencies in the form of imperfection that existed in market structure, practices and performances. Farm level constraints and lack of marketing facilities had resulted in low quality produce which induced middlemen to indulge in unethical trading practices.

Sambhar *et al.* (1990) in their study on marketing of green and dry ginger in Himachal Pradesh observed that higher net price to producers and higher share in consumer's rupee could be ensured by developing infrastructure such as roads and by encouraging group sale by organising producer co-operative. The wholesaler's net margin which was found to be creating competition at wholesaler's level. There was also a lot of scope for creating better storage facilities to reduce spoilage and dryage losses.

Sahu (1995) in his study on coconut marketing in Orissa identified two marketing channels and used Shepherd's formula was used. In the regulated market, the share of producer in consumer's price was 62.22 per cent. The marketing cost for 1000 coconuts from producer to consumers worked out to be Rs.1700 which was 37.78 per cent of the price paid by the consumers. The maximum share of price spread went to retailers as profit (15.89%) followed by traders (6.67%) and wholesalers (2.23%). In the unregulated markets the producers share in consumer's rupee was 68.57 per cent and the price spread was 31.43 of the price paid by the consumer. The maximum share of price spread went to the traders at 24.61 per cent of the consumer's price as against 68.57 per cent in unregulated markets. The marketing efficiency as per the shepherd's formula was calculated to be 1.65 per cent and 2.18 per cent for regulated and unregulated market respectively.

Bagde *et al.* (1996) in their study on dynamics of marketing of selected fruits in Nagpur used Shepherd formula in working out the marketing efficiency. They identified two marketing channels, one in which producer, pre-harvest contractor, commission agent and retailer were involved, and in the other, producer, commission agent and retailer were involved. They also found that producer's share in consumer's rupee was only 39.34 per cent in the case of apples, whereas the retailer got 41.06 per cent of the share. The study also revealed that marketing efficiency was higher for seedless grapes compared to apple and mango in Nagpur.

Singh *et al.* (2001) studied the pattern of production and marketing of fruit crops in Punjab. They found that more than 35 per cent of the grape growers gave their orchards on pre-harvest contract. The pre-harvest contractor on an average gave a contract money of Rs. 75,000 per ha. They also found that the pre-harvest losses of

grapes at field level accounted for 2.4 per cent of the total production, occurred at many stages being 33 per cent while picking, 19 per cent while assembling, 12-14 per cent at grading, packing and transport respectively.

Beeraladinni (2003) estimated the cost structure and marketing of grapes in Bijapur district of Karnataka and found that the out of the two channels identified in the marketing of grapes channel II that is farmers- commission agents- retailers- buyer was the popular among the sample growers. The total marketing cost of the farmers was Rs.38.83 per standard box and that of the commission agents and retailers were Rs. 3.94 and Rs. 38.83 per standard box respectively. The marketing margin of commission agent and retailer was Rs. 14.06 and Rs 61.17 per standard box which accounted for 3.52 per cent and 15.29 per cent of the consumers rupee. The price spread was Rs. 100 per standard box.

Jai (2003) in his study on marketing operations of Himachal apples identified that the popular marketing channel was marketing through a forwarding agency to a commission agent and wholesaler in the wholesale market. The marketing channel involved terminal markets, forwarding agency to a commission agent, wholesaler, retailer and consumer. The produce passed through a number of intermediaries. According to rough estimates, the apple grower got approximately 20 per cent of the gross price of the produce. The remaining cost was shared by various cross sections inside and outside the state. These included government by way of packing raw material taxes and sales tax, traders, bankers, insurance companies and the owners of cold storages, etc.

Gupta and Prashant (2004) tried to examine the marketing channel and price spread prevailing in cashewnut marketing in Goa state. They identified six marketing channels and concluded that inspite of the small and medium farmers sell their produce to the wholesalers due to advance borrowing from them. If sufficient and easy financing for agriculture is possible, farmers can come out from the clutch of wholesalers.

Ladaniya *et al.* (2004) in their study on price spread of pomegranate in Maharashtra state found that 90 per cent of the produce was marketed through three major marketing channels. Channel I involved producer, commission agent, wholesaler, retailer and consumer. Channel II involved producer, co-operative society, commission agent, retailer and

consumer. Channel III involved producer, commission agent (local), trader (distant), wholesaler, retailer and consumer. Local channels like 1) producer and consumer 2) producer- retailer and consumer 3) producer- pre-harvest contractor- retailer and consumer existed through which 10 per cent of the produce was marketed. Producers with smallholdings preferred co-operative society and marketing of produce through forming self-help groups for transportation. Packaging, long distance transportation and commission charges accounted for 90 per cent of the marketing costs. Marketing efficiency was the maximum in marketing through co-operative society closely followed by private commission agents. Retailer's margin was 38.50 to 56.33 per cent in the price paid by the consumer and it was the single most important factor that determined market efficiency.

Francis (2006) in her study identified the following market channel Farmer → Company → Retailer → Consumer as the most common type of channel. The share received by the farmer constituted 40 per cent of consumer's rupee. The marketing margin for the company was 27.91 per cent of consumer's rupee while it was 5.68 per cent for retailers. The marketing cost was also high for the company at 24.08 per cent of consumer's rupee where as it was low at 2.33 per cent for retailers. The marketing efficiency of the vanilla marketing channel was estimated using the following two methods: Acharya and Agarwal method and Calkins index. The marketing channel was found to be highly efficient because the value added per rupee of marketing cost was higher.

Kirithika (2009) in her study identified six types of market channels for turmeric and price spreads were estimated for each of the six marketing channels. The price spread was Rs 5335, Rs 2335 per kg, Rs 5145, Rs 2145, Rs 5085 and Rs 1585 per kg for six different market channels respectively. It was lower in the sixth marketing channel. The share received by the farmer constituted 40.70, 61.10, 42.8, 64.25, 43.50, and 71.20 per cent of consumer's rupee for six different market channels respectively. The profit margin for wholesaler constituted 35.50 per cent of consumer's rupee in all three different market channels and the marketing cost borne by the wholesaler constituted 11.11 per cent of consumer's rupee in all three different market channels. The profit margin for retailer constituted 7.7, 20.0, 7.7, 20.0, 7.7 and 12.7 per cent of consumer's rupee for six different market channels respectively and the marketing cost borne by the retailer constituted

1.11, 13.3, 1.11, 13.3, 1.11 and 14.54 per cent of consumer's rupee for six different market channels respectively. The marketing efficiency calculated through Shepherd's approach and Acharya's approach revealed that the marketing efficiency was relatively higher in marketing channel VI in two approaches, *i.e.*, 6.21 in Shepherd's method and 4.98 in Acharya's approach and the Calkin's index is low for the marketing channel VI.

2.2.5 Marketing of cardamom

Das (1982) in a review on the cardamom situation in India, observed that the area under the crop went up by 62 per cent between 1960-61 and 1979-80. Its production fluctuated violently over these years. The unit value of crop per kg increased 1000 per cent from Rs.18 in 1960-61 to Rs.199 in 1979-80. Mainly because of these unprecedented increase in price, the realised export earnings was pushed up to Rs.534.7 million in 1979-1980 from merely Rs. 36.7 million in 1960-61.

Thomas *et al.* (1990) made a study on the production and export performance of Indian cardamom on the world market making use of the secondary data from 1970-71 to 1984-85. They found that India's export was highly and significantly correlated to production. It was concluded that the low productivity and high cost of production vis-a-vis stiff competition in the interantional market rendered Indian cardamom less competitive and subsequently unremunerative for the planters

CHAPTER III

DESIGN OF THE STUDY

A proper design is essential to conduct research in the right direction. Any research is valued for its methodological framework, which helps the researcher to derive meaningful results and draw inferences from the study. Selection of tools for analysis has to be done with greater care for substantiating the results empirically and also to arrive at appropriate policy implications of the study. In this chapter, methods adopted in selection of respondents, collection of data and analytical tools used are discussed.

3.1 Selection of the Study Area

Among the major spices grown, cardamom has a dominant place in the agricultural sector of India. Kerala state holds the prime position in India, as far as area and production of cardamom are concerned. Of the fourteen districts in Kerala, only three districts contribute to cardamom production. Idukki has the largest area under cardamom accounting for 79 per cent of the total area under cardamom of the whole state and it was followed by Wayanad and Palakkad districts during 2005-06. In the case of production, Idukki accounts 92.89 per cent of the total production of cardamom in Kerala during 2005-06 (www.indiastat.com)

Cardamom is the second major crop of high ranges in Idukki district, which occupies about 10.87 per cent of the total cropped area. It is cultivated in 33078 ha of land during the year 2008-09. The yielding area was estimated to be 26,000 ha during the year. It registered a total production of 7815 MT and productivity of 301 kg per ha in 2008-09 (Spices Board, 2008-09). Since Kerala accounts for a lion's share of area and production of cardamom in India, the performance of cardamom industry of India can well be treated as synonymous with its performance in Kerala. To have an in-depth and comprehensive study of the cardamom cultivation, marketing and problems encountered in it, the main cardamom growing district of Kerala, Idukki was chosen as the study area.

3.2 Sampling Design

In Kerala, Idukki district well known for the developments in spices sector especially with respect to cardamom production was purposively selected for the study. There are four taluks in Idukki- Udumbanchola, Devikulam, Peerumedu, Thodupuzha. Udumbanchola taluk is the biggest and known for cardamom production.

Multistage sampling was followed in the study area. Among the four taluks of Idukki district, taluk with highest area under cardamom and number of holdings one taluk viz., Udumbanchola was purposively selected. Next stage of the sampling was the random selection of four villages from the taluk. The villages of the selected taluk were listed and four villages were selected randomly. A sample size of twenty five farmers was drawn randomly from each of the four villages of the taluk. Thus, the sample size of the respondent farmers was fixed at 100. The respondents were selected from the list of farmers available in the field office, Spices Board. The list of villages selected along with the distribution of the number of cultivators selected from each village is furnished in Table 3.1.

Table 3.1 Distribution of sample from selected villages

Name of the taluk and villages	Sample Size
Udumbanchola	
Pampadumpara	25
Anakkara	25
Senapathy	25
Rajakad	25
Total	100

For conducting the market study, different intermediaries involved in the cardamom marketing were studied. There are two main e-auction centers in South India-Vandanmedu in Kerala and Bodinayakanur in Tamil Nadu. There are seven auctioneers who conduct the auction. The auctioneers have collection centers in major production areas of the villages and they have specific dates to conduct the auction. The list of the auctioneers along with their day of auction is given in Appendix IX. Local dealers, traders, auctioneers, and exporters were surveyed for the purpose. The distribution of the number of samples from each category is furnished in the Table 3.2.

Table: 3.2 Distribution of number of samples from each intermediary

Intermediaries	No of samples
Local dealers	10
Traders	10
Auctioneers	7
Exporters	3
Total	30

3.3 Period of Study

A pre-survey was conducted in the study area during December 2009 in order to test the interview schedule. The detailed field survey was conducted during January-February 2010. The reference period for the study was agricultural year (July- June) 2008-2009. All the inputs were evaluated at 2008-09 prices.

3.4 Method of Data Collection

To get an insight into physical and economic environments of the taluks in the two districts, a reconnaissance survey of the taluks was undertaken. A pilot survey was conducted to pre test the schedule in order to eliminate irrelevant and ambiguous questions and to carry out the needed modifications. The primary data required for the study were collected through personal interview with the help of pre-tested comprehensive interview schedules specially designed for the purpose. Two separate schedules were prepared, one for the farmers and the other for the market functionaries. The interview schedule for the farmers covered aspects such as family size, educational status, asset position, cropping pattern, details on cost of cultivation- establishment and maintenance cost incurred, problems in production and marketing of cardamom, *etc.* In the marketing schedule, operations of the market intermediaries, expenses incurred on marketing, problems in marketing, and information about the cost incurred and profits realized by the different market functionaries were also gathered for working out the marketing cost and price spread. The data collected were tabulated, processed and subjected to statistical analysis.

To understand the basic characteristics of agricultural system in the study area, data on soil conditions, land utilization, cropping pattern, agro-climatic features and other available facilities were collected from published and unpublished records available in various Departments of Government of Kerala and Spices Board.

3.5 Methods of measurement and valuation of variables

a. Planting material

The planting material is otherwise known as suckers. The cost of suckers was arrived at by multiplying number of suckers used by the sample farmer and the price for sucker.

b. Human labour

Human labour was measured in terms of number of days separately for men and women. The permanent and hired labour was treated alike and was converted to common physical unit (man days of eight hours). The hired human labour was evaluated from the actual wages paid by the farmer. One and a half female labour days were considered as one man day, based on prevailing wage rate for such labour. Cost of family labour was imputed based on prevailing wage rate of hired labour in the study area.

c. Machine power

No specific machines are used in cardamom cultivation, so this variable is not included in the calculation of the cost.

d. Manures, fertilizers and plant protection chemicals

The data on chemical fertilizers were collected on individual fertilizers used in cardamom production. Fertilizers and plant protection chemicals were valued at the actual price paid and farm produced manure was valued at the prevailing market rates.

e. Land

The prevalent rent was taken into account, if it was leased. In the case of owned land, the rental value prevailing in the area for the similar type of land as the rent equivalent was considered. The land revenue paid was reckoned at the actual payments made in the study area.

f. Depreciation

Depreciation on machineries, implements, tools and buildings used for cardamom production was estimated by straight line method, that is, at the rate of two per cent for wells, tanks, sheds *etc.*, and ten percent for farm equipments and implements.

g. Irrigation

Irrigation cost included labour cost for irrigating the field. The electricity charges, diesel cost, other costs pertaining to operation and maintenance of pump sets and other irrigation structures used particularly for the use of irrigating the cardamom, paid by the sample farmers for irrigating the cardamom field were included in miscellaneous costs. The irrigation variable was quantified in terms of the number of irrigation since the depth of irrigation does not show much variation across farms.

h. Interest rates

Interest on working capital was worked out at the rate of 7 per cent per annum, since that was the rate at which farmers got crop loans from financial institutions, which was the prime lending rate prevailing at the time of survey on production credit. Interest on fixed investments excluding land was estimated at the rate of 12 per cent per annum.

3.6 Tools of Analysis

The data collected were tabulated and processed for subsequent analysis. Keeping in view the objectives of the study, appropriate methods were employed to analyze the collected data. The analytical tools used are presented below.

3.6.1 Conventional analysis

The conventional tools of analysis like percentages and averages were worked out to examine the characteristics and to estimate the distribution of socio-economic variables such as age, educational status, experience in farming, size of operational holdings *etc.*, of the sample farm households.

The tabular analyses were carried out to analyze the cost and returns, to determine resource structure, to study the problems of cardamom cultivation and marketing.

3.6.2 Cost concepts

The cost of production of cardamom was analyzed under three headings.

- i) Establishment cost: It included all the inputs and operational costs for establishing the plantation till bearing stage of the crop *i.e.*, three years.

- ii) Maintenance cost: It included operational and material costs in maintaining plantation in a year during its bearing stage.
- iii) Output and returns: It included output and returns obtained in cardamom plantation.

The cost of cultivation refers to the total expenses of cardamom growers, incurred in cultivating cardamom, expressed on a per hectare basis. The total cost of production of cardamom was estimated taking into account the fixed and variable cost. The fixed cost included the rental value of land, interest on fixed capital, depreciation on the value of fixed assets and annual share of the total establishment cost. The variable cost included all the cash and kind expenses actually incurred during the year on various inputs, cultural operations, drying and marketing of cardamom and interest on working capital.

In order to estimate the annual share of the total establishment cost, the total establishment expenditure incurred up to the bearing stage were apportioned among the average productive years (10 years) using the following formula.

Annualization (Amortized cost) of the Fixed Capital / Assets

$$\text{Capital Recovery Factor (CRF)} = \frac{i(1+i)^n}{1+i^n - 1}$$

i = Existing bank rate of interest.

n = Life period of the plantation.

$$\text{Annualized Fixed Cost} = \text{Establishment Cost} \times \text{Capital Recovery Factor}$$

The annualization cost thus obtained was added to the annual maintenance cost to arrive at the total annual cost per unit area.

3.6.3 Returns

In this study, both the gross income and net income (profit) were estimated. The gross income from cardamom included the total amount realized by the grower from the sale of dry cardamom. The average annual price realized by the growers was considered in estimating the total value of the sales. The net income was estimated by subtracting the total cost from the gross income.

In order to determine the benefit, the average market price of Rs. 550 per kg was considered. The average economic life span is considered as 10 years. Out of which the first two years are the pre-bearing or establishment period for cardamom.

3.6.4 Functional analysis

Production function analysis was employed to evaluate the factors influencing the cardamom cultivation and also to examine their relative influence. The average product is a simple measure relating output and input. But to know the efficiency of resources used in the farm, it is necessary to know the marginal product rather than average product. The marginal product could be known only if the technical relationships between outputs and inputs are estimated.

The production function was estimated using Ordinary Least Square (OLS) method. The estimated values of the regression coefficients were tested for statistical significance with the help of standard error value and the significance of the equation was tested by 'F' test for R^2 .

The form of regression model used was:

$$Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} X_6^{b_6} U_t$$

Where,

- Y = Yield of cardamom (kg)
- X_1 = Age of the crop (years)
- X_2 = Labour (man days per ha)
- X_3 = Fertilizer (kg per ha)
- X_4 = Manures (kg per ha)
- X_5 = Plant protection chemicals (Rs per ha)
- X_6 = Irrigation (numbers)
- a, b_1 b_6 = Parameters to be estimated
- U_t = Error term

In the present study, the production function was used to identify and evaluate the factors influencing the productivity of cardamom. The Cobb Douglas production function was found to be appropriate to explain the relationship between the yield and various

inputs. The estimated values of regression coefficients were tested for statistical significance with the help of 't' test at one, five and ten per cent significance levels.

3.6.5 Technical Efficiency

To study the technical efficiency of inputs of the cardamom cultivating farmers, the stochastic frontier production function was used.

3.6.5.1 Frontier Production Function

Frontier Production Function was employed to measure the technical efficiency among the sample farmers. The concept of production frontier is the same as that of production that describes the greatest possible output from a given combination of inputs that is a 'production frontier'. Farrell (1957) in his seminar paper elaborated the concept of technical efficiency. It involved the firm's ability to obtain the maximum output from a given set of inputs or resources. If a firm used the best practice or method to achieve the maximum output with a given set of inputs and technology, it was likely to be superior to another farm which did not get the same output with a given similar bundle of inputs and technology. The estimation of production frontier has proceeded along two general paths, viz., i) Deterministic frontier and ii) Stochastic frontier. In the present study, stochastic production frontier was estimated.

3.6.5.2 Stochastic frontiers

The key feature of the stochastic production frontier is that the disturbance term is composed of two parts, one, symmetric and the other, one-sided. The symmetric component captures the random effect outside the control of the decision maker including the statistical noise contained in every empirical relationship (such as poor input performance, bad weather, poor input supply, *etc*). The one-sided component captures deviations from the frontier due to inefficiency.

The following equations denotes the production frontier in the matrix form

$$Q_i = Q (X_{ki} \beta) e^{w_i}$$

$$i = 1, 2 \dots n, k = 1, 2 \dots m$$

Where,

Q_i = output of the i^{th} farm

X_{ki} = Vector of m inputs of the i^{th} farm.

k = k^{th} observation on all the variables.

m = number of variables in the model.

β = Vector of parameters to be estimated

w_i = Farm specific error term.

The stochastic model is called a ‘composed’ model because the error term is composed of two independent elements, given as below,

$$w_i = v_i - u_i \quad ; \quad i = 1, 2 \dots n$$

The term v_i is the symmetric component and permits random variation in output due to factors like weather and plant disease. It is assumed to be identically and independently distributed as $v_i = N(0, \sigma_v^2)$. A one sided component ($u_i \geq 0$) reflected technical efficiency related to the stochastic frontier $Q_i = Q(X_{ki} \beta) e^{v_i}$. Thus $u_i = 0$ for any farm lying on the frontier, while $u_i > 0$ for any farm lying below the frontier. Hence, expression (u_i) represents the amount by which the frontier exceeds realized output. Assuming that u_i is identically and independently distributed as $u_i = (0, \sigma_u^2)$, that is, the distribution of u is half normal and thus u_i takes the value zero when the farm produces on its outer-bound production function (realizing all the technical efficiency potential), and is greater than zero when the farm produces below its outer-bound production function (not realizing fully its technical efficiency potential). This might happen due to a number of factors, such as risk aversion, self satisfaction, information problems which may prevent the farm from achieving its full potential.

Density function of the proposed model can be written as

$$f_{u_i} = \frac{1}{\sigma_u \sqrt{1/2\pi}} \exp\left(-1/2 \frac{u_i^2}{\sigma_u^2}\right), \text{ if } u_i \geq 0$$

$$= 0, \text{ otherwise}$$

it follows that: $\sigma^2 = \sigma_v^2 + \sigma_u^2$

$$\lambda = \sigma_u / \sigma_v \quad \text{i.e., ratio of one sided error term to symmetric error term.}$$

The Cobb – Douglas functional form is generally preferred in most published papers on technical efficiency because of its well known advantages. Its purpose is to show what output of a given product will be achieved by different combinations of factors. It is possible to estimate the stochastic frontier production function using MLE method. Aigner (1977) suggested that the Maximum Likelihood Estimates of the parameters of the model can be obtained in terms of parameterization.

$$\sigma^2 = \sigma_v^2 + \sigma_u^2 \text{ and } \lambda = \frac{\sigma_u}{\sigma_v}$$

One advantage of estimating the frontier function is that it is possible to find out whether the farmer's deviations of yield from frontier yield is mainly because they did not use the best practice or technique or due to external random factors. Thus, one can say whether the difference between actual yield obtained and frontier yield, if any, occurred accidentally or not.

$$\sigma^2 = \sigma_v^2 + \sigma_u^2 \text{ and } \gamma = \sigma_u^2 / (\sigma_u^2 + \sigma_v^2), 0 \leq \gamma \leq 1$$

γ is an indicator of relative variability of u_i and v_i that differentiates the actual yield obtained from the frontier. There are two interesting points about γ

- i) When σ_v^2 is tending to zero, it implies that u_i is the predominant error, then the γ is tending to one. This means that the farmer's yield difference from the maximum feasible yield is mainly because it did not use the best practice technique.
- ii) When σ_u^2 is tending to zero, it implies that the symmetric error term v_i is the predominant error then the γ is tending to zero. This means that the farmer's yield difference from the frontier yield is mainly because of either statistical error or external factors, which are not under control.

Direct estimates of the stochastic production frontier model may be obtained by Maximum Likelihood Estimation (MLE) method. In this study, MLE method was used for estimation as was used by Aigner *et al.*, (1977) and Banik Arindam (1994).

In the present study, the following assumptions were made which underline the specification of a stochastic frontier.

- i) The frontier is stochastic in nature due to factors beyond human control, and the symmetrically distributed error term present in it is responsible to capture the effects of outside random shocks, observation and measurement error on the dependent variable and the other statistical ‘noise’
- ii) Variations in the technical efficiency of individual farms were due to factors completely under control of farmers.

The average technical inefficiency, *i.e.*, the mean of the distribution of the u_i could be easily estimated. In the half-normal case, u_i distributed as the absolute value of $N(0, \sigma_u^2)$, the mean technical efficiency is calculated using the formula $1 - \sigma_u (\sqrt{2/\pi})$, where σ_u is standard deviation of one sided error component.

In this study stochastic frontier function was fitted to measure technical efficiency. The stochastic frontier function of Cobb Douglas form was estimated using Maximum Likelihood Estimation (MLE) method. For the frontier analysis, dry cardamom yield in kg per ha was taken as the dependent variable and the independent variables included were labour (mandays per ha), quantity of fertilizers used (kg per ha), quantity of manures (kg per ha), irrigations (numbers), cost of chemicals (Rs per ha) and age of the crop (years). To measure the inefficiency the socio-economic variables like age of the farmers (years), educational level of producers, experience of farmers (years) were included. MLE method was employed using FRONTIER 4.1 software package (Coelli, 1994) and the results were obtained in one step process.

3.6.6 Price spread analysis

Price spread in general, is referred to as the difference between price paid by the consumer and that received by the growers per unit of the commodity. Price spread analysis would estimate the share of different market functionaries in the consumer rupee and this would often facilitate the understanding of the relative efficiencies otherwise of alternative channels of marketing. The method of measurement of marketing margin is the most important aspect of price spread. It could be worked out in two ways: 1) Lagged margin method and 2) Concurrent margin method

Lagged margins are the difference between the consumer's price obtained on a particular date and the producer's price obtained during the earlier date. The length of the time between the two dates, being the average period for which the marketing agency holds the produce. The concurrent margin refers to the differences between prices prevailing at successive stages of marketing on the same date.

For the present study, concurrent margin method was used to analyze the price spread. The price spread analysis involved computation of different marketing cost and profit margin at each stage and thus the expression as a percentage to the consumer's rupee. The various costs incurred in the marketing process were considered for identified channel and price spread was worked out. The profit margin for each market functionary in the market channel was computed by subtracting the price paid and the marketing cost incurred by him from the price received by him on the sale of the commodity

3.6.7 Marketing efficiency

Marketing efficiency is the degree of market performance. The movement of goods from producers to the ultimate consumers at the lowest possible cost consistent with the provision of service desired by the consumers is termed as efficient marketing. The following formulae were used to estimate the marketing efficiency of the marketing channel of cardamom in the present study.

a) Acharya's Approach

According to Acharya (2003), an ideal measure of marketing efficiency, particularly for comparing the efficiency of alternate markets channels should take into account all of the following:

- a) Total marketing costs (MC)
- b) Net marketing margin (MM)
- c) Prices received by the farmer (FP)
- d) Prices paid by the consumer (RP)

Further, the measure should reflect the following relationship between each of these variables and the marketing efficiency.

- i) Higher the (a), lower the efficiency
- ii) Higher the (b), lower the efficiency
- iii) Higher the (c), higher the efficiency
- iv) Higher the (d), lower the efficiency

As there is an exact relationship among four variables, i.e. $a+b+c = d$, any three of these could be used to arrive at a measure for comparing the marketing efficiency.

The following measure is suggested by Acharya,

$$ME = FP \div (MC + MM)$$

b) Shepherd's Formula

Shepherd (1965) suggested that the ratio of total value of goods marketed to the marketing cost could be used as a measure of marketing efficiency. The higher this ratio, higher would be the efficiency and vice versa. This can be expressed in the following form:

$$ME = [(V/I)-1]$$

Where,

ME = Index of marketing efficiency

V = Value of goods sold

I = Total marketing cost

c) Calkin's index

The Calkin's index of marketing efficiency is estimated using the following formula.

$$\text{Marketing Efficiency} = \left[\frac{1 + \text{Sum of profit or margin}}{\text{Sum of marketing cost}} \right]$$

Lower the value of the index, higher would be the efficiency.

3.6.8 Garrett's Ranking Technique

In Garrett's scoring technique, respondents were asked to rank the factors or problems and these ranks were converted into percent position by using the formula

$$\text{Percent position} = \frac{100 \times (R_{ij} - 0.5)}{N_j}$$

Where,

R_{ij} = Ranking given to the i^{th} attribute by the j^{th} individual

N_j = Number of attributes ranked by the j^{th} individual.

By referring to the Garrett's table, the percent positions estimated were converted into scores. Thus, for each factor the scores of the various respondents were added and the mean values were estimated. The mean values thus obtained for each of the attributes were arranged in descending order. The attributes with the highest mean value was considered as the most important one and the others followed in that order.

CHAPTER IV

DESCRIPTION OF THE STUDY AREA

A general knowledge about the characteristics of the study area is vital to understand the background of research. The physical and economic environments of the region are the major determinants of crop production and manufacturing system. It provides the background for analysis, interpretation and discussion of the results and helps in drawing meaningful inferences. Recognising this, a profile of the region comprising various agro-economic features such as geographical locations, land use pattern, soil type, topography, demography, rainfall, sources of irrigation, cropping pattern, infrastructural facilities etc of Idukki district and insight of Udumbanchola taluk are presented in this chapter.

Location

The beautiful high range district of Kerala, geographically known for its mountainous hills and dense forests is located in the middle part of Kerala. The district is bound on the East by Theni district of Tamil Nadu State while on the West by Ernakulam and Kottayam districts of Kerala. In the South it is the Pathanamthitta district, while on the North it is bound by Trichur and Coimbatore districts of Kerala and Tamil Nadu States respectively. It extends by 115 km from south to north and 67km from east to west. It lies between 9 ° 15' and 10 ° 21' of North Latitude and 76 ° 37' and 77 ° 25' of East Longitude. The maps showing the location of Idukki district in Kerala and taluks in Idukki are provided in the following page.

Topography

An understanding about topography of the land assumes greater importance, since cardamom cultivation is highly dependent on the topography of the land. Cardamom is found within an altitude ranging between 600m and 1200m above mean sea level. More than 50 percent of the total area of the district is covered by rugged mountains and forests. There is only a strip of middle land (3%) in the western part of the district. Low land area is totally absent in the district. As the district lies mostly in the highland, it is covered with dense forest, steep hills, and deep valleys. The following Table 4.1 shows the land pattern of Idukki district.

Table 4.1 Land pattern of Idukki district

Land Pattern	Altitude (Above Mean Sea Level)	Percentage of Land Area
Midland	20m - 100m	4.5
Mid – upland	100m - 300m	7.5
Upland	300m - 600m	12.1
Western Ghats High Range	600m - 1200m	48.3
Top Western Ghats High Range	1200m - Above	24.5

Source: <http://www.idukki.nic.in>

Table 4.2 Idukki district – a glance

Geographical Area	4358 sq.kms
Head Quarters	Painavu
Taluks	4 (Thodupuzha, Devikulam, Udumbanchola, Peerumedu)
Revenue Villages	64 Nos.
Municipality	1 No.
Development Blocks	8 (Thodupuzha, Ilamdesam, Adimaly, Devikulam, Nedumkandam, Kattappana, Idukki, Azhutha)
Panchayats	51 Nos.

Source: Project on Pepper Production in Idukki district of Kerala under National Horticulture Mission implemented by Spices Board, Govt.of India, 2008-09.

Demographic Features

Idukki accounts only 3.7 per cent of the population of Kerala. The total population in Idukki district was 11, 28,605 as per 2001 census. The male population (50.19%) was marginally higher than the female population (49.81%). The population growth rate of

Idukki district declined to 6.96 per cent from 10.45 per cent during the period 1991-2001. The literates constituted 78.19 per cent. Educational status of the males and females revealed that, literacy is more among the males than among the females *viz.*, 52.16 per cent for males and 47.84 per cent for females. The population density per sq. km was 252. Population and other details are given in the Table 4.3.

Table 4.3 Demographic features of Idukki district

Particulars	As per 2001 Census
Total Population (in numbers)	11,28,605
Male	5,66,405 (50.19)
Female	5,62,200 (49.81)
Population density (Sq.Km)	252
Sex Ratio (females per 1000 males)	999
Growth Rate (%)	6.96
Child Population (in numbers)	1,34,177
Male	68,155 (50.79)
Female	66,022 (49.21)
Child Ratio (per 1000 males)	969
Scheduled Caste (Lakhs)	1.59
Scheduled Tribe (Lakhs)	0.509
House Holds (Lakhs)	2.65
Literacy population- Total (in numbers)	8,82,458
Male	4,60,310 (52.16)
Female	4,22,148 (47.84)
Literacy percentage	78.19

Source: <http://www.idukki.nic.in>

(Figures in parenthesis denote the percentage to its respective total).

Distribution of Working Population

The distribution of working population in Idukki district is summarized in Table 4.4. From the table it is clear that the 47.24 per cent of the population are other workers followed by agricultural labours. The labour force in the district mainly depends on agricultural sector.

Table 4.4 Occupational distribution of population in Idukki district in 2001-02

Particulars	Numbers
Marginal workers	39,470 (10.14)
Cultivators	75,392 (19.37)
Agricultural labourers	86,030 (22.11)
Cottage & Household Ind.	4,437 (1.14)
Other workers	1,83,827 (47.24)
Total Workers	3,89,136 (100.00)

Source: Panchayath Census Abstract, Department of Economics and Statistics, 2001.

(Figures in parenthesis denote the percentage to total).

Area of Operational Holdings

From the Table 4.5 it could be observed that there are 2, 11,174 lakh farm households in Idukki district. The marginal farmers accounted for 80.42 per cent followed by small farmers (14.34%).

Table 4.5 Land holding pattern in Idukki district in 2007-08

Size of holding (ha)	Type of farmers	Numbers
Up to 1 Ha.	Marginal	1,69,822 (80.42)
Between 1 and 2 Ha.	Small	30,283 (14.34)
Above 2 Ha.	Large	11,065 (5.24)
Total		2,11,174 (100)

Source: Project on Pepper Production in Idukki district of Kerala under National Horticulture Mission implemented by Spices Board, Govt. of India, 2008-09

(Figures in parenthesis denote the percentage to total).

Land utilization pattern

The land utilization pattern, gives a picture on the area put under different categories of uses like forest, agriculture, non agriculture, fallow *etc.* Hence one can easily assess the thrust given to agriculture in a particular district by studying the land use pattern. The Table 4.6 indicate that the land under forest is high in the district. Net sown area was about 47.75 per cent and gross cropped area was 67.79 per cent of the total geographical area, which shows the predominance of agricultural activity in the districts. The cropping intensity was 141.96.

Table 4.6 Land utilisation pattern of Idukki district in 2007-08

Particulars	Area (ha)
Forest	1,98,413 (45.47)
Land put to non agricultural uses	11,256 (2.58)
Barren and uncultivable land	2,615 (0.60)
Permanent pastures and grazing land	171 (0.04)
Land under miscellaneous tree crops	248 (0.06)
Cultivable waste land	151 (0.35)
Fallow other than current fallow	2232 (0.51)
Current fallow	11513 (2.64)
Net sown area	2,08,363 (47.75)
Total geographical area	4,36,328 (100)
Area sown more than once	87,420
Gross cropped area	2,95,783
Cropping intensity	141.96

Source: Farm Guide, Farm Information Bureau, Govt. of Kerala, 2010.

(Figures in parenthesis denote the percentage to total geographical area).

Soil type

Laterite soil and alluvial soil are the two types of soil found in the Idukki district. The highland area is covered by forest soil (alluvial soil) and the other parts by laterite soil. Peeramedu and Thodupuzha taluks possess lateritic soil whereas alluvial soil is seen in Devikulam and Udumbanchola taluks. Cardamom generally grows well in forest loamy soil that are acidic in nature, preferable pH 5.5-6.5 and high in organic matter and nitrogen, low to medium in phosphorus and medium to high in available potassium.

Climate and rainfall

The climate in the district undergoes a sudden variation from West to East. The western parts of the district comprising midland area experiences moderate climate, temperature varying between 21° C to 27 °C with minimum seasonal variation. The eastern parts of the district located in the highland have a comparatively cold climate with temperature varying between minus 1 °C to 15 °C in November - January and 5 °C to 15 °C during March- April. Annual rainfall varies from 250 to 425 cm.

As common to other parts of the state, the Idukki district also experiences both the south-west monsoon (Edavappathy) and North-East Monsoon (Thulavarsham) during June-July and October - November respectively. The former is more predominant. The actual rainfall received by the district during 2007-08 was 4046 mm and the normal rainfall received was 3769 mm. The rainfall distribution of Idukki district and Kerala for the year 2007-08 is given in the Table 4.7.

Table 4.7 Rainfall distribution in Idukki district and Kerala in 2007-08 (mm)

Month	Idukki	State average*
July	1234.1 (30.50)	996.1 (29.05)
August	616.6 (15.24)	502.4 (14.65)
September	696.0 (17.20)	550.3 (16.05)
October	465.7 (11.51)	366 (10.76)
November	92.1 (2.28)	93.7 (2.73)
December	45.8 (1.13)	13.4 (0.34)
January	5.0 (0.12)	0.8 (0.02)
February	44.9 (1.11)	29.7 (0.87)
March	166.5 (4.11)	215.9 (6.29)
April	120.2 (2.97)	103.7 (3.02)
May	65.2 (1.61)	78.5 (2.28)
June	494.3 (12.22)	477.9 (13.94)
Total	4046.4 (100)	3428.4 (100)

Source: Farm Guide, Farm Information Bureau, Govt. of Kerala, 2010.

*Area weighted average of district values.

(Figures in parenthesis denote the percentage to total).

Water resources

The important rivers of the district are Periyar, Thodupuzhayar and Thalayar. Periyar which is 277 km long is the second longest river of Kerala. It originates from Sivagiri in the southeast part of the district and touches all the taluks of the district. There

are a few natural lakes in the district. They are Eravikulam and Devikulam lakes in Devikulam taluk, Elavizhapunchira, in Thodupuzha taluk.

Irrigation

Irrigation is a very important factor in agriculture. Availability of irrigation facilities is a major factor determining the consumption of fertilizers and pesticides. A brief note about the irrigation facilities is essential to obtain a complete picture about the infrastructural development especially in the agricultural sector. Different sources of irrigation and source wise net irrigated area in Idukki district are presented in the Table 4.8. Private tanks forms the major source of irrigation which accounted 39.86 per cent, followed by 27.92 per cent of net irrigated area by other sources and 18.88 per cent by government canals. The other sources include farm ponds, storage structures, silpoline lined tanks *etc.*

Table 4.8 Net irrigated area (source wise) of Idukki district in 2007-08

Source	Irrigated area (ha)
Government canal	3103 (18.88)
Private canal	322 (1.96)
Private tanks	6553 (39.86)
Government Wells	2 (0.01)
Private wells	1596 (9.71)
Minor irrigation	33 (0.02)
Other sources	4590 (27.92)
Tube wells	240 (1.46)
Total	16439 (100)

Source: Farm Guide, Farm Information Bureau, Govt. of Kerala, 2010.

(Figures in parenthesis denote the percentage to total).

Live Stock and Poultry Population

Livestock rearing is a viable proposition, both as full time and part time occupation. It provides assured income and ensures better utilisation of human resources. It is a major source of self-employment to a substantial number of rural population. The presence of livestock in the farm would help to improve the stability of income generated and also aid in nutritional security. The livestock particulars are given in the Table 4.9.

Table 4.9 Livestock and poultry population in Idukki district in 2007-08

Particulars	Number	Percentage
Cattle	166678	22.69
i) Indigenous	23431	
ii) Cross Bred	143247	
Buffaloes	4348	0.59
Goat	84790	11.55
Pigs	22914	3.12
Fowls	413099	56.25
Ducks	11114	1.51
Other poultry	31486	4.29
Total	734429	100.00

Source: Farm Guide, Farm Information Bureau, Govt. of Kerala, 2010.

Cropping pattern

Idukki district is known for growing major spices *viz.*, pepper and cardamom and hence called as the 'spice district'. Studying cropping pattern of the study area is very important to know the major crops and cultivation practices followed so that better management of the available resources can be identified. More than 80 per cent of the cropped area is under perennial crops. Paddy cultivation is comparatively less. The major crops grown along with their area and production are furnished in the Table 4.10.

Table 4.10 Cropping pattern of Idukki district in 2007-08

Crop	Area (Ha)	Production (Tonnes)
Cardamom	31241	6404*
Pepper	65333	23311
Rubber	39335	54800
Tea	24083	37108
Coconut	19925	72 (nos. in million)
Coffee	12120	6410
Tapioca	6374	211702
Paddy	2190	5959
Jackfruit	12495	35 (nos. in million)
Banana & other plants	2559	18733
Arecanut	3451	3886 (nos. in million)
Ginger	934	2968
Cocoa	9355	7055
Mango	5298	35602
Cashew	1617	588
Papaya	833	2074
Pineapple	1083	7332
Turmeric	387	588

Source: Farm Guide, Farm Information Bureau, Govt. of Kerala, 2010.

*Processed cardamom production

Financial institutions

Idukki district had 99 branches of 11 Commercial Banks, 29 branches of Idukki District Cooperative Bank, 71 Primary Agricultural Credit Societies (PACS), 4 Primary Cooperative Agriculture & Rural Development Banks (PCARDB) and one Farmers

Service Society (FSS) to meet the credit requirements of the district. A large number of PACS are heavily dependent on the District Cooperative Bank due to their poor resource base. The district also has large number of registered private money lenders including that of the leading private bankers like Muthoot Bankers, etc. The financial institution statistics are given in the Table 4.11.

Table: 4.11 Financial institutions in Idukki district

Particulars	District Co-operative Bank	Primary Agricultural Credit Societies	Primary Cooperative Agriculture & Rural Development Banks	Commercial Banks	Total
No. of Banks	1	72	4	11	88
No. of Branches					
(a) Rural	23	72	11	94	200
(b)Semi- Urban	4	Nil	Nil	Nil	4
(c) Urban	1	Nil	Nil	5	6
Total	29	72	11	99	211

Source: <http://www.idukki.nic.in>

Infrastructure facilities

Road transport is the only mode of transportation in Idukki - both for moving goods and passengers. The total extent of road lines in the district is about 8000 Kms. National Highway NH-49 and state highways 13 and 33 passes through the district. Different types of roads and their lengths are presented in the Table 4.12.

Idukki district is the major producer of electricity for the state. The district gets poor supply of electricity, despite the fact that 66 per cent (1196.51 Mega watts) of the entire production of electricity in the State of 1812.9 Mega watts is produced in 8 Electricity Projects located in the district. There are ten electric substations in the district. The district has fifteen main water reservoirs. Besides, health and sanitation facilities,

education are provided in every taluk. Idukki is an industrially backward district. Lack of infrastructure like electricity, transportation, communication *etc.*, hinder industrial development. The district with its natural beauty, evergreen hills, valleys, forests, waterfalls, game sanctuaries, wild flora and fauna, congenial and hospitable cool weather, *etc.* offers vast potential for forest based industries and tourism development

Table: 4.12 Types of roads and their lengths in Idukki district

Type of Road	Length (Kms)
State highways	880.593
Major district roads	495.573
Other district roads	278.606
Village roads	16.250
Totals	1671.022

Source: <http://www.kerala.gov.in>

Description of the selected taluk

Udumbanchola Taluk, with a total geographical area of 1071.40 sq.km and total population of 434954 persons, is the most densely populated taluk of Idukki district. It is located between 9 ° 8'55"N to 10 ° 4'52"N latitudes and 76 ° 58"E to 77 ° 16' 27"E longitude. Udumbanchola forms part of the Western Ghats. The topography is highly undulating and mostly covered with ridges and intervening valleys (Raju and Anilkumar, 2006). Udumbanchola taluk has 23 villages.

About 70.15 per cent of the area and 74.74 per cent of the farm holdings in Idukki district is in Udumbanchola taluk. The taluk wise number of holdings and area under small cardamom in Idukki district is presented in the Table 4.13.

Table 4.13 Taluk-wise number of holdings and area under small cardamom

Taluks	No. of holdings	Area (ha)
Udumbanchola	14291 (74.74)	22544.44 (70.15)
Peeramedu	2365 (12.37)	4044.10 (12.59)
Devikulam	1628 (8.51)	4298.00 (13.37)
Thodupuzha	837 (4.38)	1252.73 (3.90)
Total	19121 (100.00)	32139.27 (100.00)

Source: Report of the survey for assessment of area under small cardamom in India, Spices Board, 1991. (Figures in parenthesis denote the percentage to total).

The distribution of the operational holdings along with area is furnished in the Table 4.14.

Table 4.14 Number and area of individual operational holdings in Udumbanchola taluk

Particulars	No.of holdings	Area(ha)
Below 2 Ha	11489 (80.39)	9849.19 (43.69)
2-4 Ha	1883 (13.18)	5064.24 (22.46)
4-8 Ha	717 (5.02)	3775.02 (16.74)
8-20 Ha	169 (1.18)	1909.74 (8.47)
20-40 Ha	18 (0.13)	478.82 (2.12)
40-100 Ha	10 (0.07)	640.54 (2.84)
100 & above Ha	5 (0.03)	826.88 (3.68)
Total	14291	22544.44

Source: Report of the survey for assessment of area under small cardamom in India, Spices Board, 1991. (Figures in parenthesis denote the percentage to total).

Out of the total operational holdings, 80.39 per cent belonged to the category of below 2 ha followed by the category of 2-4 ha with 13.18 per cent. In the case of total operated area, 43.69 per cent falls in the category of less than 2 hectare. It was seen that as the size of operational holdings increased, the percentage of farmers got decreased. High proportion of the farmers was in the category of marginal and small farmers. After 1989-90 survey no other survey had been done by Spices Board for the assessment of area under small cardamom.

CHAPTER V

RESULTS AND DISCUSSION

The present study analyses the economics of the cardamom production in the Idukki district of Kerala. Keeping the objectives in view, the data collected were subjected to statistical analysis and the results are presented and discussed in this chapter under the following sections.

- General characteristics of the sample farmers.
- The economics of production of cardamom
- Production function analysis
- Technical efficiency of cardamom production
- Marketing of cardamom

5.1 General Description of the Sample Farmers

5.1.1 Family Size of the Farm Households

Among the states in India, Kerala witnessed the lowest population growth rate of 9.4 per cent during 1991-2001. Out of 14 districts of the state, Idukki was the second lowest in population. This feature was reflected in the family size of the farm households. It could be seen from Table 5.1.1 that among the cardamom growers 72 per cent of the households had medium size family with four to five persons per family, 24 per cent of the household had less than four members per household and only about 4 per cent were larger families with more than five persons. This shows that family of the respondents was of nuclear type and the average size of the family of sample respondents was 4.

Table 5.1.1 Size of the family.

Sl. No	Family size	Number of family	Average size
1.	Small (< 4)	24	3
2.	Medium (4-5)	72	4
3.	Large (>5)	4	6
	All size class	100	4

5.1.2 Age of the heads of farm households

Age of the heads of the farm household has been found to be an important determinant of production decisions of the farmers in many studies. The results furnished in Table 5.1.2 showed that among the respondent farmers, 28 per cent of the respondents had more than 50 years of age and 66 per cent were in the age group of 36-50. Only 6 per cent of the farmers were young with an age of less than 35 years. The average age of the heads of farm households was around 47 years. This indicated that the majority of the respondents were in the middle age group and they had relatively good experience in cardamom cultivation.

Table 5.1.2 Age of the heads of farm households

Sl. No	Age group (years)	Number of Respondents	Average age
1.	<35	6	32
2.	36-50	66	43
3.	>50	28	58
	All age group	100	47

5.1.3 Educational status of heads of farm Households

Educational status of the farmers is also an important factor influencing the decision-making behaviour to a great extent. The results presented in the Table 5.1.3 showed the literacy level of heads of households. All the sample farmers were literate. About 20 per cent of the heads of the households had collegiate level of education and 34 per cent had higher secondary education. The numbers of respondents in the primary and secondary level were 5 and 41 per cent respectively. Majority of the farmers had secondary education. This result reflects the fact that Kerala has the highest literacy rate (90.90% as per 2001 census).

Table 5.1.3 Educational status of the heads of farm households

Sl. No	Educational Status	Number of Respondents
1.	Primary	5
2.	Secondary	41
3.	Higher Secondary	34
4.	Collegiate	20
	Total	100

5.1.4 Experience in cardamom cultivation by the households

The results of the experience in farming of the heads of the households are presented in Table 5.1.4. Among the sample farmers, only 5 per cent had the farming experience of more than 30 years. About 30 per cent of the farmers had the farming experience of 20-30 years, 46 per cent of the farmers had the experience of 10-20 years and 19 per cent of the farmers had less than 10 years of experience. Thus, majority of the respondents had fairly a good experience in cardamom cultivation with an average of more than 18 years.

Table 5.1.4 Experience in cardamom cultivation by the heads of farm households

Sl. No	Experience (in years)	Number of Households	Average years of experience
1.	< 10	19	7
2.	10-20	46	16
3.	20-30	30	25
4.	>30	5	39
	Total	100	18

5.1.5 Land holding pattern of the selected farm households

The size of land holding of the sample farmers would indicate the scale of operation which in turn would influence the extent of income from farm. The land holding pattern of the sample farmers are reported in the Table 5.1.5. From the table, it could be inferred that 72 per cent of the respondents were under the category of owning below 2 ha with an average area of 0.68 ha. About 22 per cent of the respondents were under the category of owning 2 to 4 ha of land. The average size of the holding for this category was 2.56. The respondents owning 4 to 8 ha of land constituted 6 per cent of the total households with an average size of 5.33 ha. The average size of holding of the respondents as a whole was 1.37 ha.

Table 5.1.5 Land holding pattern of the selected farm households

Sl. No	Size of holdings (ha)	Number of Households	Average Area Cultivated (ha)
1.	Below 2	72	0.68
2.	2- 4	22	2.56
3.	4-8	6	5.33
	All size	100	1.37

It was observed that all the cardamom farmers had only owned lands and all were irrigated lands. The average rental value of land was Rs. 37,500 per hectare per year and the average land revenue was Rs. 102.18 per hectare per year.

5.1.6 Age of cardamom plants in the selected farm households

The age of the cardamom plants in the selected farm households were analyzed and presented in the Table 5.1.6.

Table 5.1.6 Age of cardamom plants in the selected farm households

Sl. No	Age group (years)	Number of house holds
1.	1-2	14
2.	3-5	56
3.	6-8	28
4.	>8	2

From the table it is clear that more than half the farmers had plants in the age group of 3-5 years and 28 per cent of the farmers had plants in the age group of 6-8 years. The farmers with plants in the establishment stage (1-2 years) constituted 14 per cent of the total farmers and only 2 per cent of the farmers had plants with more than 8 years. The cardamom plants with the age group of less than 5 years were still in the growing stage and characterized by an increase in yield. From 6th year onwards the yield will be stabilized and this will be maintained up to an age of 8-9 years. As the major variety grown in the survey area was “Njallani” most of the farmers replanted after 10 years. So the maximum economic life of this variety was taken as 10 years.

5.2 Economics of cardamom production

In order to know the economics of cardamom production in Kerala, the cost of production for cardamom in Idukki district was estimated and discussed in this section.

The cost concepts followed are given below:

- i) Establishment cost: It includes all the inputs and operational costs for establishing the plantation till bearing stage of the crop *ie.*, two years from the date of planting.
- ii) Maintenance cost: It included operational and maintenance costs in maintaining plantation in a year during its bearing stage.
- iii) Output and returns: It included total production and income obtained in cardamom plantation.

An analysis of cost would enable the farmers to examine the efficiency of allocation of farm resources and reallocate these effectively. The cost of cultivation refers to the total expenses incurred by the farmers, expressed per unit area (per ha).

In order to estimate the returns, average price realized during the year 2008-09 was considered. The average economic life of cardamom was 10 years (for Njallani variety), out of which first two years being the pre-bearing or establishment period.

5.2.1 Cost of cultivation of cardamom

Generally to raise a cardamom plantation, suckers or seedlings of the varieties suitable to the location were used. In the study area, the sample farmers mostly used suckers of the popular variety Njallani, for raising and also for replanting the cardamom plantation. For shade purpose quick growing shade trees like Karuna (*Vernonia arborea*), Chandana Viambu (*Toona ciliate*), Jack tree (*Atrocarpus hetrophyllus*) etc were grown. Pits of 90x90x45 cm were taken and plants were planted at a spacing of 3x3m. On an average 1111 plants were planted per hectare. The details of cost of cultivation of cardamom in Idukki district are presented and discussed below.

A. Establishment cost

The total establishment cost comprised of the expenditure on the preparation of the land, which included the clearing or removal of old plants, digging of the pits and pit filling, planting, manuring, plant protection and other cultural operations.

Cost of labour

The total cost of labour included hired and family labour involved in clearing up of land, digging pits, pit filling, planting of suckers, staking, application of manures and fertilizers, plant protection chemicals including bordeaux mixture and irrigation. It also included the total labour required for cultural operations like shading, weeding, mulching, and irrigation. The cost of labour was computed on the basis of the wage levels prevailing in the study area. *ie.*, Rs.150 for male and Rs.130 for female per day of eight hours. The cost of family labour was imputed based on the same wage rate.

Cost of planting material

Mostly suckers were used as planting material and the average cost was Rs. 25 per sucker. It was either brought from the nurseries or from the farmers field.

Cost of manures and fertilizers.

On an average 6-7 kg of dried cowdung, 1 kg of neemcake and 1 kg of bonemeal were applied per plant in two- three splits. The cost of manures was accounted based on the market rate prevailing in the study area *ie.*, Rs.2 per kg of cowdung, Rs.11 per kg of neemcake and Rs.12 per kg of bonemeal. On an average of 350 grams of fertilizers per plant was applied for three times per year. Factomphos and muriate of potash (MOP) were the main fertilizers used by the farmers.

Cost of plant protection chemicals

Cardamom plants are susceptible to many diseases and pest attack. So, farmers were applying plant protection chemicals for managing pest and diseases. Bordeaux mixture was used as a preventive measure for fungal diseases. Cost of chemicals and bordeaux mixture was accounted based on the market rate prevailing in the study area.

B. Maintenance cost

It included operational and material cost in maintaining cardamom plantations in a year during its bearing period. The various cost included were, cost of labour, maures and fertilizers, plant protection chemicals, depreciation, land revenue, interest on working capital and miscellaneous costs like drying cost, transportation cost etc.

Cost of labour

It included both hired and family labour for the operations like shade regulation, application of manures, fertilizers and plant protection chemicals, cultural operations like weeding, mulching, trashing and irrigation. It also included the labour required for harvesting per year for one ha. The labour cost was calculated based on the market rate prevailing in the study area.

Cost of manures, fertilizers and plant protection chemicals

It included the cost of manures at the average rate of Rs. 25 per kg and cost of fertilizers at an average rate of Rs. 11 per kg. Cowdung, neemcake and bonemeal were the manures mainly used by the farmers. Factomphos and muriate of potash fertilizers were applied at an average rate of 550 grams per plant for three to four times per year. The cost of plant protection chemicals at an average rate of Rs. 500 per litre was also included. Most of the farmers sprayed 13 rounds of plant protection chemicals per year at the rate of 2.5 litres per ha.

Interest on working capital

The interest for agricultural loan during the survey period was seven per cent. Accordingly the interest on working capital at the rate of 7 per cent was calculated and added to the maintenance cost.

Land revenue

The tax on land under cardamom cultivation was included under fixed cost.

Rental value of land

The rental value of land Rs. 37,500 per ha of land per year was included under the fixed cost.

Depreciation

Depreciation for fixed capital was calculated at the rate of two per cent for wells, sheds etc., ten per cent for farm equipments and implements. This was included in annual fixed cost.

Interest on fixed capital

Interest on fixed capital excluding land was estimated at the rate of 12 per cent per annum and treated as fixed cost.

Annual share of establishment cost

The annualized fixed cost was calculated by multiplying the establishment cost with the capital recovery factor. The capital recovery factor was calculated by taking

seven per cent as the bank rate of interest for the agricultural loan and ten years as the life period of the plantation. This amount is added to the annual fixed cost.

Cost of cultivation of cardamom

The input wise cost of cultivation of cardamom crop is presented in Table 5.2.1 and Table 5.2.2. The establishment cost (cost incurred during the first two years) of cardamom is presented in Table 5.2.1. It could be observed from the table that labour, planting materials, manures, fertilizers, plant protection chemicals were the major input items for which cost has been incurred. The labour cost worked out to be Rs. 59,507.46 accounting 45.94 per cent of the total establishment cost. This was followed by planting material, manures, fertilizers and plant protection chemicals amounting to Rs. 25,470.81, Rs. 22,109.54, Rs. 13,105.98 and Rs. 7815.84 respectively. The percentage share being 19.67, 17.07, 10.12 and 6.03 respectively. The total establishment cost was Rs. 1, 29,521.98. Most of the works were performed by manual labour and the extent of machine labour usage was low. It was evident from the data that organic fertilizers were applied in large quantity than the inorganic fertilizers. Among the operations carried out by the labour, weeding and mulching operations was in need of extensive labour force accounting around 21.03 per cent, followed by pit taking (12.87%), irrigation (12.64%), plant protection operations (11.14%) and land preparations (9.66%). Other works were pit filling (9.52%), manures and fertilizer application (8.79%), earthing up (8.10%) and planting and staking (6.25%).

The annual maintenance cost of cardamom is presented in Table 5.2.2. These were the paid out costs incurred every year and otherwise known as operational cost for the year. It could be inferred from the table that more than 50 per cent of total variable cost was incurred on labour. The total labour cost was Rs. 55,932.65. The other major cost items were plant protection chemicals, fertilizers and manures accounting Rs. 17, 404.81, Rs. 12, 350.90 and Rs. 10, 848.68 respectively. The respective percentage share values were 15.70, 11.14 and 9.78. Another important cost item was drying cost amounting to Rs. 4613.34, which accounts for 4.16 per cent. It has been noted that application of fertilizers and plant protection chemicals were of higher order during the cardamom capsule bearing period compared to establishment period.

Table. 5.2.1 Cost of cultivation of cardamom - Establishment cost**(Rs/ha)**

Sl. No.	Cost components	Value (Rs)	Percentage to total cost
1.	Labour		
	a) Land preparation	5750.67 (9.66)	
	b) Pit taking	7659.62 (12.87)	
	c) Pit filling	5667.62 (9.52)	
	c) Planting and staking	3721.19 (6.25)	
	d) Weeding and mulching	12,512.60 (21.03)	
	e) Forking/ Earthing up	4819.17 (8.10)	
	f) Irrigation	7518.93 (12.64)	
	g) Manures and fertilizers application	5230.89 (8.79)	
	h) Plant protection operations	6626.79 (11.14)	
	Total labour cost	59,507.46 (100)	45.94
2.	Planting material	25,470.81	19.67
3.	Manures	22,109.54	17.07
4.	Fertilizers	13,105.98	10.12
5.	Plant protection chemicals	7815.84	6.03
6.	Miscellaneous cost	1512.35	1.17
	Total establishment cost	1,29,521.98	100.00

(Figures in parenthesis indicate the percentage to the total labour cost.)

Table 5.2.2 Cost of cultivation of cardamom - Annual maintenance cost**(Rs/ha)**

Sl. No	Cost components	Value (Rs)	Percentage to total cost
	Variable cost		
1.	Labour		
	a) Shade regulation	844.11 (1.51)	
	b) Trashing and pruning	3896.63 (6.97)	
	c) Weeding and mulching	11341.46 (20.28)	
	d) Forking / Earthing up	3615.70 (6.46)	
	e) Irrigation	7810.47 (13.96)	
	f) Manures and fertilizers application	7213.51 (12.90)	
	g) Plant protection operations	7385.92 (13.21)	
	h) Harvesting	13,824.87 (24.72)	
	Total labour cost	55,932.65 (100)	50.45
2.	Manures	10,848.68	9.78
3.	Fertilizers	12,350.90	11.14
4.	Plant protection chemicals	17,404.81	15.70
5.	Drying cost	4613.34	4.16
6.	Miscellaneous cost	2464.13	2.22
7.	Interest on working capital	7260.83	6.55
	Total variable cost	1,10,875.34	100.00

(Figures in parenthesis indicate the percentage to the total labour cost)

Table 5.2.3 Cost and returns of cardamom for the year 2008-09**(Rs/ha)**

Sl. No	Cost components	Value
1.	Fixed cost	
	a) Land revenue	102.18
	b) Depreciation	3,567.88
	c) Interest on fixed capital	6,265.50
	d) Rental value of owned land	37,500
	Total fixed cost	47,435.56 (26.84)
2.	Annual share of establishment cost	18,441.99 (10.43)
3.	Total variable cost	1,10,875.34 (62.73)
3.	Total cost (1+2 +3)	1,76,752.89
4.	Yield (kg/ha - dry cardamom)	576.76
5.	Cost of production (Rs/kg)	306.46
6.	Price realized by the producer (Rs/kg)	550.00
7.	Annual gross income	3,17,217.73
8.	Net income over variable cost	2,06,342.39
9.	Net income over total cost	1,40,464.84

(Figures in parenthesis indicate percentage to total cost)

The cost and returns of cardamom for the year 2008-09 is given in the Table 5.2.3. The total cost comprised of three major cost items *viz.*, total variable cost, total fixed cost and annual share of establishment cost. The total variable cost was Rs. 1, 10,875.34 accounting 62.73 per cent of the total cost. The fixed cost was at Rs. 47,435.56 accounting 26.84 per cent of the total cost. Among the fixed cost items, rental value of land had huge share of 79.05 per cent of total fixed cost and other items were far below. The annualized establishment cost was Rs. 18,441.99 accounting 10.43 per cent of total cost. The average yield (dry cardamom) obtained was 576.76 kg per ha. The cost of production worked out to be Rs. 306.47 per kg. The average price realized during 2008-09 was Rs. 550 per kg. The annual gross income was Rs. 3, 17, 217.73. The cardamom cultivation was a profitable enterprise showing a net income of Rs. 2, 06,342.39 over the variable cost. Taking into account the total cost, the net income realized was still Rs. 1, 40,464.84, suggesting scope for getting higher profit in cardamom cultivation in Idukki district.

5.3 Production function analysis

To evaluate the factors influencing the cardamom cultivation and also to examine their relative influence production function was fitted. The Cobb-Douglas production function was used and the production elasticities were estimated accordingly. The production function was estimated using Ordinary Least Square (OLS) method. The estimated values of the regression coefficients were tested for statistical significance with the help of 't' test and the significance of the equation was tested by 'F' test for R^2 . The independent variables were number of total labour (man days per hectare), quantity of fertilizers used (kg per ha), quantity of manures (kg per ha), irrigations (numbers), cost of chemicals (Rs per ha) and age of the crop (years). The result of production function analysis relating yield of cardamom and factors influencing it are given in the Table 5.3.

Table 5.3 Results of Cobb Douglas production function analysis for cardamom

Sl.No	Explanatory variables	Parametric values	Standard error	t-ratio
1.	Constant	2.3384	0.7028	3.327
2.	Age of the crop (years)	0.0285	0.0204	1.397
3.	Labour (man days per ha)	0.2060***	0.0609	3.383
4.	Fertilizer (kg per ha)	0.2611**	0.1166	2.238
5.	Manures (kg per ha)	0.3835**	0.1604	2.391
6.	Plant Protection chemicals (Rs per ha)	0.1740	0.1410	1.234
7.	Irrigation (numbers)	0.0905**	0.0423	2.139
8.	R ²	0.8518		
9.	Adjusted R ²	0.8358		
10.	F	53.17		

*** Significant at one per cent level, ** Significant at five per cent level,

* Significant at ten per cent level

The coefficient of multiple determination (R²) value at 0.8518 would indicate that 85 per cent of the variation in the dependent variable was explained by the relevant independent variables selected for the study. The calculated F value at 53.17 was significant at one per cent level of probability and indicated the goodness of the fit. The co-efficients of the variable namely labour was significant at one per cent level of probability, which indicated that an increase in use of labour by one per cent, *ceteris paribus*, would increase yield by 0.206 per cent from the geometric mean level. The high wage rates, non availability of labourers were some of the reasons to reduce the engagement of human labour for various operations. The co-efficient for variables, fertilizer and manure was significant at five per cent level of probability. An increase in use of fertilizer by one per cent, *ceteris paribus*, would increase the yield by 0.26 per cent and by one per cent

increase in the use of manures the yield will increase by 0.38 per cent. Number of irrigations also significantly influenced yield. It could be inferred that an increase in the number of irrigations by one per cent, *ceteris paribus*, would increase the yield by 0.09 per cent.

5.4 Technical efficiency of cardamom plantation

Efficiency is very important concept in production economics, where resources are meager and opportunities for developing and adopting better technologies are competitive. Efficiency of a firm is its ability to produce the greatest amount of output from a fixed amount of inputs. In other words an efficient firm is one that given a state of technical know-how can produce a given quantity of goods by using least quantity of inputs possible. It is also important to know well how the resources are being utilized and what possibilities exist for improving the operational efficiency in the phase of overall resource efficiency. Efficiency studies would show whether it is possible to raise productivity by improving the level of efficiency without actually increasing the resource base. Estimates on the extent of inefficiency could also help to decide whether to improve efficiency (or) to develop technologies to raise agricultural productivity. In this study stochastic frontier function was fitted to measure technical efficiency of two category cardamom growers. The Cobb Douglas functional form was used to estimate stochastic frontier using Maximum Likelihood Estimation (MLE) method. For the frontier analysis, dry cardamom yield in kg per ha was taken as the dependent variable and the independent variables included were labour (mandays per ha), quantity of fertilizers used (kg per ha), quantity of manures (kg per ha), irrigation (numbers), cost of chemicals (Rs per ha), age of the crop (years). To measure the inefficiency the socioeconomic variables like age of the farmers (years), educational level of producers, experience of farmers (years), were included. Maximum Likelihood Estimation method was employed using FRONTIER 4.1 software package and the coefficients are presented in Table 5.4.1

Table 5.4.1 Maximum likelihood estimates of stochastic frontier function

Explanatory variables	Parametric values	Standard error
Constant	2.1303**	1.0340
Age of the plantation (years)	0.0516	0.0327
Labour (mandays per ha)	0.3493***	0.1167
Fertilizers (kg per ha)	0.1538**	0.0726
Manures (kg per ha)	0.2902**	0.1318
Plant protection chemicals (Rs per ha)	0.1743	0.1173
Irrigation (numbers)	0.1402**	0.0605
σ^2_u	0.05976	
σ^2_v	0.00517	
$\lambda = \sigma_u / \sigma_v$	3.3998	
$\theta = \sigma^2_u / (\sigma^2_u + \sigma^2_v)$	0.9203	
$MTE = 1 - \sigma_u (\sqrt{2} / \pi)$	0.8049	

*** Significant at one per cent level, ** Significant at five per cent level, * Significant at ten per cent level.

Table 5.4.2 Estimated parameters of technical inefficiency model

Variables	Parametric values	Standard error
Constant	0.2417	0.4542
Age of the farmer (years)	0.1192**	0.0498
Educational status of the head of the family	-0.0196**	0.0087
Experience of the farmer in cardamom cultivation	-0.1049	0.0709
Family size	0.1612	0.1011

*** Significant at one per cent level, ** Significant at five per cent level, * Significant at ten per cent level.

The variance of one sided error term (σ^2u) and symmetric error term (σ^2v) were estimated at 0.05976 and 0.00517 respectively. This implied that one sided error was dominant which measured the shortfall of output from the maximum possible output. The ratio of one sided error term to symmetric error term λ worked out to 3.3998 which would depict that the technical inefficiency was more than that of the statistical error.

The variance ratio parameter (θ) was estimated at 0.9203 which is closer to one. This indicated deviation in the output from the frontier yield was mainly due to technical inefficiency. The mean technical efficiency was estimated at 0.8049, which implied that the technical efficiency of farmers was 80.49 per cent and the yield of cardamom can be increased to 19.51 by the use of technically efficient plan. So, there is still scope to increase the production of cardamom without an increase in cost of production.

The estimated parameters of the inefficiency effect model from the Table 5.4.2, obtained from the results of Maximum Likelihood Estimates of stochastic frontier, show that educational status and experience of the farmers are the main socioeconomic variables that significantly affect the technical inefficiency of farmers (Amadou Nchare, 2007). Both the variables have a negative and significant effect on technical inefficiency. This shows that the farmers who are more educated and those who have good experience in cardamom cultivation tend to be more efficient in cardamom production. This may be due to their

knowledge, both from education and experience, about the uses of resources in an efficient manner.

The individual farms technical efficiency levels were determined and presented in the Table 5.4.3

Table 5.4.3 Frequency distribution of technical efficiency of individual farms

Sl.No	Efficiency levels (percentage)	Number of farms	Percentage to total
1.	< 40	Nil	Nil
2.	40-50	2	2.33
3.	50-60	3	3.49
4.	60-70	9	10.47
5.	70-80	20	23.26
6.	80-90	46	53.49
7.	90-100	6	6.98
	Total	86	100.00
	Mean Technical Efficiency	80.4892	

From the Table 5.4.2 it could be seen that 53.49 per cent of the farms had efficiency levels in the range of 80-90 and 23.26 per cent of the farms had efficiency levels of 70-80 per cent. Only two farms (2.33 %) had efficiency in the range of 40-50 per cent.

5.5 Marketing of cardamom

Cardamom generally becomes ready for harvest during August to January in the region. During August to September harvesting starts in slow pace based on the weather conditions. The peak harvesting period is from September to November and by December – January the harvesting season ends. But if irrigation and suitable microclimate is provided during summer, then the crop will yield through out the year. Based on the harvest and the demand during the festival season the peak months of

cardamom arrival hitting the market are September to November and the lean months are March to June. There are eight major grades available in the market. The details regarding the grades are furnished in the Appendix X. In India the major destinations are Delhi, Mumbai, Kanpur, Kolkata and Madras. The major export destinations are Saudi Arabia, Kuwait, USA and Japan. Under normal conditions cardamom can be stored for two months and under good packing it can be stored upto one year. But farmers mainly preferred to dispose the produce immediately after the harvest. The major markets of cardamom in India are Saklaspur, Mercara, Medikeri, Mangalore all in Karnataka, Bombay in Maharashtra, Virudhunagar, Cumbum, Bodinayakanur, Thevaram, Pattiveerampatti- all in Tamil Nadu. Cardamom auction system is one of the oldest methods of marketing. At present, e-auction is there at Vandenmedu (Kerala) and Bodinayakanur (Tamil Nadu). There are seven auctioneers registered with the Spices Board, Government of India, who conduct regular auction on a particular day in a week. In order to know the marketing practices and problems in marketing of cardamom, the marketing channel through which cardamom is marketed was traced and the marketing efficiency was worked out. The results are presented in the Tables 5.5.1 through 5.5. 4.

5.5.1 Marketing channels

The cardamom growers sold their produce either to auction centers or village traders. The wholesalers and retailers bought the produce from the above intermediaries. In the case of farmers selling directly to traders, cleaning and grading was carried out by the traders themselves. Usually lower grades of cardamom were catered to the local markets through retailers. While the higher grades of the produce were handled by exporters and up country wholesalers. The following channels were identified in the study area.

Channel I

Producer → Hill produce dealers → Wholesalers → Retailers → Consumers
(Local merchants)

Channel II

Producer → Auction centre → Wholesalers → Retailers → Consumers

Channel III

Producer → Auction centre → Traders → Up country wholesalers → Retailers → Consumers

Channel IV

Producer → Auction centre → Traders → Exporters → Consumers

The marketing channels I and II were the main channels identified within the state. The channel III was identified within the country, especially for north India and channel IV was for export purpose.

5.5.2 Price spread

The price spread worked out for different cardamom marketing channels are furnished in the Tables 5.5.2.1 through 5.5.2.4.

It could be observed from the Table 5.5.2.1 that in the marketing channel I, the net price received by the farmers was Rs. 525 per kg, which constituted about 74.85 per cent of the consumer price. The marketing cost incurred by the local dealers accounted for about 4.73 per cent, for the wholesalers it was 3.56 per cent and for the retailers it was about 2.85 per cent. The margin received by the local dealers, wholesalers and retailers was up to 5.45 per cent, 4.28 per cent and 3.56 per cent of consumer price respectively.

In marketing channel II, the producers received about 80.72 per cent of consumer price. The marketing cost incurred by the farmers was 1.80 per cent of consumer price and for wholesalers and retailers it was about 5.40 per cent and 2.81 per cent respectively. The margin received by the wholesalers and retailers was up to 6.00 per cent and 3.26 per cent of consumer price.

In marketing channel III, the producers received about 77.94 per cent of the consumer price. The marketing cost incurred by farmers was 1.70 per cent of consumer price. The marketing cost for traders, wholesalers and retailers was about 5.53 per cent, 2.51 per cent and 2.64 per cent of consumer price respectively. The margin received by the traders, wholesalers and retailers were 6.09 per cent, 3.22 per cent and 3.48 per cent of the final price paid by the consumers respectively.

Table 5.5.2.1 Price spread of cardamom in Market Channel I**(Rs/kg)**

Sl. No	Particulars	Amount (Rs)	Percentage to the consumer price
1.	Producer		
a.	Price received per kg of dry cardamom	530	75.56
	Packing and weighing	3.00	0.43
	Transportation cost	2.00	0.29
b.	Total cost	5.00	0.71
c.	Net price received	525.00	74.85
2.	Local dealers		
a.	Purchase price	530.00	
	Cleaning	4.00	0.57
	Packing and weighing	4.00	0.57
	Transportation cost	3.00	0.43
	Sales Tax	21.20	3.02
	Miscellaneous charges	1.00	0.14
b.	Total marketing cost	33.20	4.73
c.	Profit margin	38.20	5.45
d.	Marketing margin	71.40	10.18
e.	Sale price	601.40	85.74

Sl. No	Particulars	Amount (Rs)	Percentage to the consumer price
3.	Wholesaler		
a.	Purchase price	601.40	
	Labour charges for unloading	2.00	0.29
	Grading	6.00	0.85
	Packing and weighing	5.00	0.71
	Transportation cost	3.00	0.43
	Miscellaneous charges	1.00	0.14
	Storage cost	4.00	0.57
	Commission charges	4.00	0.57
b.	Total cost	25.00	3.56
c.	Profit margin	30.00	4.28
d.	Marketing margin	55.00	7.84
e.	Sale price	656.40	93.58
4.	Retailer		
a.	Purchase price	656.40	
	Labour charges for unloading	3.00	0.43
	Labour	4.00	0.57
	Rent	4.00	0.57
	Miscellaneous charges	1.00	0.14
	Transportation cost	3.00	0.43
	Commission charges	5.00	0.71
b.	Total cost	20.00	2.85
c.	Profit margin	25.00	3.56
d.	Marketing margin	45.00	6.42
e.	Sale price	701.40	
	Price spread	171.40	24.44

Table 5.5.2.2 Price spread of cardamom in market channel II

(Rs/kg)

Sl. No	Particulars	Amount (Rs)	Percentage to the consumer price
1.	Producer		
a.	Price received per kg of dry cardamom	550.00	82.52
	Transportation cost	2.50	0.38
	Packing and weighing cost	4.00	0.60
	Commission charges	5.50	0.83
b.	Total cost	12.00	1.80
c.	Net price received	538.00	80.72
2.	Auction centre		
a.	Purchase price	550.00	82.52
3.	Wholesaler		
a.	Purchase price	550.00	
	Sales Tax	22.00	3.30
	Transportation cost	2.00	0.30
	Grading	5.00	0.75
	Packing and weighing	3.00	0.45
	Storage cost	3.00	0.45
	Miscellaneous charges	1.00	0.15
b.	Total cost	36.00	5.40
c.	Profit margin	40.00	6.00
d.	Marketing margin	76.00	11.40
e.	Sale price	626.00	93.92

Sl. No	Particulars	Amount (Rs)	Percentage to the consumer price
4.	Retailer		
a.	Purchase price	626.00	
	Unloading cost	1.50	0.23
	Transportation cost	2.00	0.30
	Labour	3.00	0.45
	Rent	2.00	0.30
	Storage cost	3.00	0.45
	Commission charges	6.26	0.94
	Miscellaneous charges	1.00	0.15
b.	Total cost	18.76	2.81
c.	Profit margin	21.76	3.26
d.	Marketing margin	40.52	6.08
e.	Sale price	666.52	
5.	Consumers		
a.	Price paid by the consumers	662.52	
	Price spread	116.52	17.48

Table 5.5.2.3 Price spread of cardamom in market channel III

(Rs/kg)

Sl. No	Particulars	Amount (Rs)	Percentage to the consumer price
1.	Producer		
a.	Price received per of dry cardamom	550	77.94
	Transportation cost	2.50	0.35
	Packing and weighing cost	4.00	0.57
	Commission charges	5.50	0.78
b.	Total cost	12.00	1.70
c.	Net price received	538.00	76.24
2.	Auction centre		
a.	Purchase price	550.00	77.94
3.	Traders		
a.	Purchase price	550.00	
	Cleaning and grading	5.00	0.71
	Packing and weighing	4.00	0.57
	Transportation cost	4.00	0.57
	Sales Tax	22.00	3.12
	Storage cost	3.00	0.43
	Miscellaneous charges	1.00	0.14
b.	Total cost	39.00	5.53
c.	Profit margin	43.00	6.09
d.	Marketing margin	72.00	10.20
e.	Sales price	622.00	88.14

Sl. No	Particulars	Amount (Rs)	Percentage to the consumer price
4.	Wholesaler		
a.	Purchase price	622.00	
	Unloading cost	1.50	0.21
	Packing and weighing	3.00	0.43
	Storage cost	3.00	0.43
	Transportation cost	3.00	0.43
	Miscellaneous charges	1.00	0.14
	Commission charges	6.22	0.88
b.	Total cost	17.72	2.51
c.	Profit margin	22.72	3.22
d.	Marketing margin	40.44	5.73
e.	Sale price	662.44	93.87
5.	Retailer		
a.	Purchase price	662.44	
	Unloading cost	1.50	0.21
	Transportation cost	2.00	0.28
	Labour	3.00	0.43
	Rent	2.00	0.28
	Storage cost	3.00	0.43
	Commission charges	6.62	0.94
	Miscellaneous charges	1.00	0.14
b.	Total cost	18.62	2.64
c.	Profit margin	24.62	3.49
d.	Marketing margin	43.24	6.13
e.	Sale price	705.68	
5.	Consumers		
a.	Price paid by the consumers	705.68	
	Price spread	155.68	22.06

Table. 5.5.2.4 Price spread of cardamom in market channel IV

(Rs/kg)

Sl. No	Particulars	Amount (Rs)	Percentage to the consumer price
1.	Producer		
a.	Price received per kg of dry cardamom	550	80.76
	Transportation cost	2.50	0.37
	Packing and weighing cost	4.00	0.59
	Commission charges	5.50	0.81
b.	Total cost	12.00	1.76
c.	Net price received	538.00	79.00
2.	Auction centre		
a.	Purchase price	550.00	80.76
3.	Traders		
a.	Purchase price	550.00	
	Cleaning and grading	5.00	0.73
	Packing and weighing	4.00	0.59
	Transportation cost	5.00	0.73
	Sales Tax	22.00	3.23
	Storage cost	3.00	0.44
	Miscellaneous charges	2.00	0.29
b.	Total cost	41.00	6.02
c.	Profit margin	46.00	6.75
d.	Marketing margin	87.00	12.78
e.	Sales price	637.00	93.54

Sl. No	Particulars	Amount (Rs)	Percentage to the consumer price
4.	Exporters		
a.	Purchase price	637.00	
	Freight charges	3.00	0.44
	Packing and weighing	6.00	0.88
	Storage cost	5.00	0.73
	Miscellaneous charges	3.00	0.44
b.	Total cost	17.00	2.50
c.	Profit margin	27.00	3.96
d.	Marketing margin	44.00	6.46
e.	Sale price	681.00	
5.	Consumers		
a.	Price paid by the consumers	681.00	
	Price spread	131.00	19.24

In marketing channel IV, the producers on an average received 80.76 per cent of consumer price. The marketing cost incurred by farmers was 1.76 per cent of consumer price. The marketing cost for traders and exporters were about 6.02 per cent and 2.50 per cent of consumer price respectively. The margin received by the traders and exporters were 6.75 per cent and 3.96 per cent of the consumer price respectively.

5.6 Marketing Efficiency

Marketing is said to be efficient if the total marketing margins are higher per unit of marketing cost. The marketing efficiency of different marketing channels for cardamom was estimated using the following three methods. More than one method was used to check the accuracy of the efficiency.

1. Acharaya's approach.
2. Shepherd's formula.
3. Calkin's index

The results of the above analysis are furnished in the following tables.

Table 5.6.1 Marketing efficiency of cardamom - Acharya's approach

Sl. No	Market channel	Net price received by the farmer (Rs)	Marketing cost + Marketing margin (Rs)	Marketing Efficiency
1.	Channel I	525.00	176.40	2.98
2.	Channel II	538.00	128.52	4.19
3.	Channel III	538.00	177.68	3.03
4.	Channel IV	538.00	143.00	3.76

Table 5.6.2 Marketing efficiency - Shepherd's formula

Sl. No	Market channel	Value of goods sold (Rs)	Total marketing cost (Rs)	Marketing efficiency
1.	Channel I	701.40	83.20	8.43
2.	Channel II	666.52	66.76	9.98
3.	Channel III	705.68	87.34	8.08
4.	Channel IV	681.00	70.00	9.73

The results of marketing efficiency presented in Tables 5.6.1 and 5.6.2, revealed that the marketing efficiency was relatively higher in marketing channel II in both the approaches, *ie.*, 4.19 in Acharya's approach and 9.98 in Shepherd's formula.

Table 5.6.3 Marketing efficiency - Calkin's Index

Sl. No	Market channel	Sum of profit (or) margin (Rs)	Sum of marketing cost (Rs)	Marketing Efficiency
1.	Channel I	93.20	83.20	2.12
2.	Channel II	61.76	66.76	1.92
3.	Channel III	90.34	87.34	2.03
4.	Channel IV	73.00	70.00	2.04

The results of Calkin's index provided in Table 5.6.3 shows that the Calkin index is low for the marketing channel II. Thus the results revealed that the marketing channel within the state, where auction centre is involved had higher efficiency. Thus channel II found out to be most efficient channel.

5.7 Problems faced in cardamom cultivation by the sample farmers

The problems faced in cardamom cultivation by sample farmers were listed and were quantified using Garrett's ranking and the results are presented in Table 5.7.

Table 5.7 Problems faced in cardamom cultivation by the sample farmers

Sl. No	Problems	Score	Rank
1.	Labour shortage	54.41	I
2.	High cost of labour	52.41	II
3.	Pest and Diseases	47.97	III
4.	High cost of inputs- manures, plant protection chemicals	47.15	IV
5.	Water scarcity	44.48	V

In the order of Garrett score ranking, the most important problem was labour shortage during peak season, especially during harvesting time coupled high cost of labour. The next important problem was pest and diseases which lead to yield loss. The other problems were high cost of inputs (mainly manures and plant protection chemicals) and water scarcity. The scores of the problems did not show wide difference. This may be due to the reason that these problems are interconnected.

5.8 Problems faced in cardamom marketing by the sample farmers

The farmers were asked to rank the problems faced by them in marketing and the results are presented in Table 5.8.

Table 5.8 Problems faced in cardamom marketing by the sample farmers

Sl. No	Problems	Score	Rank
1.	Delay in getting the payment from the auction centre	56.28	I
2.	Price fluctuation	44.73	II
3.	High grading cost	39.45	III

The farmers ranked delay in getting the payment from the auction centre as the most important problem. In auction centre there is a delay in getting the payment, ie., 21 to 23 days after the day of auction. If payment is made on the day of auction the interest for the above said period has to be borne by the producer. The other problems were fluctuating price and high cost for grading because of high labour cost. For immediate disposal and cash realization most of the farmers preferred selling their produce to local village merchants.

5.9 Problems faced by the market intermediaries

The intermediaries were asked to rank the problems faced by them in cardamom marketing and results presented in Table 5.9.

Table 5.9 Problems faced by the market intermediaries

Sl. No	Problems	Score	Rank
1.	Delay in getting the payment from upcountry wholesalers and from importers	59.39	I
2.	High handling cost	48.77	II
3.	Non availability of specified grades	33.45	III

The intermediaries expressed that the delay in getting the payment from the upcountry wholesalers or retailers and from the importers as the most important problem (59.39) followed by the high handling cost (48.77) and non availability of specified grades (33.45).

CHAPTER VI

SUMMARY AND CONCLUSION

Small Cardamom (*Elletaria cardamomum*) known as the “Queen of spices” enjoys a unique position in the international spice market. The cardamom of commerce is the dried fruit (capsule) accounting 90 per cent of its world trade. Cardamom is a low volume, high value crop. It is one of the most exotic and second most expensive spice after saffron. The high price reflects the high reputation of this most pleasantly scented spice. India is the second largest producer with an average production of 11,500 MT.

In view of the economic importance of cardamom in both national and farm economy and the problems faced by farmers in production and marketing of cardamom the present study was taken up with the following specific objectives.

- v) To estimate the cost associated with cultivation and maintenance of cardamom,
- vi) To analyze the technical use efficiency in cardamom cultivation,
- vii) To identify the marketing channel and to estimate the price spread for the same and
- viii) To find out the constraints in production and marketing of cardamom to suggest suitable policy measures for its promotion.

The Kerala state which occupies prime position in cardamom production among all the states in India was selected for the study (Spices Board, 2008-09). Idukki district which is well known for the developments in spice sector especially with respect to cardamom production was selected for the study.

For the purpose of selecting samples, Udumbanchola taluk, having largest area and production under cardamom, was purposively selected. Within the taluk, four villages were selected randomly. A sample of 25 farmers from each of the four villages was drawn and the total number of sample size was fixed at 100.

For conducting the market study, different intermediaries involved in the cardamom marketing were studied. The primary data required for the study were

collected through personal interview with the help of a pre-tested comprehensive interview schedule.

Two separate interview schedules were used, one for the farmers and the other for the market functionaries. The survey was conducted during the months of January 2010 to February 2010. The data collected were tabulated, processed and subjected to statistical analysis.

General characteristics of sample farmers

The low population growth rate in Kerala was reflected in the family size of farm households. The majority of families were of nuclear type. Medium sized families were larger in number (72 %) followed by small sized families with less than four members per household (24 %). The households with a family size of more than five were only 4 per cent of the total and the average family size was around four.

The respondents were mainly in the age group of 36 and 50 years (66 %), followed by the respondents with the age group of more than 50 years (28 %). Only 6 per cent of the farmers were young with an age less than 35 years. The average age of the farmers was around 47 years which indicated that the farmers were in the middle age group and they had relatively good experience in cardamom cultivation.

Educational status of the heads of the farm households was quite impressive. There was no illiterate farmer and majority of the farmers had secondary education. The respondents with primary and higher secondary education were 5 per cent and 34 per cent respectively. About 20 per cent of the heads of the households had collegiate level of education. The result reflected the fact that Kerala has the highest literacy rate (90.90% as per 2001 census).

Experience in farming of the heads of farm households was analysed. About 46 per cent of the total number of respondents had of 10-20 years of experience in cardamom cultivation. The farmers with an experience of 20 and 30 years were 30 per cent and with less than 10 years were only 19 per cent. The average year of experience was 18 for the sample farmers. From this, it could be concluded that the majority of farmers were well educated and better experienced in farming.

The land holding pattern of the farmers revealed that 72 per cent of the respondents had the owned land of less than 2.0 ha. About 22 per cent of the respondents possessed land between 2 and 4 ha and only 6 per cent of respondents had more than 4 ha. The average land holding sizes for these three categories listed above were 0.68 ha, 2.56 ha and 5.33 ha respectively. The average land holding size of the sample farmers was 1.46 ha and most of them were marginal farmers.

As far as the age of the plantations is concerned, more than half of the farmers had plants in the age group of 3-5 years and 28 percent of the farmers had plants in the age group of 6-8 years. The farmers with plants in the establishment stage (1-2 years) constituted 14 per cent of the total farmers and only 2 percent of the farmers had plants with more than 8 years. The cardamom plants with the age group of less than 5 years were still in the growing stage and characterized by an increase in yield. From 6th year onwards the yield will be stabilized and this will be maintained up to an age of 8-9 years. The major variety grown in the survey area was “Njallani”. And most of the farmers replanted the crop after 10 years. Hence the maximum economic life of this variety was taken as 10 years.

Cost of cultivation of cardamom

The total establishment cost (cost incurred during the first two years) was Rs. 1, 29,521.98. The major input items for which establishment cost has been incurred were labour, planting materials, manures, fertilizers, plant protection chemicals. The labour cost worked out to be Rs. 59,507.46 accounting 45.94 per cent of the total establishment cost. This was followed by planting material, manures, fertilizers and plant protection chemicals with percentage share of 19.67, 17.07, 10.12 and 6.03 respectively. Among the operations carried out by the labour, weeding and mulching operations was in need of extensive labour force accounting around 21.03 per cent, followed by pit taking (12.87 %), irrigation (12.64 %), plant protection operations (11.14 %) and land preparations (9.66 %).

The annual maintenance cost of cardamom was worked out to be Rs. 1,10,875.34. More than 50 per cent of total variable cost was incurred on labour. The total labour cost was Rs. 55,932.65. The other major cost items were plant protection chemicals, fertilizers and

manures accounting Rs. 17, 404.81, Rs. 12, 350.90 and Rs. 10, 848.68 respectively. The respective percentage share values were 15.70, 11.14 and 9.78. Another important cost item was drying cost amounting to Rs. 4613.34, which accounted for 4.16 per cent.

The total variable cost was Rs. 1, 10,875.34 accounting 62.73 per cent of the total cost. The fixed cost was at Rs. 47,435.56 accounting 26.84 per cent of the total cost. Among the fixed cost items, rental value of land had huge share of 79.05 per cent of total fixed cost and other items were far below. The annualized establishment cost was Rs. 18,441.99 accounting 10.43 per cent of total cost. The average yield (dry cardamom) obtained was 576.76 kg per hectare. The cost of production worked out to be Rs. 306.47 per kg. The average price realized during 2008-09 was Rs. 550 per kg. The annual gross income was Rs. 3, 17, 217.73. The cardamom cultivation was a profitable enterprise showing a net income of Rs. 2, 06,342.39 over the variable cost. Taking into account the total cost, the net income realized was still Rs. 1, 40,464.84, suggesting scope for getting higher profit in cardamom cultivation in Idukki district.

Production function analysis

Cobb Douglas production function was run using yield per hectare as the dependent variable and total labour (man days per hectare), quantity of fertilizers used (kg per ha), quantity of manures (kg per ha), irrigation (numbers), cost of chemicals (Rs per ha), age of the crop (years) as independent variables.

Results showed that 85 per cent of the variation in the dependent variable was explained by the relevant independent variables selected for the study. The co-efficient of the variable namely labour and irrigation were significant at one per cent level of probability. The high wage rates, non availability of labourers were some of the reasons for lesser usage of human labour for various operations. In the selected study area water scarcity was a major problem and most of the marginal farmers were found to irrigate at wide intervals. The co-efficient of fertilizer and manure was significant at five per cent level of probability.

Technical efficiency of cardamom plantation

The Cobb Douglas functional form was used to estimate stochastic frontier using Maximum Likelihood Estimation (MLE) method. To measure the inefficiency the socioeconomic variables like age of the farmers (years), educational level of producers, experience of farmers (years), were included along with the other explanatory variables - total labour (man days per hectare), quantity of fertilizers (kg per ha), quantity of manures (kg per ha), irrigation (numbers), cost of chemicals (Rs per ha), age of the crop (years). Maximum likelihood method was employed using FRONTIER 4.1 software package.

The variance of one sided error term (σ^2u) and symmetric error term (σ^2v) were estimated at 0.05976 and 0.00517 respectively. This implied that one sided error was dominant which measured the shortfall of output from the maximum possible output. The ratio of one sided error term to symmetric error term, λ worked out to 3.3998, which depicted that the technical inefficiency was more than that of the statistical error. The variance ratio parameter (θ) was estimated at 0.9203, which is closer to one. This indicated deviation in the output from the frontier yield was mainly due to technical inefficiency. The mean technical efficiency was estimated at 0.8049, *ie.*, the technical efficiency of farmers was 80.49 per cent and the yield of cardamom can be increased to 19.51 by the use of technically efficient plan. So, there is still scope to increase the production of cardamom without an increase in cost of production.

The estimated parameters of the inefficiency effect model showed that educational status and experience of the farmers were the main socioeconomic variables that significantly affect the technical inefficiency of farmers. Both the variables had negative significant effect on technical inefficiency.

Marketing of cardamom

Four types of market channels were identified for cardamom in the study area and price spreads were estimated for each of the four marketing channels, so as to understand the comparative efficiency in cardamom marketing through different channels of marketing.

The price spread was Rs. 171.40, Rs. 116.52, Rs. 155.68 and Rs. 131.00 for four different market channels respectively. It was lower in the second marketing channel. The

share received by the farmer constituted 75.56, 82.52, 77.94 and 80.76 per cent of consumer's rupee for four different market channels respectively.

The profit margin for wholesaler constituted 13.50 per cent of consumer's rupee (*i.e.*, 4.28, 6.00 and 3.22 per cent of consumer's rupee for channels I, II and III respectively) in first three different market channels and the marketing cost borne by the wholesaler constituted 11.47 per cent of consumer's rupee in first three market channels together.

The profit margin for retailer constituted 3.56, 3.26 and 3.48 per cent of consumer's rupee for first three market channels respectively and the marketing cost borne by the retailer constituted 2.85, 2.81 and 2.64 per cent of consumer's rupee for the first three market channels respectively.

The profit margin for traders was 6.09 and 6.75 per cent of the consumer's price for third and fourth market channel respectively. The marketing cost borne by them for the same channels constituted 5.53 and 6.02 per cent respectively.

Marketing efficiency

Marketing efficiency of the different marketing channels was estimated using the following three methods:

1. Acharya's approach
2. Shepherd method
3. Calkin's index

The results of marketing efficiency calculated through Acharya's approach and Shepherd's approach revealed that the marketing efficiency was relatively higher in marketing channel II in both the approaches, *i.e.*, 4.19 in Acharya's approach and 9.98 in Shepherd's method.

The Calkin's index was low for the marketing channel II. Lower the value of the index, higher would be the efficiency. Thus the results revealed that the marketing channel II, which worked within the state with the involvement of the auction centre, had the highest efficiency.

Problems faced in cardamom cultivation and marketing by sample farmers

The producers expressed that the labour shortage (with garret score 54.41) during peak season, especially during harvesting time coupled with high cost of labour (52.41) was the most important problem. The next important problem was pest and diseases (47.97) which lead to yield loss. The other problems were high cost of inputs, mainly manures and plant protection chemicals, (47.15) and water scarcity (44.48). The scores of these problems did not show much difference. This may be due to the reason that these problems are interconnected.

The farmers ranked delay in getting the payment from the auction centre (56.28) as the most important problem faced by them in marketing the cardamom produce. The other problems were fluctuating price (44.73) and high cost for grading (39.45) arising out of high labour cost.

Problems faced by intermediaries

The intermediaries expressed that the delay in getting the payment from the upcountry wholesalers or retailers and from the importers was the most important problem (59.39) followed by the high handling cost (48.77) and non availability of specified grades (33.45).

Conclusions

Important conclusions of the study are summarized below:

- The total cost of establishment of cardamom was estimated to be Rs. 1, 29,521.98 per hectare. The major input items of the establishment cost were labour, planting materials, manures, fertilizers, plant protection chemicals. The labour cost was worked out at Rs. 59,507.46 accounting 45.94 per cent of the total establishment cost. Most of the works were performed by manual labour and the extent of machine labour usage was low. It was noted that organic fertilizers were applied in large quantity than the inorganic fertilizers during establishment period.
- The annual maintenance cost of cardamom was worked out to be Rs. 110875.34. More than 50 per cent of total cost was incurred on labour followed by plant protection chemicals, fertilizers, manures and drying accounting 15.70, 11.14, 9.78 and 4.6 per

cent respectively. It was noted that application of fertilizers and plant protection chemicals were of higher order during the cardamom capsule bearing period compared to establishment period.

- The variable cost constitutes 62.73 per cent of the total cost, 26.84 per cent fixed cost and the remaining 10.43 per cent was annual share of establishment cost.
- The cost of production of dry cardamom was estimated at Rs. 306.46 per kg. However; the output price was Rs. 550 per kg.
- Production function analysis results indicated that an increase in labour, number of irrigation, quantity of organic manure, and quantity of inorganic fertilizer would lead to an increase in yield.
- Cardamom yield found to be 19.51 per cent less than the maximum possible output *ie.*, the Mean Technical Efficiency of farmers was 80.49 per cent. This would indicate the scope for increasing the yield by way of reorganizing the use of existing resources, given the current level of technical knowledge.
- Educational status and experience of the farmers were the main socio-economic variables that significantly affected the technical inefficiency of farmers. Both the variables had negative significant effect on technical inefficiency. This showed that the farmers who were highly educated and those who had good experience in cardamom cultivation tend to be more efficient in cardamom production. This may be due to their know-how on usage of resources in an efficient manner from their education and experience.
- Farmers were marketing their produce through regulated market with the involvement of auction centre. Marketing of cardamom through the auction centre was found to be efficient as explained by the Acharya approach, Shepherd's method and Calkin's index.
- Labour shortage during peak season, especially during harvesting time coupled with high labour cost, pest and diseases, high cost of inputs, water scarcity, delay in getting the payment from auction centre, price fluctuation and higher grading cost were some of the production and marketing constraints faced by the sample farmers. In auction

centre there was a constant problem of delay in getting the payment, *ie.*, 21 to 23 days after the day of auction. Even if payment was made on the day of auction the interest for the above said period has to be borne by the producer. For immediate disposal and cash realization most of the farmers preferred selling their produce to local village merchants.

- Delay in getting the payment from upcountry wholesalers and importers, high handling cost and lack of quality of cardamom were the major important problems faced by the intermediaries.

Policy implications

The findings of the study and the conclusions drawn have got certain specific implications for the policy issues.

- ❖ The results of the study on economics of production showed that the net returns per hectare received from cardamom were relatively high. The cardamom cultivation is profitable for the farmers. So, the agricultural extension system should take appropriate steps to promote scientific methods and also provide support to farmers to realize high profit.
- ❖ The results of production function analysis suggested that an increase in labour, irrigation, quantity of organic manure and quantity of inorganic fertilizer would increase the yield of cardamom. Following the recommended dose of the inputs will help the farmers to get yield, without affecting the soil health. Hence, the agriculture department of the state government and the Spices Board, Government of India, have to arrange training programmes to make the farmers aware of appropriate use of inputs. The authorities have to make arrangement to test the soil. Erratic rainfall resulted in water scarcity and lack of irrigation in the critical periods of plant growth affected the productivity. So drought management strategies should be practised by the farmers, for which more awareness campaigns are to be arranged.
- ❖ The demand for organic cardamom is increasing rapidly in the world particularly in developed countries. The organically derived cardamom fetches higher price compared to one obtained from conventional farming. But cardamom is not presently

amenable to organic cultivation due to inherent pest and disease problem. The research institutions should work on the pest and disease resistant varieties and thereby help in reducing the application of plant protection chemicals. This will help in promoting the export of Indian cardamom.

- ❖ The efficiency measures of cardamom revealed that there was ample scope of increased production by proper adoption of technology and optimum allocation of resources. Since literacy was not a short coming, a sound technology delivery system must be made not only in terms of adoption but in terms of cost effectiveness. Farmers should be suitably trained to get the maximum possible yield.
- ❖ The cardamom consumption is highly restrictive in domestic field. Tourism promotion should be evolved for promoting the domestic cardamom trade. Development of eco- tourism in cardamom hills will augment the economics and social status of the people in the region. It should not be undertaken at the cost of habitat degradation. Predominantly younger generation with high purchasing power, sophisticated eating habits, popularity of fast food, increasing number of working women, high quality of life and increasing health consciousness create a highly conducive Indian market for branded cardamom i.e., retail marketing of popular brands in small packets is an easy approach to promote cardamom consumption.
- ❖ The farmers felt that high labour cost was the most important problem in cultivation of cardamom. Since 90 per cent of the farmers were small and marginal farmers, usage of family labour may be encouraged under the NREGA programme to reduce the problem of labour shortage and labour cost
- ❖ The farmers also felt that the input prices were high especially manures and plant protection chemicals. If these are provided at a subsidised rate the cost of cultivation can be reduced to some extent.
- ❖ The farmers ranked delay in getting the payment from the auction centre as the most important problem. Hence suitable mechanism has to be designed by the authorities for immediate payment of cash to the cardamom growers.

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APPENDIX I

Area and production of cardamom in India and Guatemala

Year	Area (ha)		Production (MT)	
	India	Guatemala	India	Guatemala
2000	72320	42297	10480	14780
2001	72663	48990	11365	17247
2002	73125	50370	11920	16694
2003	72237	62100	11580	20336
2004	73725	64170#	11415	25932#
2005	73795	67620*	12540	28526*
2006	73228	67620*	11235	24500*
2007	69300	NA	9450	NA
2008	71170	NA	11000	NA

Source: Anonymous, 2009 and Spices Board, 2008-09.

Provisional, * Estimate, NA- Not available.

APPENDIX II

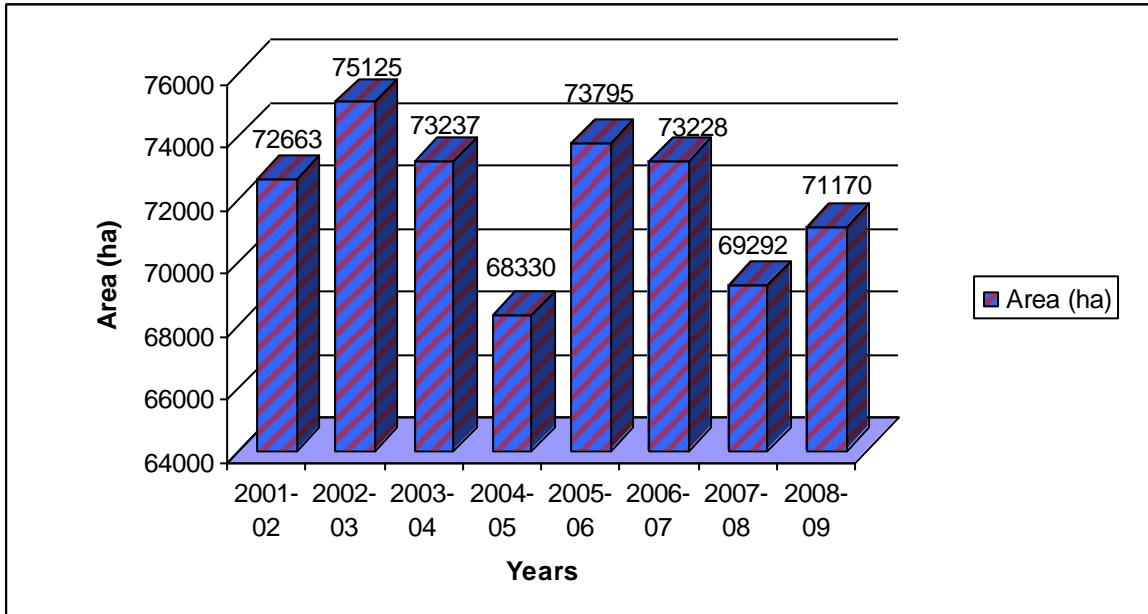
Percentage share of countries in cardamom consumption

Country	% Consumption
Western Asia region (Saudi Arabia, United Arab Emirates, India etc)	60
Scandinavian countries (Denmark, Finland, Sweden, Norway and Iceland)	16
Other European countries	14
Japan	3
USA	2.5
Rest of the world	4.5

Source: Thamarai Kannan, Palaniappan and Dharmalingam. Kissan World, 2009.

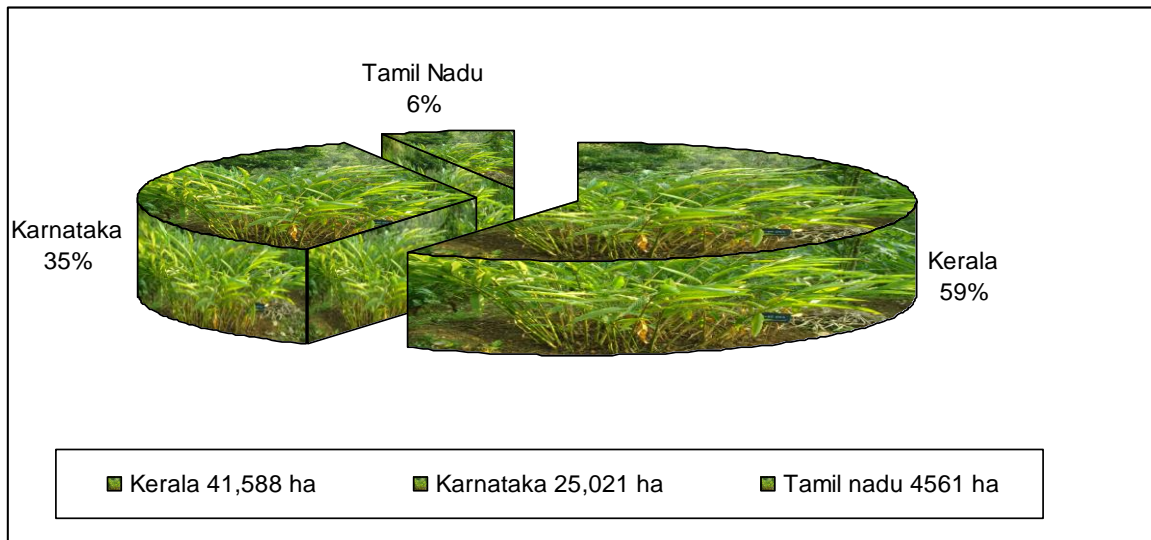
APPENDIX III

Area in India



Source: www.indiastat.com and Spices Board- Annual report 2008-09

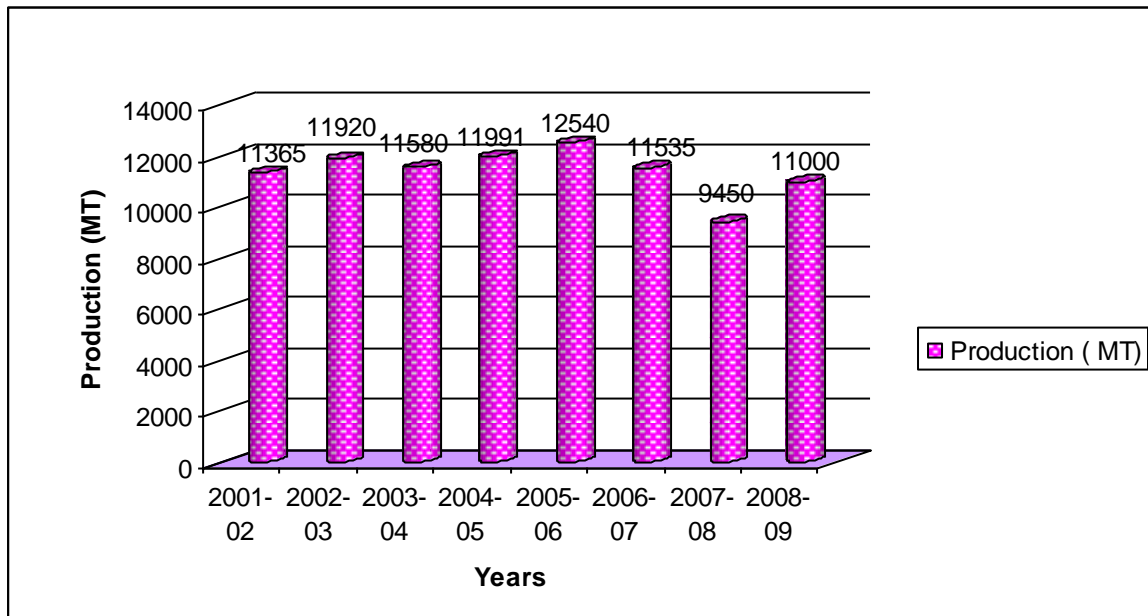
Percentage share of the states on the total area under cardamom in India



Source: Spices Board- Annual Report 2008-09

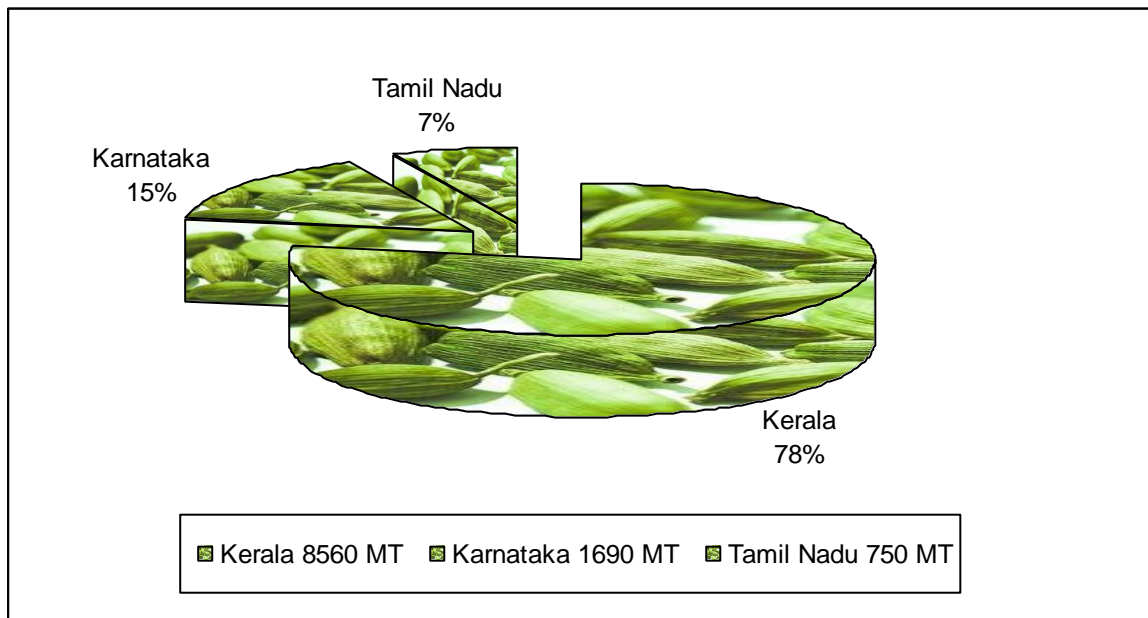
APPENDIX IV

Production of cardamom in India



Source: <http://www.indiastat.com> and Spices Board- Annual report 2008-09

Percentage share of the states in the total production of cardamom in India.



Source: Spices Board- Annual report 2008-09.

APPENDIX V

State wise break up of area, production and productivity.

Year	Particulars	Kerala	Karnataka	Tamil Nadu	All India
2000-01	Area(ha)	41288	25947	5085	72320
	Production(tonnes)	7580	2100	800	10480
	Yield (kg/ha)	247	109	217	195
2001-02	Area(ha)	41336	26258	5069	72663
	Production(tonnes)	8380	2115	870	11365
	Yield (kg/ha)	272	108	238	210
2002-03	Area(ha)	41412	26644	5069	73125
	Production(tonnes)	8680	2310	930	11920
	Yield (kg/ha)	281	115	251	218
2003-04	Area(ha)	41332	26838	5067	73237
	Production(tonnes)	8875	1740	965	11580
	Yield (kg/ha)	286	85	259	210
2004-05	Area(ha)	41378	27094	5253	73725
	Production(tonnes)	8616	1879	920	11415
	Yield (kg/ha)	276	91	257	206
2005-06	Area(ha)	41367	27173	5255	73795
	Production(tonnes)	9765	1775	1000	12540
	Yield (kg/ha)	318	85	282	227
2006-07	Area(ha)	41362	26611	5255	73228
	Production(tonnes)	8545	1725	965	11235
	Yield (kg/ha)	283	85	272	208
2007-08	Area(ha)	39763	24976	4561	69300
	Production(tonnes)	7030	1585	835	9450
	Yield (kg/ha)	248	89	253	191
2008-09	Area(ha)	41588	25021	4561	71170
	Production(tonnes)	8550	1700	750	11000
	Yield (kg/ha)	294	94	233	218

Source: <http://www.indiastat.com> and Spices Board, 2008-09.

APPENDIX VI

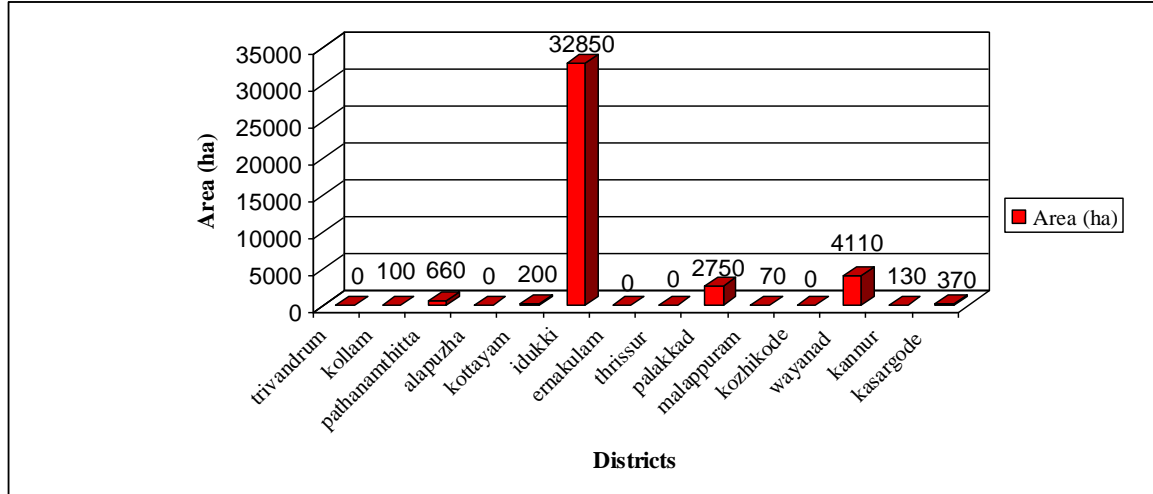
Export quantities, value and unit value realisation of export cardamom from India

Year	Quantity (Metric tonnes)	Value (Rs in Lakhs)	Unit value (Rs/Kg)
2000-01	1545.00	8468.02	548.09
2001-02	1031.00	6167.80	598.23
2002-03	682.00	4707.42	690.24
2003-04	756.70	3691.70	487.87
2004-05	642.50	2362.40	367.69
2005-06	862.80	2682.10	310.86
2006-07	650.00	2236.00	344.00
2007-08	500.00	2475.00	495.00
2008-09	750.00	4726.00	630.20

Source: <http://www.indianspices.com> and Spices Board, 2008-09.

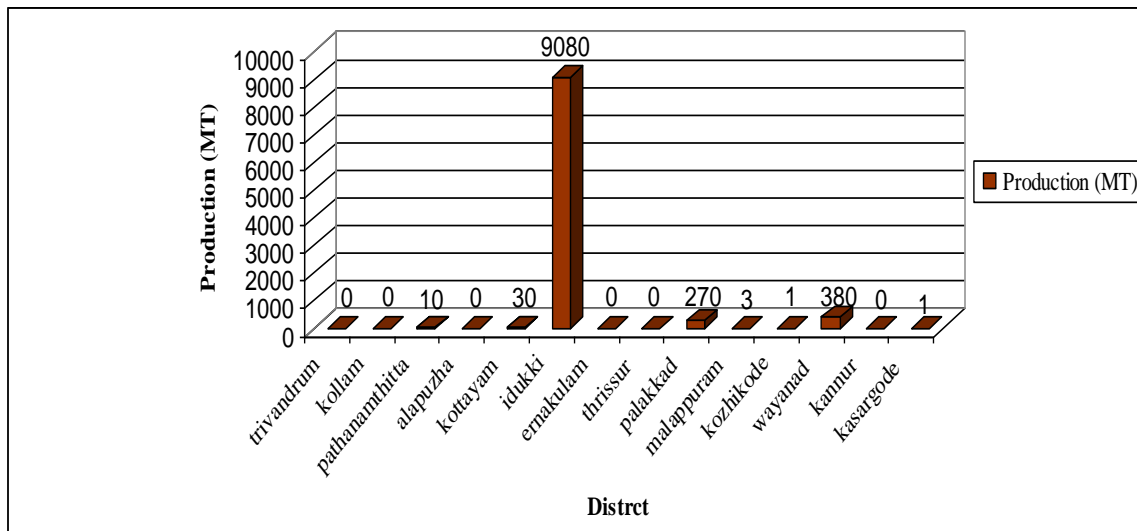
APPENDIX VII

District wise area in Kerala



Source: <http://www.indiastat.com>

District wise production in Kerala



Source: <http://www.indiastat.com>

APPENDIX VIII

Idukki district production of cardamom from 2000-01 to 2008-09

Year	Total Area (ha)	Production (MT)	Productivity (kg/ha)
2000-01	32671	7072	216
2001-02	32668	7788	236
2002-03	32743	8057	246
2003-04	32815	8224	251
2004-05	32668	7814	286
2005-06	32846	9076	330
2006-07	32840	7894	293
2007-08	31221	6416	256
2008-09	33078	7815	301

Source: The Kerala State Farmers' Debt Relief Commission Thiruvananthapuram (Suo Motu Proceedings No. 2 of 2007) and Spices Board, 2008-09.

APPENDIX IX

List of Auctioneers with their day and place of auction.

Sl. No	Auctioneers	Day of auction	Place of auction
1.	Kerala Cardamom Processing Marketing Company Ltd. (KCPMC)	Sunday	Vandenmedu.*
2.	Cardamom Planters' Association, (CPA)	Monday	Bodinayakanur
3.	South Indian Green Cardamom Company Ltd (SIGC)	Tuesday	Vandenmedu.*
4.	The Cardamom Processing Marketing Corporative Society Ltd (CPMCS)	Wednesday	Vandenmedu.*
5.	Header Systems (India) Ltd, Spices Trading Corporation Ltd, Government of India (STCL)	Thursday	Bodinayakanur
6.	Mas Enterprises (Mas)	Friday	Vandenmedu.*
7.	Idukki District Spices Marketing and Processing Co-op Society (ISMPCS)	Saturday	Bodinayakanur

Source: Collected from Spices Board auction centre at Vandanmedu.

* Puttady Spice Park, Idukki was inaugurated last month and auction is conducted there.

APPENDIX X

Varieties and Grades of Small Cardamom

1. **Bold:** It is popular export grade; 90% and above capsules will be having 6.5mm and above diameter, matured and Greenish color. Lt. Wt. will be 415 gm.
2. **Super Bold:** It is a very special variety. All capsules will be matured greenish and having above 8 mm diameter size. Lt. Wt. will be more than 450 gm.
3. **Extra Bold:** Best in the Export market. All capsules will be matured, greenish and having 7 mm and above diameter. Lt. Wt. will be 435 gm.
4. **Bulk:** This is the grade of cardamom produced as it is. This grade will contain all size, matured and immature capsules, black, yellow and splitted cardamom. This is to be graded.
5. **Small:** Small size cardamom having size between 5.5 mm and 6.5 mm. Cleaned and removed dust, husk and black capsules. Lt. Wt. will be around 385 gm.
6. **Open / Splits:** More than 60% capsules will be in open condition and the color may be partly greenish/pale yellow. All capsules will be matured and the size are 6.5mm and above
7. **Seeds:** Black / Brown colour seeds are the original content in every cardamom capsule. The husks were fully removed. Lt. Wt may be around 550 gm to 600 gm.
8. **Fruit :** Fruits are generally over matured capsules with slight yellowish in color and Lt. Wt. over 425 gm.

Standard Export Grades:-

AGEB (Alleppey Green Extra Bold)	Size 7mm above, wt/lit 435 gms
AGB (Alleppey Green Bold)	Size 6mm above, wt/lit 415gms
AGS (Alleppey Green Superior)	Size 5mm above, wt/lit 385 gms
AGS-1(Alleppey Green Shipment Green-1)	Size 4mm above, wt/lit 350gms
AGS-2 (Alleppey Green Shipment Green-2)	Size 4mm above, wt/lit 320gms

Source: www.nmce.com.

Figure 4.1 Location of Idukki district in Kerala



Figure 4.2 The four taluks of Idukki district

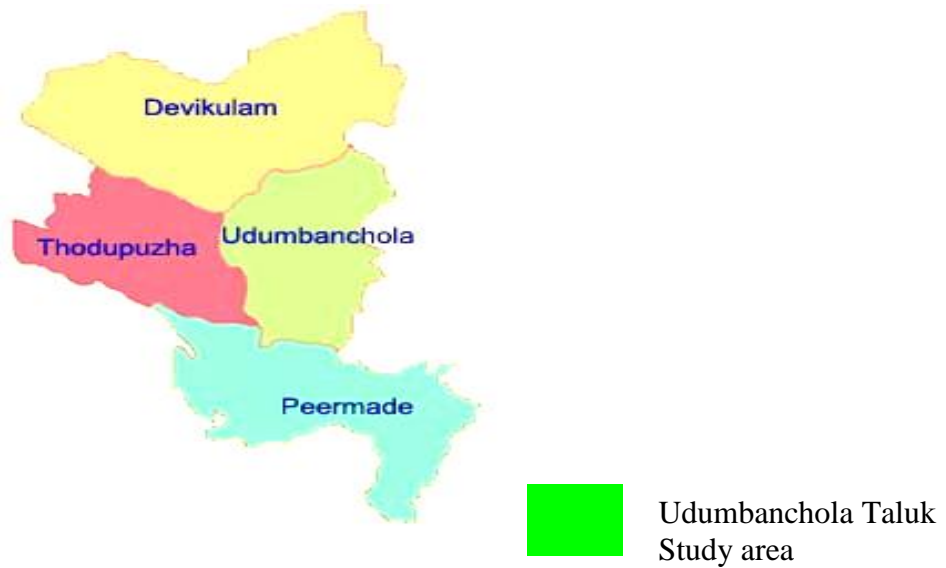


Figure 4.3 Map of Idukki district showing taluk and blocks

