

**SCENARIO ANALYSIS OF CARDAMOM GROWERS IN CARDAMOM  
HILL RESERVES OF KERALA**

*by*

**ANJU S.**

**(2016-11-081)**

**THESIS**

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**COLLEGE OF AGRICULTURE**

**VELLAYANI, THIRUVANANTHAPURAM- 695522**

**KERALA, INDIA**

**2018**

## DECLARATION

I, hereby declare that this thesis entitled “**Scenario analysis of cardamom growers in cardamom hill reserves of Kerala**” is a bonafide record of research work by done by me during the course of research and that the thesis has not previously formed the basis of the award to me any of degree, diploma, associateship, fellowship or another similar title, of any other university of society.

Vellayani

Date: 14/08/2018.



Anju S.

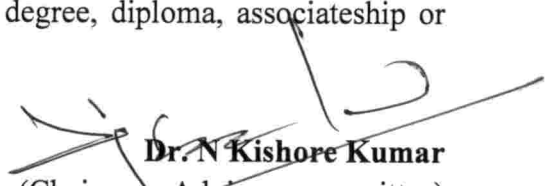
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**CERTIFICATE**

Certified that this thesis entitled “**Scenario analysis of cardamom growers in cardamom hill reserves of Kerala**” is a research work done independently by **Ms. Anju S.** (2016-11-081) under my guidance and supervision and that it has not previously formed the basis of the award of any degree, diploma, associateship or fellowship to her.

Vellayani

Date: 6/8/18

  
**Dr. N Kishore Kumar**  
(Chairman, Advisory committee)  
Professor and Head (TSS)  
Department of Agricultural Extension  
College of Agriculture, Vellayani  
Thiruvananthapuram

### CERTIFICATE

We, the undersigned members of the advisory committee of **Ms. Anju S. (2016-11-081)**, a candidate for the degree of **Master of Science in Agriculture**, with major in Agricultural Extension, agree that the thesis entitled “**Scenario analysis of cardamom growers in cardamom hill reserves of Kerala**” may be submitted by Ms. Anju S., in partial fulfillment of the requirement for the degree.

  
**Dr. N Kishore Kumar**

Chairman, Advisory committee  
Professor and Head (TSS)  
Department of Agricultural Extension  
College of Agriculture, Vellayani  
Thiruvananthapuram

  
**Dr. B Seema**

Professor and Head  
Department of Agricultural Extension  
College of Agriculture, Vellayani  
Thiruvananthapuram

  
**Dr. Allan Thomas**

Assistant Professor (Sel. Grade)  
Department of Agricultural Extension  
College of Agriculture, Vellayani  
Thiruvananthapuram

  
**Dr. Vijayaraghava Kumar**

Professor and Head  
Department of Agricultural Statistics  
College of Agriculture, Vellayani  
Thiruvananthapuram

  
**Dr. B. Krishnamurthy (External Examiner)**

Professor, Department of Agricultural Extension,  
GKVK Campus, University of Agricultural  
Science, Bangalore- 560065

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## LIST OF ABBREVIATIONS

<b>Abbreviations</b>	<b>Full form</b>
%	Percentage
°C	Degree celsius
cm	Centimeter
F	Frequency
ha	Hectare
g	Grams
kg	Kilograms
m	Meter
ATMA	Agricultural Technology Management Agency
CHR	Cardamom Hill Reserves
CIB	Central Insecticide Board
CRS	Cardamom Research Station
FAO	Food and Agriculture Organization
FYM	Farmyard manure
GAP	Good Agricultural Practices
ICRI	Indian Cardamom Research Institute
ICT	Information and Communication Technology
KAU	Kerala Agricultural University
KVK	Krishi Vigyan Kendra
LEADS	Lead Farmer centred Extension Advisory and Delivery Services
NGO's	Non Governmental Organisations
NKAE	Neem Kernal Aqueous Extract
SD	Standard Deviation
SMS	Subject Matter Specialist
VFPCK	Vegetable and Fruit Promotion Council Keralam

# *Introduction*

## 1. INTRODUCTION

Agriculture is the largest and most important sector that boosts the Indian economy with sixty seven per cent of its population and fifty five per cent of the total work forces depend on agriculture and allied activities as the source of livelihood. Despite this, it is facing a number of constraints such as fragmentation of landholding, low productivity and conversion of agricultural land to non-agricultural uses. Then also agricultural sector is giving a number of opportunities due to the rising need for quality and value added produce. In the course of time the predominance of chemical intensive farming has resulted in a near stagnant level of productivity of many of the economically important crops and the indiscriminate use of chemical fertilizers and pesticides has eventually emerged as a potential source of danger not only to the sustainability of the environment but also to the safe food requirement of our population.

Small cardamom (*Elettaria cardamomum*) is traditionally grown in the Indian Cardamom Hill Reserves (CHR) area of Kerala. Cardamom is known as the “Queen of spices”. Cardamom is the most expensive spice in the world after saffron and vanilla. Currently the production of cardamom in major producing countries consumes high quantity of pesticides and other chemicals. The chemical intensification of cardamom farming in CHR has been going on for the last two decades. Cardamom cultivation in India might have experienced deterioration of ecosystem because of growing practices of intensive chemical application and shade lopping that radically changes the properties of cardamom ecosystem components i.e., soil and water. Also the impacts of chemical intensification on the ecosystem properties are not well known which is very important for such a densely populated biodiversity hot spots like cardamom hills.

Among the spices cardamom is important in sense that, it is contributing a large portion in the global market. Till early seventies India was the largest producer and exporter of the cardamom. Now Guatemala has emerged as the world’s largest



producer, offering the strong competition to Indian cardamom in the international market. Production of small cardamom confined to southern states viz., Kerala, Karnataka and Tamil Nadu. Among these states, Kerala is taken the largest portion of total production followed by Karnataka and Tamil Nadu respectively.

In Kerala, where cardamom is commercially cultivated in Idukki district, leading from the front both in area and production perspective. The cardamom growers are facing declining profit margins due to price fluctuations. As spices cultivation is the means of living for a large number of agricultural households in high ranges of Kerala, so spices trade is having a crucial role in their earnings, well-being and standard of living. As the major spice growing in Idukki is cardamom, so it is time to concern with those related to this industry to make earnest effort to overcome the problems faced by the sector.

### 1.1 OBJECTIVE OF THE STUDY

The objective of the study is to assess the current scenario of cardamom production system and analysis of the socio- economic situation among growers and good agricultural practices (GAP) and to enumerate the present challenges with respect to ecological, climatic challenges as well as explore the health externalities for cardamom growers and labourers.

### 1.2 SCOPE AND IMPORTANT OF THE STUDY

Cardamom is generally known as Ilaichi or Elachi in India. And it is also called “Queen of spices” “Green gold”. Cardamom is very expensive because of its aroma and flavor as well as colour. Cardamom is indigenous to the Southern stretch of evergreen forests of the Western Ghats. Kerala is the leading producer of cardamom in the country constituting 65-70 per cent of the total production from 56 per cent of the total area under cardamom in the country that is area (39730 ha) and production (14000 MT) (Government of Kerala 2016). Among the districts where

cardamom is commercially cultivated in Idukki district, is leading from the front both in area and production perspective.

The increased production is mainly due to the intensive cultivation of cardamom and the heavy use of fertilizers and plant protection chemicals. Transformation of agriculture to high intensive production system can bring about the ecological and environmental upsets besides socio-economic and health problems. Majority of farmers apply high amount of fertilizer and pesticides than the recommended rates. Increased nutrient supply leads to the increased rate of pests and disease incidence, which also leads to the application of crop protection chemicals. Most of the farmers or growers don't know that most of the pesticides that are currently in widespread use in cardamom have not registered with the Central Insecticide Board (CIB) (The New Indian Express, 2011). Five years after Kerala government woke up to the Endo-sulfan tragedy in Kasargod district and banned the deadly pesticides; disaster looms large over the cardamom hills in Idukki district (Roy, 2011). Implementation of Good Agricultural Practices (GAP), judicious use of pesticides, application of bio-inputs and better grading will help growers to produce high quality cardamom and boost exporters. Detection of disease at an early stage will reduce the crop damage.

The present study seeks to analyse the trends in cardamom production over 20 years, profile characteristic of cardamom growers and agricultural labourers, inventorize the Good Agricultural Practices (GAP) in cardamom production, effects of ecological and climatic changes, governmental interventions in cardamom production, document health externalities of cardamom growers/ labourers and problems of cardamom growers.

### 1.3 LIMITATIONS OF THE STUDY

The study has some limitations due to restricted time and resources; it was conducted by single investigator. As most of the information they have given is from

their own experiences during the various stages of their farming life there may be chance of human bias. Even if the data was cross checked to minimize the error, it is a fact that the result of the study may be apt only for the area where study had been conducted. Considering the limitations, much effort was taken to make the study as systematic and relevant as possible.

#### 1.4 ORGANIZATION OF THE THESIS

The description of the research work has been presented under five chapters. The first chapter starts with introduction, the objectives, the scope of the study, and the limitation of the study. In the second chapter, the review of literature associated to the current study is discussed. The third chapter covers the methodology used for the study. The fourth chapter deals with the result of the study and discussion of the result. The fifth chapter and final chapter represent the summary of the study, and strategy for the development. The references and abstract of the thesis are given at the end.

# *Review of Literature*

## 2. REVIEW OF LITERATURE

Review of literature helps the researcher in developing insight about the broader areas of study in detail and enhances the knowledge. Evaluative report of information found in the literature associated to selected area of study is literature review. The review should explain, summarize, appraise, and clarify this literature. It should provide a theoretical base for the research.

Published information in a definite subject area is clearly reflected by review of literature. It can be just a simple summary of sources, but it both usually summarizes and synthesizes obtainable information.

The key strategy to find out new clarifications to a problem or gaining a new perspective is to think about a research problem from multiple vectors. Almost every field of study has at least one comprehensive data base committed to indexing its research literature (Robert, 2010).

Since the limited reviews is available on spice crops in respect to the adoption of good agricultural practice aspects, and related to other crops also incorporated to this chapter. The reviews are presented below under various heads in accordance with the objectives of study undertaken.

2.1 Overall scenario of cardamom cultivation.

2.2 Variables and their review.

2.3 Effects of ecological and climatic changes.

2.4 Documentation of governmental interventions in cardamom production.

2.5 Documentation of health externalities of cardamom growers/ labourers.

2.6 Constraints faced by the cardamom growers.

## 2.1 OVERALL SCENARIO OF CARDAMOM CULTIVATION

Cardamom universally called “Queen of spices” the third most expensive after saffron and vanilla. Annual production of cardamom is about 19,625 MT. The greater part of the cardamom production is from India, by Western Ghats of Kerala, Karnataka and Tamil Nadu. In case of Kerala, cardamom mainly cultivated in the cardamom hill reserves (CHR) of Idukki district. The area under cardamom cultivation in Kerala is about 39,680 ha with annual production of 17,215 tonnes.

Suresh (1983) studied on the economics of cardamom plantations in Kerala. The study pointed out that the low productivity, plant diseases, and drought conditions are the major factors affecting the cardamom plantations.

George (1994) in the study on problems and prospects of cardamom production in Idukki district observed that increasing productivity, reducing cost of cultivation and improving labour relations are necessary for the improvement of cardamom industry in Kerala.

## 2.2 VARIABLES AND THEIR REVIEW

### 2.2.1 Adoption of Good Agricultural Practices in Cardamom

Rogers (1962) defined adoption as a process of thinking and doing in which an individual passes from first hearing of an innovation to its final adoption.

Dewan (1987) studied technological gap in adoption of large cardamom cultivation practices in north district of Sikkim revealed that majority (76.00 %) of the cardamom growers belongs to category of low level of adoption, whereas 23.00 per cent and one per cent of the cardamom growers were found medium and high level of adoption respectively.

Good agricultural practices as a collection of principles to apply for an on-farm production and post- production processes, resulting in safe and healthy food

and non- food agricultural products, while taking into account economical, social and environmental sustainability (FAO, 2003).

Gudade *et al.* (2012) in their study about adoption of large cardamom practices by tribal farmers in Sikkim showed that 22.40 per cent had low adoption, 35.20 per cent had medium adoption and 42.40 per cent had high adoption.

### **2.2.2 Age**

Chetan (2011) studied about adoption of cardamom cultivation practices by the farmers of Chikmagalur district revealed that, majority (48.00 %) of the cardamom growers belongs to the middle age group followed by young age (26.66 %) and old aged (25.34 %) group.

Gills (2012) in her study about organic and inorganic cardamom growers, found that most of the organic (63.30 %) and inorganic (80.00 %) cardamom growers belong to the middle aged group. Less than half (22.20 %) of the organic and (13.30 %) inorganic cardamom growers belongs to old age group. About (14.40%) and (6.50 %) of the organic and inorganic cardamom growers belongs to young age group respectively.

### **2.2.3 Educational Status**

Rai (1965) in his study about diffusion of information of farmers' response in relation to improved farm practices (Hybrid Maize) pointed out that higher the education of the farmer, greater the interest of reading various kind of literatures in relation to the improved agricultural practices.

Quazi and Iqbal (1991) studied about organizational and individual correlates to the adoption of internet technology reveals that education was an important determinant of innovation adoption.

Dhamodaran and Vasanthakumar (2001) conducted study sugarcane growers and their extent of adoption of improved sugarcane cultivation practices

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found that majority of the growers (35.83%) had high school education, followed by middle school (25.00 %), primary (16.67%) and collegiate level (15.00 %).

Gills (2012) found that most (33.00 %) of the cardamom growers had education upto secondary level and 20.00 per cent of the cardamom growers had primary and high school level of education.

Singha *et al.* (2012) in their study about analysis on influencing factors of technology adoption under diversified farming system, pointed out that farmers with higher level of education make more level of technology adoption. Because farmers with higher level of education can easily learn and understand the importance of the technology from different sources.

Farid *et al.* (2015) in their study reported that 37.20 per cent of the respondent had secondary level of education while 18.00 per cent are illiterate.

Anju (2016) studied about adoption of technology utilization of KAU practices in amaranthus and cowpea, observed that majority of the farmers were literate. This shows that today's farmers educationally forward.

#### **2.2.4 Family size**

Family size operationalized as the number of members of either sex living in a household/ family dependent on the head of the family.

Chetan (2011) revealed that more than half (53.33 %) of the cardamom growers belonged to medium size family, followed by 30.00 per cent and 16.66 per cent of small and large size family respectively.

Rahul (2013) in his study on techno socio- economic characterization of specialized homegardens: A dominance- diversity approach reveals that more than three fourth of the home garden farmers (66.67%) were having the family size with 3- 4 members and 33.33 per cent of the farmers having 5-6 members of family members.



### 2.2.5 Occupation

Anandaraja (2002) revealed that more than half (60.00 %) of the farmers had farming as their sole occupation in his study on developing farmer friendly interactive multimedia compact disc and testing its effectiveness in transfer of farm technology.

Agwu *et al.* (2008), they studied about adoption of improved agricultural technologies disseminated via radio farmer programme pointed out that 54.80 per cent of farmers engaged in farming.

Gills (2012) in their study pointed out that 76.70 per cent of the cardamom growers are fulltime farmers. About 16.70 per cent and 6.70 per cent of cardamom growers were doing farming with services and farming with business respectively.

Farid *et al.* (2015) studied about factors affecting adoption of improved farm practices by the farmers revealed that 89.00 per cent of the farmers had primary occupation as agriculture.

According to Athira (2017), majority of the farmers (67.50 per cent) undertakes farming as a sole occupation in case of rice farmers in Palakkad district.

### 2.2.6 Farming experience

Jagnathan (2004) studied on analysis of organic farming practices in vegetables cultivation, reported that 47.00 per cent of the farmers were having medium level of experience in vegetable cultivation followed by high (35.00 %) and low (18.00 %) level of farming experience respectively.

Athira (2017) reported that 80.83 per cent had more than twenty years of farming experience followed by 16.66 per cent had ten to twenty years and 2.5 per cent had less than 10 years of farming experience.

Paul (2017) studied about LEADS, reported that majority of the farmers had more than 25 years of farming experience with 82.22 per cent and 75.56 per cent in Kollam and Palakkad.

**2.2.7 Annual income**

Fayas (2003) found that 60 per cent of Self Help Groups in VFPCCK had obtained an income which belongs to the medium category in a study on viability of self-help groups in Vegetable and Fruit Promotion Council of Keralam.

Sabira (2016) reported that the majority of the farmers belongs to high income group (57.50 %) followed by low income group (30.00 %) and less percentage of respondents coming under medium income group (11.70 %).

Namitha (2017) pointed out that majority of the vegetable farmers earn an annual income of more than one lakh whereas twenty one per cent of the respondents were earning income only up to fifty thousand.

**2.2.8 Extension agency contact**

According to Deshmukh (2007) and Kumar *et al.* (2012), majority of the farmers had low level of extension contact followed by medium and high level of extension contact. The reason might be due to the unawareness of farmers about information sources for accessing information about agricultural technologies.

Agwu *et al.* (2008) reported in their study, more than half (70.4 %) of the farmers have not had any contact with extension personnel's, 18.5 per cent had been one to three contacts with extension personnel's in the last 12 months.

Sinhga *et al.* (2012) revealed that higher level of extension contact, farmers are exposed to more interactions with the extension personnel and they receive scientific guidance to access production and management practices from different sources.

### **2.2.9 Mass media utilization/ICT**

Parikh (2013) studied on technological gap on adoption of improved cultivation practices by soybean farmers revealed that 57.50 per cent of them were in medium level followed by low (22.50 %) and high (20.00 %) level mass media utilization.

Reghunath (2016) studied about innovations in technology dissemination, reported that 85.5 per cent of the respondents were exposed to TV programmes regularly and 14.17 per cent occasionally.

Namitha (2017) pointed out that most of the farmers use newspapers (72.00 %), mobiles (61.00 %) and TV (56.00 %) regularly for the getting information regarding the cultivation practices in her study about sustainability of commercial vegetable cultivation.

### **2.2.10 Economic motivation**

Thomas (1998) found that the more one is motivated by economic ends, the more he/she will try to adopt the practices which are aimed at increasing sustainable returns in a study on Indo German Reservoir Fisher Development Project.

Jaganathan (2004) studied on adoption of organic cultivation practices in Thiruvananthapuram district observed that higher percentage of the vegetable growers (71.00 %) had medium level of economic motivation.

Reghunath (2016) found that majority (85.00 %) of progressive farmers had medium level of economic motivation followed by 10.00 per cent respondents had low level and 5.00 per cent respondents had high level of economic motivation.

Namitha (2017) found that more than half (52.00 %) of the vegetable growers had medium level of economic motivation followed by 25.00 per cent with high economic motivation and 23.00 per cent with low economic motivation.

### **2.2.11 Risk orientation**

Sivaprasad (1997) studied about problems and prospects of self employment of trained rural youth in agriculture revealed that by imparting training orientation, the risk bearing ability of the individual can be increased.

Kumaran (2008) found that risk orientation is required for a farmer to motivate him to perform effectively for high returns and to manage the situation according for better performance in agriculture and hence there is negative relationship exist between this variable and extent of indebtedness.

Chetan (2011) in his study about knowledge and adoption of cardamom farmers found that near half (44.00 %) of the respondents had medium level of risk orientation followed by high (29.33 %) and low (26.66%) level of risk orientation.

Athira (2017) reported in her study about rice farmers, majority of rice farmers belonged to medium level risk orientation and more in younger generations. Because the young farmers are more educated and have good knowledge on innovative farming practices.

### **2.2.12 Scientific orientation**

Suthan (2003) studied about the vegetable growers in participatory technology development reveals that 57.33 per cent of the farmers had high level of scientific orientation and 42.67 per cent of farmers had low level of scientific orientation.

Rakesh (2010) reported in his study on precision farming in sugarcane, 42.50 per cent of the sugarcane farmers possessed medium level of scientific orientation followed by 35.50 per cent by high level and 22.00 per cent with low level scientific orientation respectively.

Athira (2017) revealed that rice farmer in the high productive blocks had high (51.66 %) level extension agency contact and the farmers in the low productive blocks had only medium (46.66 %) level extension agency contact.

### **2.2.13 Innovation proneness**

Gangadharan (1993) reported that innovativeness is the degree of an individual's interest to see the modifications in farming techniques and to introduce such modification in his own farm operations when found useful and feasible in his study on adoption of improved agricultural practices by pepper growers.

Chinchu (2011) noticed that more than half (58.00 %) of the beneficiary farmers of SHM- Kerala were innovative in nature and also were good adopters of improved agricultural practices.

Reghunath (2016) reported that 54.17 per cent of the farmers were accepting the innovation in medium level and 25.00 per cent with low and 20.83 per cent with high acceptance.

According to Athira (2017), in their study most of the farmers are eager to know about new ideas and practices and new methods to achieve better results in their farm.

### **2.2.14 Decision making ability**

Shankaraiah and Swamy (2012) pointed out that farmers (40.00 %) belonged to middle aged group and medium education level had medium decision making ability in a study on attitude of farmers and scientist towards dissemination of technologies through mobile message services.

According to Reghunath (2016), 69.17 per cent of the farmers had medium level decision making ability followed by 21.67 per cent with low and 9.17 per cent with high decision making ability related to group activities.

Athira (2017) in their study revealed that majority of the rice farmers had good contact with Krishibhavan and the farmers are taking decisions after consulting the agricultural officers or assistants.

**2.2.15 Credit orientation**

Fernadaz (1995) studied about the self help group farmers in different states reported that group provides cost effective credit delivery system as the transaction cost of lending decreased sharply both to the banks and borrowers.

Padmaiah *et al.* (1998) studied adoption behavior of farmers revealed that watershed area of farmers had positive and significant relation with the adoption of recommended production practices.

Athira (2017) studied about rice farmers, revealed that most (53.33 %) of the respondents in high productive blocks and 46.66 per cent of respondents in low productive blocks had medium level of credit orientation.

Namitha (2017) reported that 69.00 per cent of vegetable grower's shows medium level of credit orientation followed by high level (18.00 %) and very little part (13.00 %) of them had low level of credit orientation.

**2.2.16 Market orientation**

Suthan (2003) reported that 54.67 per cent of the respondents had medium level of market perception in his study on participatory technology development of plant protection measures in vegetables.

Jaganathan (2004) observed that 55.00 per cent of the vegetable growers had medium level of market perception followed by low (32.00 %) and high levels (13.00 %).

According to Anupama (2014) only a limited number of farmers are aware of the markets where organic produce can fetch high price than the conventionally produced vegetables. A medium percentage of the farmers were aware about that there are such markets where organic products could get maximum price in a

study on content development for an agricultural expert system on organic vegetable cultivation

Namitha (2017) reported that more than half (55.00 %) of the vegetable farmers had medium level of market orientation.

### 2.3 EFFECTS OF ECOLOGICAL AND CLIMATIC CHANGES

Murugan *et al.* (2000) in their study on change in climatic elements and their impact on production of cardamom revealed that there has been a drastic reduction in tree cover due to deforestation; felling and excessive opening of canopy during the last decade and this could be the reason for the increase in minimum temperature.

Nair (2006) studied the problems of production and marketing in the cardamom industry, reported that cardamom growing tracts are diverted for cultivation of other crops to reap temporary advantages.

Murugan *et al.* (2011) found that clean cultivation, earthing up, severe pruning and shade lopping as well as forest under growth clearing were the major reasons for the elimination of biodiversity in cardamom hill reserves of Kerala in their study on environmental impact of intensive cardamom cultivation.

### 2.4 DOCUMENTATION OF GOVERNMENTAL INTERVENTIONS IN CARDAMOM PRODUCTION

Gills (2012) reported that many of the NGOs within the state and government accreditation agencies are utilizing the entrepreneurial abilities for the proper processing and export of the cardamom from Kerala.

Indian Cardamom Research Institute standardized the package of practices for organic cardamom production, especially for the agro climatic conditions of Kerala (Spices Board, 2015).

## 2.5 DOCUMENTATION OF HEALTH EXTERNALITIES OF CARDAMOM GROWERS/ LABOURERS

Externalities arise when certain actions of an individual have unintended external (indirect) effects on another individual.

Jeyaratnam (1990) found that three percentages of agricultural workers in developing countries suffered a poisoning incident in each year, resulting in 25 million occupational poisoning in his study on acute pesticide poisoning.

Shetty *et al.* (2011) in their study on farmer's health externalities in pesticide use predominant regions in India observed that farmers, the major pesticide users, were not fully aware of the risks related to pesticide use.

## 2.6 CONSTRAINTS FACED BY THE RESPONDENTS

Singh (2004) in his study on problems in adoption of improved dry land practices among arid zone farmers reported that the lack of rainfall, drought, lack of knowledge on improved practices, lack of finance and low price of produce as the biggest constraints.

Ponnusamy (2007) conducted study on constraints encountered by farmers in different production systems and integrated farming system in coastal Tamil Nadu. The study found that marketing problems, input related problems, natural calamities, labour, pest and disease occurrence, lack of infrastructure facilities, financial difficulties are the major problems in a crop production system in order of their importance.

Thomas (2009) studied about problems and prospects of the spices trade in Kerala observed that the cardamom cultivators' perception about labour problems includes scarcity of agricultural labour, migration of plantation workers to other occupations, low labour productivity, low wage rate, outdated plantation laws, labour unrest and indiscipline.



Raman (2016) revealed that cardamom plantations are the second largest employment provider after tea estates experiencing severe shortage of labour problems at time of harvesting seasons.

Mathew and James (2017), they studied on problems and prospects of cardamom cultivation in Idukki district reported that 98 per cent of cardamom growers are using various types of fertilizers and the prices of chemical fertilizers are very high is one of the major problem of the respondents.

# *Methodology*

### 3. METHODOLOGY

Research is the idea, arrangement and approach of study perceived in order to get answers to research questions and also to control variance (Kerlinger, 1978).

Research methodology is a method to technically answer the research problem. It can be considered as a science of studying how research is done methodically. In this we study the various steps that are generally adopted by researcher in studying his research problem along with the logic behind them (Kothari, 1985).

The study was conducted in the selected panchayath of Cardamom Hill Reserves (CHR) of Idukki district.

This chapter depicts the methods and procedures that were used for the study to convene the objectives. The method and procedures implemented in the study are presented under the following sub headings.

- 3.1 Research design.
- 3.2 Locale of the study.
- 3.3 Selection of respondents.
- 3.4 Data collection methods and tools.
- 3.5 Operationalization of variables and its measurements.
- 3.6 Documentation of good agricultural practices in cardamom production.
- 3.7 Effects of ecological and climatic changes.
- 3.8 Documentation of governmental interventions in cardamom production.
- 3.9 Documentation of health externalities of cardamom growers/ labourers.
- 3.10 Constraints in cardamom cultivation.

### 3.11 Statistical tools used.

## 3.1 RESEARCH DESIGN

The selection of the research design is a significant step in the whole research procedure. Kerlinger (1978) reported that research design is a plan, structure and strategy of investigation considered so as to find answers to research questions and to control variance.

Ex- post facto research design is used here. It is a type of research design in which systematic empirical investigation is made by the researcher who does not have direct control of independent variables because their expressions have already happened or because they are not manipulable. Interpretations about relations among variables are made, without direct intervention

## 3.2 LOCALE OF THE STUDY

### 3.2.1 Selection of district

Idukki called the “Spice garden of Kerala” because most of the spice crops are cultivated in this district. Among the all spice crop, cardamom is the important spice crop cultivated in Idukki and the total contribution of area is about 80 per cent. So the Idukki district was purposively selected for the study. In Idukki district, cardamom is intensively cultivated in Cardamom Hill Reserves (CHR) area. It is also known as spice district of Kerala.

#### 3.2.1.1 *Location, General Boundaries*

Idukki district is located between north latitude  $9^{\circ} 15'$  and  $10^{\circ} 21'$  and east longitude  $76^{\circ} 37'$  and  $77^{\circ} 25'$ . The district is surrounded by Madurai district of Tamil Nadu in east, west by Ernakulam and Kottayam districts of Kerala, south by Pathanamthitta and north by Trichur and Coimbatore districts of Kerala and Tamil Nadu states respectively.

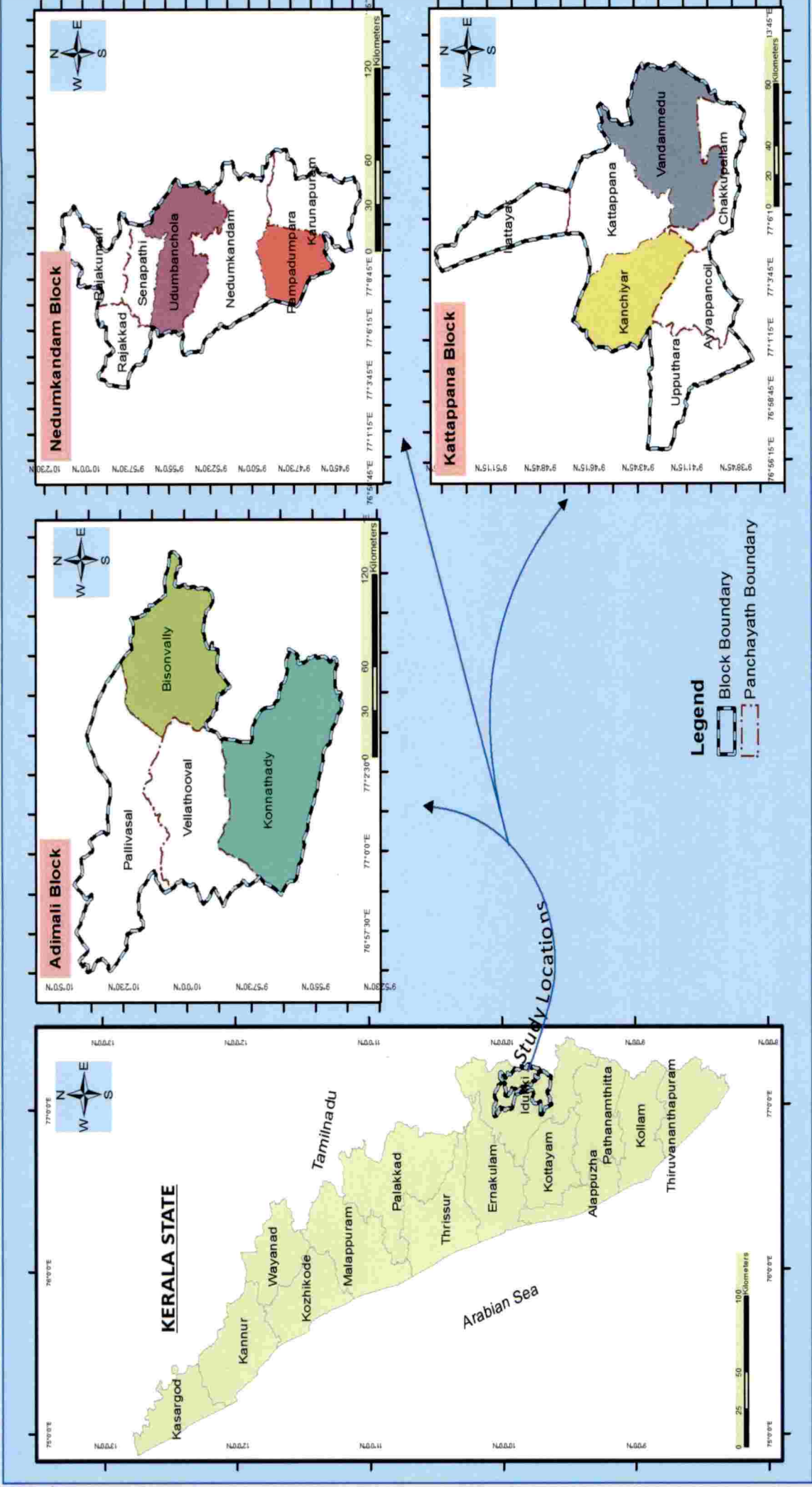


Plate 1. Location map

### **3.2.1.2 Topography of the district**

Idukki has many unique topographical and geographical characteristics. Idukki is the second largest district of Kerala with an area of 5105.22 km<sup>2</sup>. About 97 per cent of the total area of the district is covered by rugged mountains and forests.

Topographically, the district can be divided into three regions, the midland (12%), upland (12.1%) and high range (72.8%).

### **3.2.1.3. Climate of the district**

The climate in the district undergoes a sudden variation as we goes 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 variations. The eastern parts of the district located in the highland have comparatively cold climate with temperature varying between -1°C to 15°C in November/ January and 5°C to 15°C during March/ April.

The district receives plenty of rains from both the south- west monsoon during October to November. The normal rainfall is 3265 mm. 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.

### **3.2.2 Selection of blocks**

From the eight block panchayath of the Idukki district, three blocks coming under the Cardamom Hill Reserves (CHR) area with maximum productivity were selected. The selected blocks were Nedumkandam, Kattappana and Adimali. From Nedumkandam, Udumbanchola and Pampadumpara, from Kattappana, Kanchiyar and Vandanmedu and from Adimali, Bisonvalley and Konnathady in maximum productivity were selected with the help of agriculture statistics of the district. These six panchayths coming under the CHR area were purposively selected for the study.

### 3.3 SELECTION OF THE RESPONDENTS

A list of cardamom growers and agricultural labourers from Udumbanchola and Pampadumpara panchayaths of Nedumkandam, Kanchiyar and Vandanmedu panchayaths of Kattappana, Bisonvalley and Konnathady panchayaths of Adimali were selected. From each panchayath ten cardamom growers were selected based on land holding size less than one acre and five agricultural labourers were selected by simple random sampling, so as to get total number of 90 respondents.

### 3.4. DATA COLLECTION METHOD AND TOOL

Considering the scope and objectives of the study, an interview schedule was prepared after consultation of experts in the field of extension and other related fields. A pilot study was conducted in non sampling area and suitable modifications were made in the final interview schedule.

### 3.5 OPERATIONALIZATION AND MEASUREMENT OF THE VARIABLES

#### **3.5.1 Measurement of dependent variable**

##### **3.5.1.1 Adoption of good agricultural practices**

Adoption is a decision to continue maximum use of innovation. Adoption level refers to the level of adoption of good agricultural practices for cardamom cultivation by the respondents.

To study the level of adoption of good agricultural practices, a list of practices including the recommended varieties was prepared based on the package of practices recommendations of cardamom by Kerala Agricultural University (2016). Based on the practices, a list of questions was prepared. These questions were administered to farmers and it was measured as No adoption, Partial adoption, Full adoption and Modified adoption with the score of 1, 2, 3 and 4 respectively. The score range is from 1- 48. The mean and standard deviation of

the adoption score was calculated. The respondents were categorized into low, medium and high levels based on mean  $\pm$  standard deviation.

The technologies taken for the study are given below:

Sl. no	Technology	Extent of Adoption			
		No adoption	Partial adoption	Full adoption	Modified adoption
1.	Selection of planting materials				
2.	Propagation methods				
3.	Planting in field				
4.	Weed management				
5.	Trashing				
6.	Earthing up				
7.	Irrigation management				
8.	Soil and water conservation technology				
9.	Manuring				
10.	Shade regulation				
11.	Plant protection-pest				
12.	Plant protection-disease				



### 3.5.2 Measurement of independent variables

A list of thirty- seven independent variables which related to the study were selected after discussion with extension experts and reviewing the literature. Then these variables along with operational definitions were sent to 15 experts in the field of extension. They were asked to examine these variables and to elicit the relevancy in a five point continuum ranging from most relevant, more relevant, relevant, less relevant and least relevant.

The final variables were selected based on mean relevancy score, obtained by summing up the weightages obtained and dividing it by number of judges responded. Those variables that scored more than the mean score were selected for the study.

#### 3.5.2.1 Age

Age was operationally defined as the number of calendar years reported to have been completed by the respondent at the time of interview. Classified based on census report (2011).

Age wise distribution of respondents

Sl. no	Age category	Years	Score
1.	Young	< 35	0
2.	Middle aged	36 to 55	1
3.	Old age	>55	2

#### 3.5.2.2. Educational status

It refers to the highest academic qualification possessed by the respondent through formal and informal education. Measured using the scoring pattern developed by Trivedi (1963) adopted by Sreedaya (2000) followed by Sobha (2013). The scoring procedure for educational status is represented below.

Sl. no	Category	Score
1.	Illiterate	0
2.	can read & write	1
3.	Primary school	2
4.	Middle school	3
5.	High school	4
6.	Diploma	5
7.	Collegiate	6

### 3.5.2.3. Family size

It is defined as the total no of members in the respondent's family at the time of data collection by directly asking to the respondent.

Sl. no	Family size	Score
1.	Small (upto 4 members)	0
2.	Medium (5 to 6 members)	1
3.	Large (more than 6 members)	2

### 3.5.2.4. Occupation

Defined as the main vocation and other additional vocations possessed by the respondents at the time of interview. Scale developed by Anandaraja (2002) was used here.

Sl. no	Category	Score
1.	Farming as a sole profession	3
2.	Farming+ Agri. labour	2
3.	Farming+ business	1
4.	Farming+ service	0

### 3.5.2.5 Farming experience

Defined as the involvement of farmers in farming measured in number of years.

Years	Score
Less than 10 years	0
10 - 20 years	1
More than 20 years	2

### 3.5.2.6 Annual income

Refers to the total income obtained from the cardamom cultivation.

Sl.no	Annual income	Score
1.	Less than 1 lakh	0
2.	1 - 2 lakh	1
3.	2- 3 lakh	2
4.	3- 4 lakh	3
5.	More than 4 lakh	4

### 3.5.2.7 Extension agency contact

The degree to which an individual have contacts with research and extension agencies for the purpose of obtaining information and advices. The scoring procedure used by Manoj (2000) with slight modifications was followed in the study.

Extension agency	Frequency of contact		
	Regularly (2)	Occasionally (1)	Never (0)
Agril. Officers			
Agril. Assistants			

ADA/DDA			
Agril. Scientist			
KVK			
ATMA			
Any other			

### 3.5.2.8 Mass media utilization/ICT

Defined as the degree to which the respondents were exposed to various mass media or ICT channels. Measured using the scale developed by Lakshmi (2000) and followed by Peter (2014).

Sl. no	Items	Regularly (2)	Occasionally (1)	Never (0)
1.	Television			
2.	Radio			
3.	Newspaper			
4.	Internet			
5.	Magazine			
6.	Bulletin			
7.	Information Kiosk			
8.	Mobiles			
9.	Others			

### 3.5.2.9 Economic motivation

Operationalized as the extent to which a farmer is oriented towards attainment of the maximum economic ends. The scale developed by Fayas (2003) was used. Scale consists of 6 statements, fifth and sixth was negative. Each statement is provided with five point continuum, strongly agree, agree undecided,

disagree, and strongly disagree with scores 4, 3, 2, 1 and 0 for positive statements and 0, 1, 2, 3 and 4 for negative statements. The score range is from 6-24.

#### **3.5.2.10 Risk orientation**

Operationally defined as the degree to which a farmer oriented towards risk and uncertainty and portrayed the courage to face problems in farming.

Scale developed by Selvanayagam (1986) with slight modifications followed by Sebastian (2015) used. Scale consists of 5 statements, of which 2 are negative. The responses were collected on a five point continuum from strongly agree to strongly disagree with scores of 4, 3, 2, 1 and 0 respectively. The scoring procedure was reversed for negative statements.

#### **3.5.2.11 Scientific orientation**

Operationalized as the degree to which a farmer is oriented to the use of scientific method in decision making in farming. Scale developed by Supe (1969) used with slight modifications.

The scale consists of 6 statements of which one is negative. Responses were collected on a 5 point continuum, strongly agree, agree undecided, disagree, and strongly disagree with scores of 4, 3, 2, 1 and 0 respectively for positive statements and reverse for negative statements.

#### **3.5.2.12 Innovation proneness**

Refers to the keenness of the respondent in accepting new ideas and seeking changes in farming technique and to introduce such changes into their farm operations when practical and feasible. Scale used by Gurubalan (2007) followed by Athira (2017) was used. It consists of 5 statements.

Responses were obtained on a five point continuum ranging from strongly agree to strongly disagree with scores 4, 3, 2, 1 and 0 respectively. Scoring procedure was reversed for negative statements. The total score ranges from 5- 20.

### 3.5.2.13 Decision making ability

Operationally defined as the ability of the respondents to select the most efficient means from among the available alternatives without depending on others. Scale developed by Parimaladevi (2004) was used. Scale consists of 6 statements (four positive and 2 negative) in a four point continuum strongly agree, agree, disagree, and strongly disagree.

A score of 3, 2, 1 and 0 for positive statements, and score reversed for negative statements. The scores of all statements were added to get the decision making ability score of each respondent.

### 3.5.2.14 Credit orientation

The procedure developed by Beal and Sibely (1967) followed by Athira (2017) was adopted here. The scale consists of five statements;

1. Do you think a farmer like you should borrow for agricultural purpose?  
Yes (1)/ No (0)
2. In your opinion, how difficult is to secure credit for agricultural purpose?  
Very difficult (0)/ difficult (1)/ easy (2)/ very easy (3)
3. How a farmer is treated when he goes to secure credit?  
Very badly (0)/ badly (1)/ fairly (2)/ very fairly (3)
4. There is nothing wrong in taking credit from institutional sources for increasing farm production?  
Strongly disagree (0)/ Disagree (1)/ undecided (2)/ agree (3)/ strongly agree (4)
5. Did you use the credit in the last two years for crop production?  
Yes (1)/ No (0)

The total score was obtained by summing up the scores obtained for all the responses.

### **3.5.2.15 Market orientation**

The extent to which a farmer is oriented towards marketing to obtain the reasonable gains from, selling of their produce. The method used by Samantha (1977) used. 3 positive (one for agree and zero for disagreement) and 2 negative (pattern reversed). The score ranges from 0- 6.

## 3.6 DOCUMENTATION OF GOOD AGRICULTURAL PRACTICES IN CARDAMOM PRODUCTION

The package of practices recommendation by Kerala Agricultural University (2016), adopted by the respondents and also the farmer practices done by the cardamom growers were documented and inventorized as the good agricultural practices.

## 3.7 EFFECTS OF ECOLOGICAL AND CLIMATIC CHANGES

An open ended questionnaire was developed for measuring the awareness about ecological and climatic changes that occur in the study area, by the respondents.

## 3.8 DOCUMENTATION OF GOVERNMENTAL INTERVENTIONS IN CARDAMOM PRODUCTION

An open ended questionnaire was developed to document the various innovations, schemes and policies developed by the governmental institutions to enhance the cardamom production among respondents.

## 3.9 DOCUMENT HEALTH EXTERNALITIES OF CARDAMOM GROWERS/ LABOURERS

An externality is any impact, be it positive or negative, on individuals or groups not involved in a given economic transaction. That is to say, an externality

is something that affects other people outside of the particular parties involved in an exchange.

For documenting the health externalities of cardamom growers and agricultural labourers an open ended questionnaire was developed. It involves the pesticide applications, precautions of pesticide application, dosage of the pesticides adopted by the respondents.

### 3.10 CONSTRAINTS IN CARDAMOM CULTIVATION

Based on the discussion with respondents, scientists, expert in agriculture and also through relevant review of literature, constraints were identified. A list containing such constraints was prepared and included in the final interview schedule. Constraints were ranked based on the frequency obtained. The constraints with maximum frequency were taken as the most important constraint.

### 3.11 STATISTICAL TOOLS USED

#### **3.11.1 Frequency and Percentage analysis**

The selected variables were subjected to and interpreted in terms of frequency and percentage, to make simple comparisons and classify the respondents wherever necessary. Percentage was calculated by finding the frequency of particular cell multiplied by 100 and then further divided by the total number of respondents.

#### **3.11.2 Mean and Standard Deviation**

The respondents were classified into categories based on scoring pattern into low, medium and high groups for the variables based on mean scores and standard deviation after statistical analysis.

#### **3.11.3 Correlation analysis**

To explain the relationship between variables simple correlation analysis was done. In order to measure the degree of relationship the correlation



coefficient was worked out. The computed 'r' values were tested for their significance using table values for 'n-2' degree of freedom.

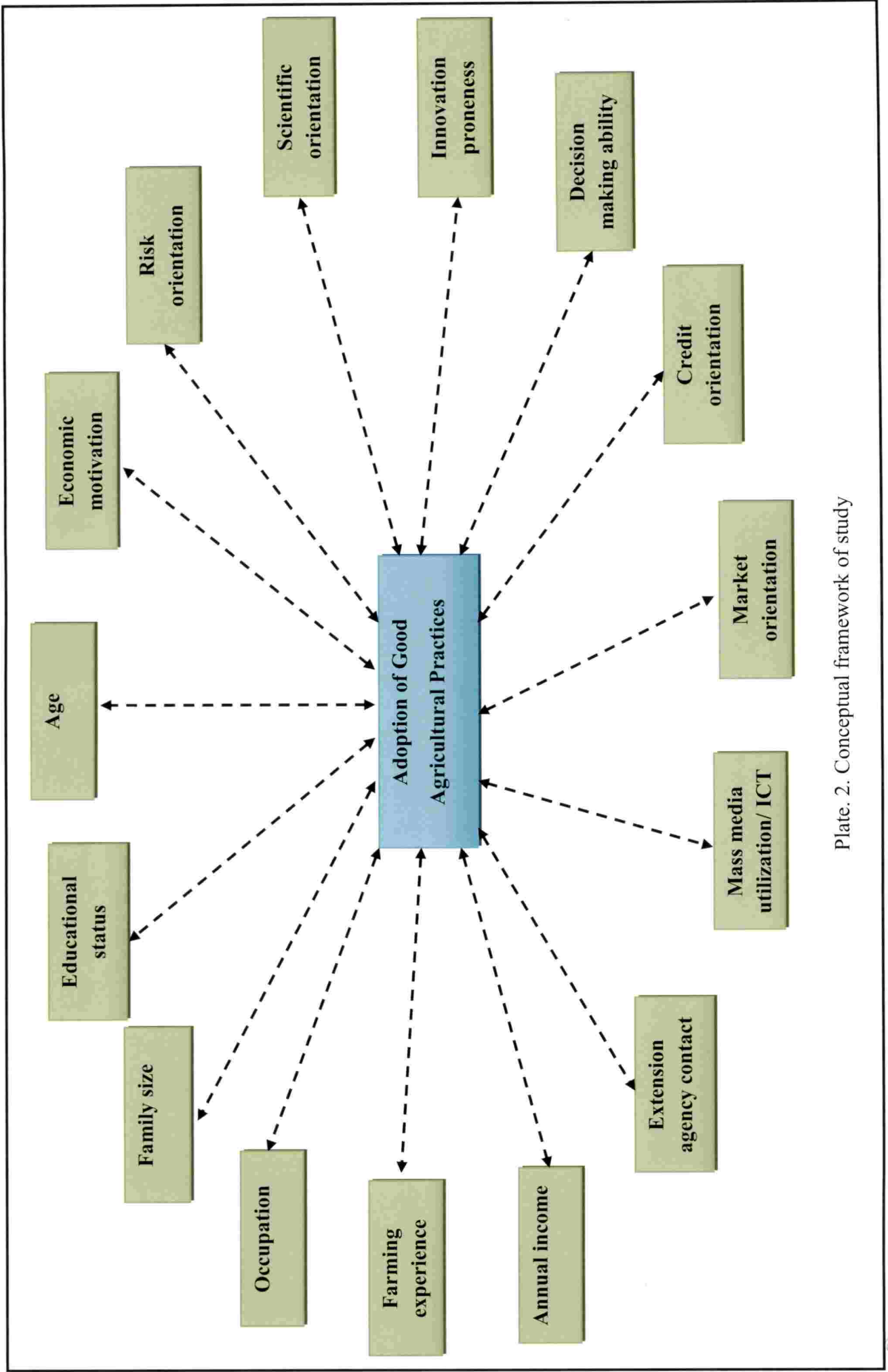


Plate. 2. Conceptual framework of study

## *Results and Discussions*

## 4. RESULT AND DISCUSSIONS

The key component of research report is 'Result and Discussions' the purpose of which is to impart sufficient information so as to arrive at valid conclusion and recommendations. Discussion helps to interpret the results in proper perspective and to relate them with other relevant studies, including the hypothesis supported or non- supported.

The prime objective of the study was to analyse the current scenario of cardamom production system and analysis of the socio-economic situation among growers and good agricultural practices (GAP) and to enumerate the present challenges with respect to ecological, climatic changes as well as explore the health externalities of cardamom growers and labourers. Keeping in view of the specific objectives, the data was collected and processed through the tool of statistical analysis. The inferences are drawn based on the objectives set forth. The chapter is organized under the following sub headings.

- 4.1 Changing trends in cardamom production in the past 20 years.
- 4.2 Adoption of Good Agricultural Practices.
- 4.3 Profile characteristics of the cardamom growers and agricultural labourers.
- 4.4 Correlation between independent variable and adoption of good agricultural practices.
- 4.5 Documentation of good agricultural practices in cardamom production.
- 4.6 Effects of ecological and climatic changes.
- 4.7 Documentation of governmental interventions in cardamom production.
- 4.8 Documentation of health externalities of cardamom growers/ labourers.
- 4.9 Constraints in cardamom cultivation.
- 4.10 General suggestions for improving the cardamom cultivation.

#### 4.1 CHANGING TRENDS IN CARDAMOM PRODUCTION IN THE PAST 20 YEARS OF KERALA

Cardamom is mainly cultivated in the cardamom hill reserves (CHR) of Idukki district. At present, area under cardamom cultivation in Kerala is about 39,680 ha with annual production of 15,650 tonnes. Cardamom is one of the major plantation crop cultivated in Idukki.

##### 4.1.1 Trends in area, production and productivity of cardamom in Kerala

Productions of cardamom have significantly increased in the past years and were the area under cultivation reduced. Cardamom was cultivated in an area of 40,867 ha in 1997 and it declined to 39,080 ha by the year 2017. Productivity of cardamom in cardamom hills of Kerala has been spectacular for the last 20 years (1997-2016) period with 4 fold increase from 130 kg to 400 kg ha<sup>-1</sup>. Fig. 1 depicts the graphical representation of the cardamom area, production and productivity over 20 years.

Table 1. Cardamom area, production, productivity of Kerala over 20 years

Sl. no.	Year	Area (Ha)	Production (Tonnes)	Productivity (Kg/Ha)
1.	1997-98	40867	5290	130
2.	1998-99	41449	4990	120
3.	1999-00	41491	6585	159
4.	2000-01	41288	7580	184
5.	2001-02	41336	8380	203
6.	2002-03	41412	8680	210
7.	2003-04	41332	8875	215
8.	2004-05	41378	8616	208
9.	2005-06	41367	9765	236
10.	2006-07	41362	8545	207
11.	2007-08	39763	7031	177

12.	2008-09	41588	8550	206
13.	2009-10	41593	7800	188
14.	2010-11	41242	7935	192
15.	2011-12	41600	10222	246
16.	2012-13	39660	11350	286
17.	2013-14	39730	14000	352
18.	2014-15	39730	16000	403
19.	2015-16	39680	21503	542
20.	2016-17	39080	15650	401

(Source: Spices Board of India, 2017)

#### 4.2 ADOPTION OF GOOD AGRICULTURAL PRACTICES IN CARDAMOM

Table 2. Distribution of cardamom growers based on their adoption of good agricultural practices (n=60)

Category	F	%
Low (<26)	29	48.33
Medium (26 to 34)	23	38.33
High (>34)	7	11.67
Mean= 29.77		SD= 3.78

Near half (48.33 %) of the respondents had low level of adoption of good agricultural practices in cardamom cultivation followed by medium (38.33 %) and high (11.67 %) level of adoption.

Most of the farmers were having the farming experience more than twenty years so they mostly preferring their own practices than adopting the good agricultural practices. Most of them are adopting the good agricultural practices like propagation methods, spacing, pit size, application of manures, pest control measures and disease control measures. The results were in line with the findings

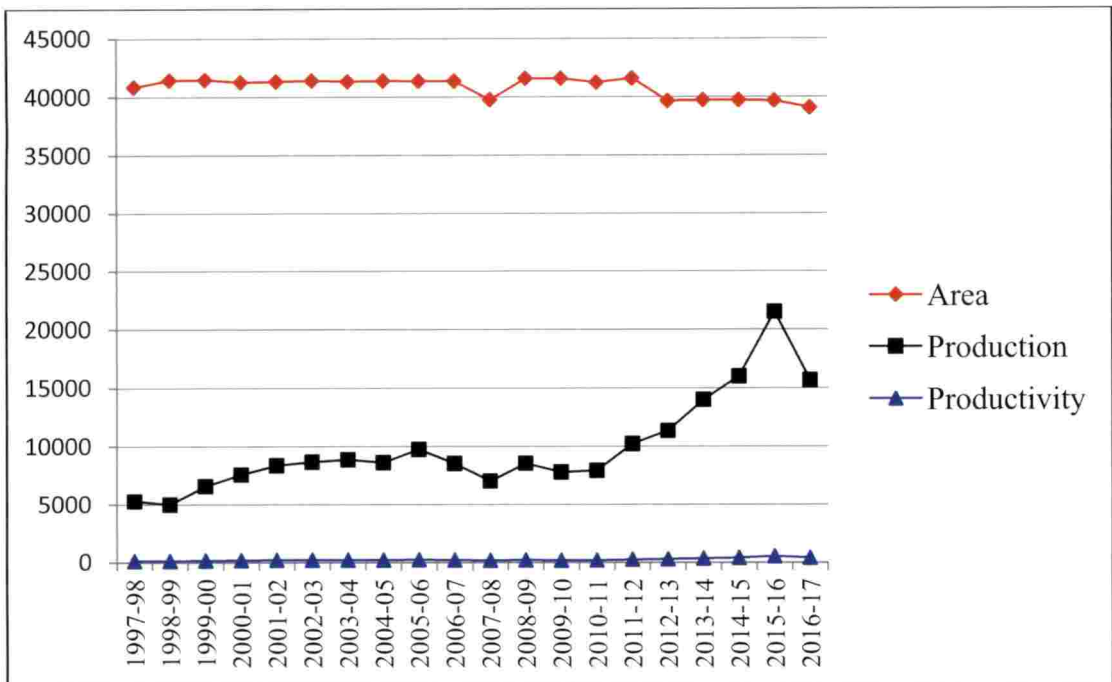


Fig 1. Cardamom area, production, productivity of Kerala over 20 years

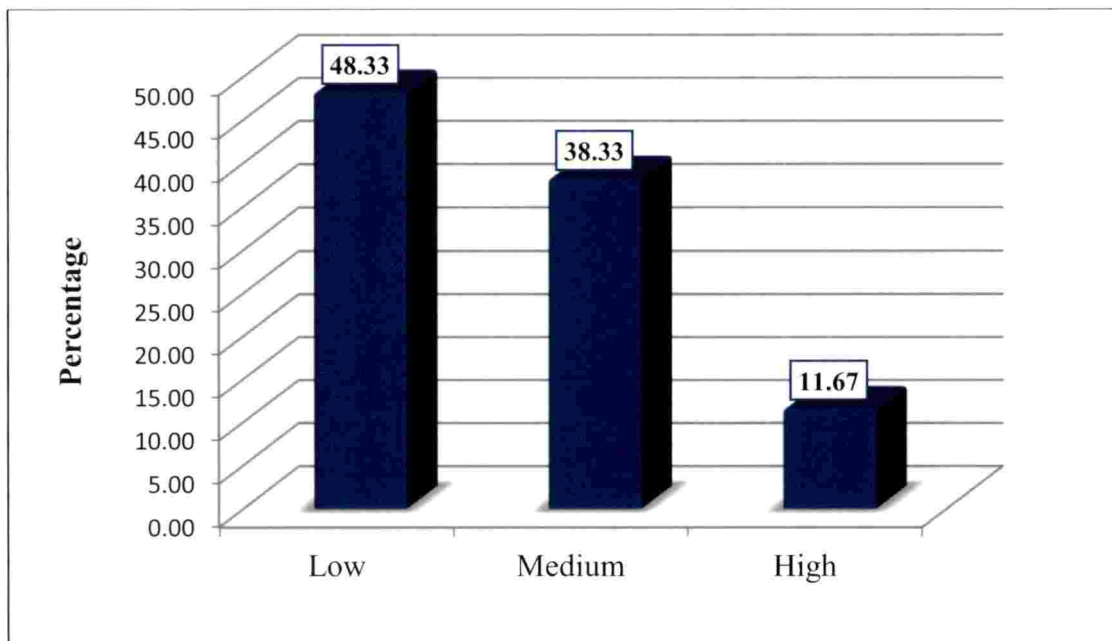


Fig 2. Distribution of cardamom growers based on adoption of good agricultural practices

of Dewan (1987). Fig. 2 depicts the graphical representation of the distribution of cardamom growers based on adoption of good agricultural practices

### 4.3 PROFILE CHARACTERISTICS OF CARDAMOM GROWERS AND AGRICULTURAL LABOURERS

#### 4.3.1 Age

Table 3. Distribution of cardamom growers and agricultural labourers based on age

Category	Cardamom growers (n=60)		Agricultural labourers (n=30)	
	F	%	F	%
Young age (upto 35)	13	21.67	6	20.00
Middle age (36- 55)	36	60.00	20	66.67
Old age (55 above)	11	18.33	4	13.33

Table 3 and Fig. 3 reveals that majority (60.00 %) of the cardamom growers belonged to middle aged group, whereas, 21.67 per cent and 18.33 per cent of them belonged to young and old age groups, respectively. In case of agricultural labourers, 66.67 per cent belonged to middle age group, while 20.00 per cent and 13.33 per cent were belonging to young and old age groups, respectively. These results were line with the findings of Gills (2012).



### 4.3.2 Educational status

Table 4. Distribution of cardamom growers and agricultural labourers based on educational status

Category	Cardamom growers (n=60)		Agricultural labourers (n=30)	
	F	%	F	%
Illiterate	0	0.00	0	0.00
can read & write	0	0.00	0	0.00
Primary School	0	0.00	4	13.33
Middle School	6	10.00	9	30.00
High school	32	53.33	17	56.67
Diploma	6	10.00	0	0.00
Collegiate	16	26.67	0	0.00

More than half of the cardamom growers were educated upto high school level (53.33 %) followed by collegiate level (26.67 %), diploma and middle school level at 10.00 per cent. About 56.67 per cent of agricultural labourers were educated upto high school followed by middle school (30.00 %) and primary school (13.33 %) level education. None of the respondents were observed to be illiterate nor can read and write category. The results were line with the findings of Gills (2012).

Fig. 4 depicts the graphical representation of the distribution of cardamom growers and agricultural labourers based on educational status.

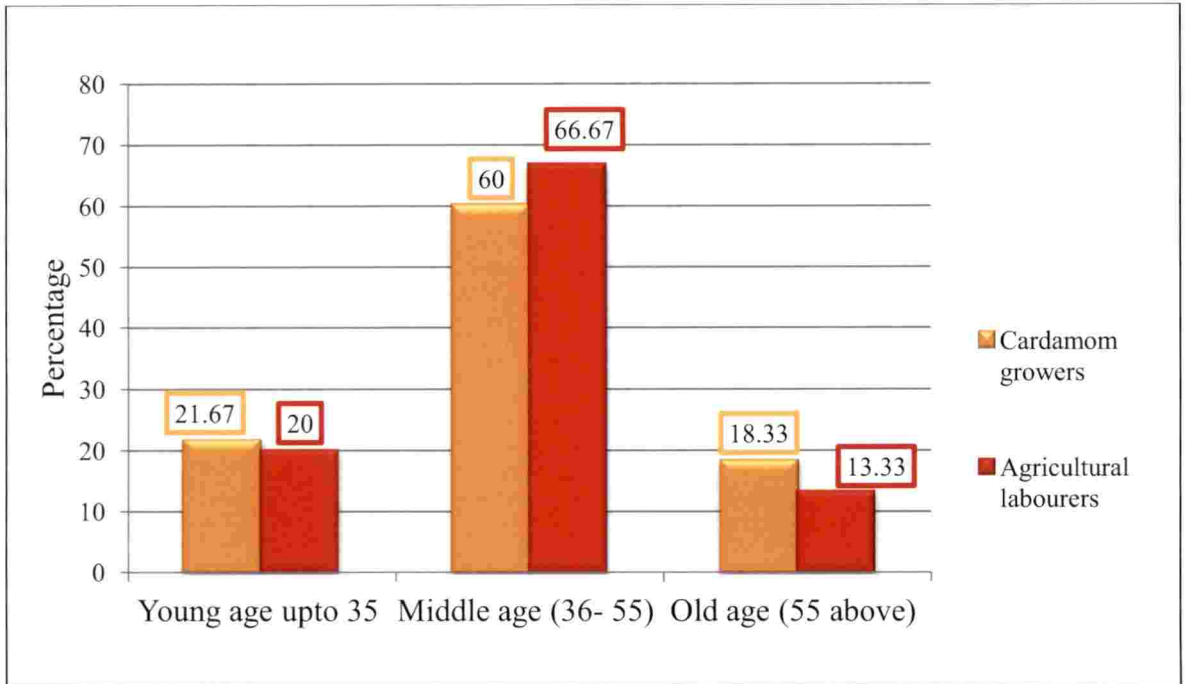


Fig 3. Distribution of cardamom growers and agricultural labourers based on age

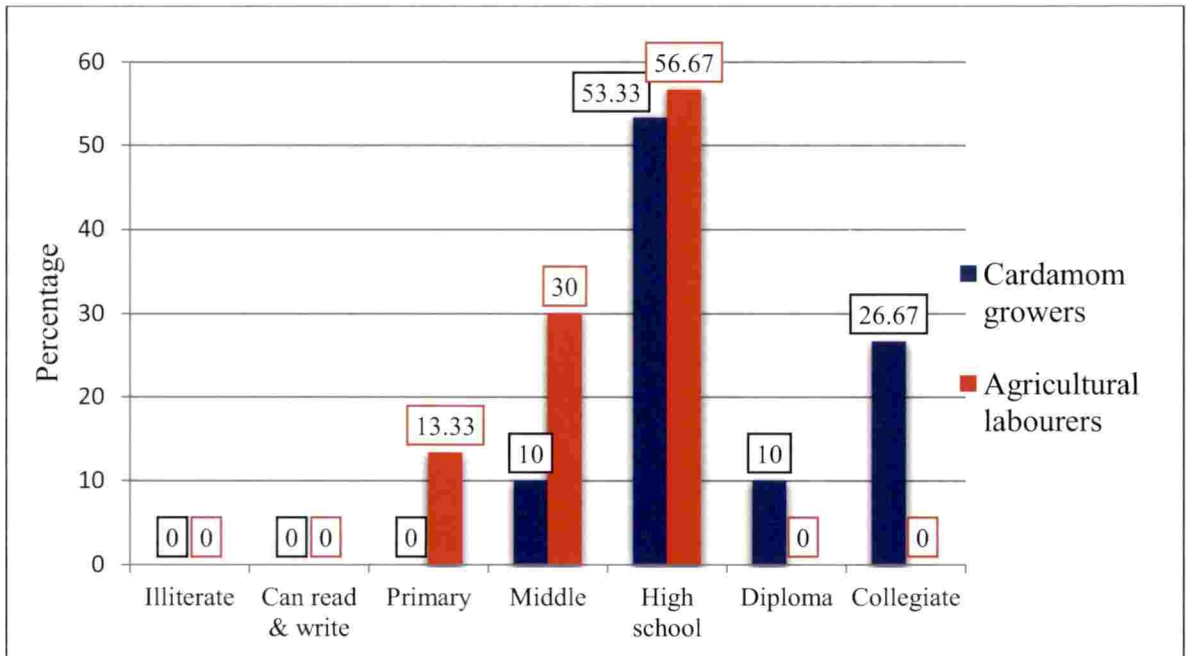


Fig 4. Distribution of cardamom growers and agricultural labourers based on educational status

### 4.3.3 Family size

Table 5. Distribution of cardamom growers and agricultural labourers based on family size

Category	Cardamom growers (n=60)		Agricultural labourers (n=30)	
	F	%	F	%
Small (upto 4)	32	53.33	17	56.67
Medium (5 to 6)	26	43.33	13	43.33
Large (more than 6)	2	3.33	0	0.00

More than half (53.33 %) of the cardamom growers had small size family whereas, 43.33 and 3.33 per cent of them belonged to medium and large size family respectively. In case of agricultural labourers, 56.67 per cent belonged to small size family and remaining 43.33 per cent belonging to medium size family. The results were in line with the results of Rahul (2013).

Fig. 5 depicts the graphical representation of the distribution of cardamom growers and agricultural labourers based on family size.

### 4.3.4 Occupation

Table 6. Distribution of cardamom growers and agricultural labourers based on occupation

Category	Cardamom growers (n=60)		Agricultural labourers (n=30)	
	F	%	F	%
Farming	54	90.00	0	0.00
Farming + labour	1	1.67	30	100
Farming + business	4	6.67	0	0.00
Farming + Service	1	1.67	0	0.00

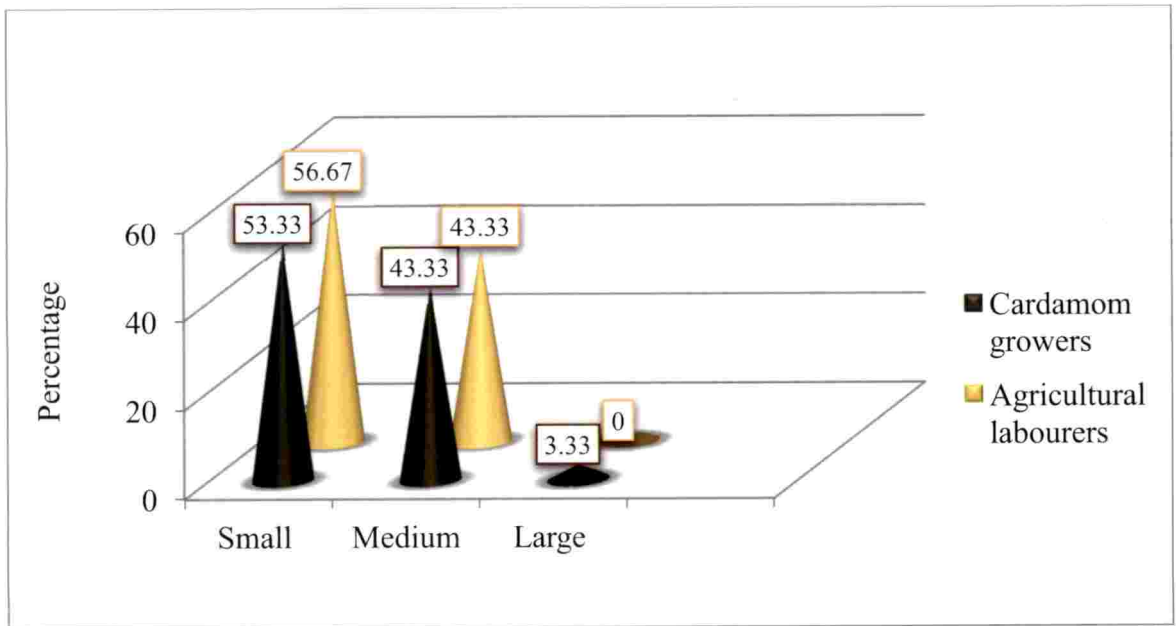


Fig 5. Distribution of cardamom growers and agricultural labourers based on family size

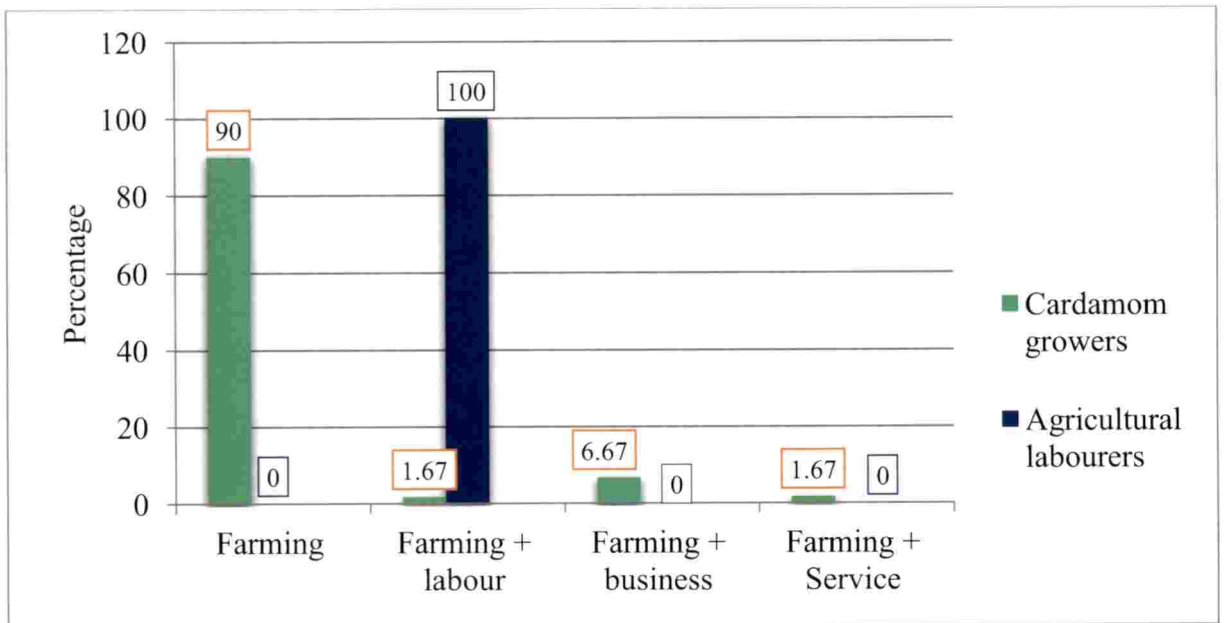


Fig 6. Distribution of cardamom growers and agricultural labourers based on occupation

Majority of the cardamom growers (90.00 %) undertakes farming as their primary occupation due to high remunerative nature of the cardamom plantations and 6.67 per cent of the growers are doing farming with a small scale business. About 1.67 per cent of the growers are doing other services with farming activities and also doing farming with labour. Cent per cent of the agricultural labourers were doing farming along with labour as their sole occupation. These results were line with the results of Gills (2012) and Athira (2017).

Fig. 6 depicts the graphical representation of the distribution of cardamom growers and agricultural labourers based on occupation.

#### 4.3.5 Farming experience

Table 7. Distribution of cardamom growers and agricultural labourers based on farming experience

Category	Cardamom growers (n=60)		Agricultural labourers (n=30)	
	F	%	F	%
<10 years	0	0.00	5	16.67
10 - 20 years	25	41.67	4	13.33
>20 years	35	58.33	21	70.00

It could be observed from Table 7 that, majority (58.33 %) of the cardamom growers had more than twenty years of farming experience, while 41.67 per cent of the growers had ten to twenty years of farming experience. A greater proportion (70.00 %) of the agricultural labourers had more than twenty years of farming experience. About 16.67 per cent and 13.33 per cent had less than ten years and ten to twenty years of farming experience respectively. The above findings line with the studies conducted by Athira (2017) and Paul (2017).

Fig. 7 depicts the graphical representation of the distribution of cardamom growers and agricultural labourers based on farming experience.

### 4.3.6 Annual income

Table 8. Distribution of cardamom growers and agricultural labourers based on annual income

Category	Cardamom growers (n=60)		Agricultural labourers (n=30)	
	F	%	F	%
< 1 lakh	0	0.00	17	56.66
1 - 2 lakh	5	8.33	9	30.00
2- 3 lakh	7	11.67	4	13.33
3- 4 lakh	9	15.00	0	0.00
> 4 lakh	39	65.00	0	0.00

Majority (65.00 %) of the cardamom growers had more than four lakh of annual income. It is due to most of the cardamom growers having farming as major source of income to the household. Majority of farmers having cultivation area of minimum one acres and they were getting the yield about minimum 400-500 kg/ acre.

More than half (56.66 %) of the agricultural labourers had less than one lakh annual income and 30.00 per cent and 13.33 per cent of them had one to two lakh and two to three lakh income respectively. The above findings were in line with the findings of Sabira (2016) and Namitha (2017). Fig. 8 depicts the graphical representation of the distribution of cardamom growers and agricultural labourers based on annual income.

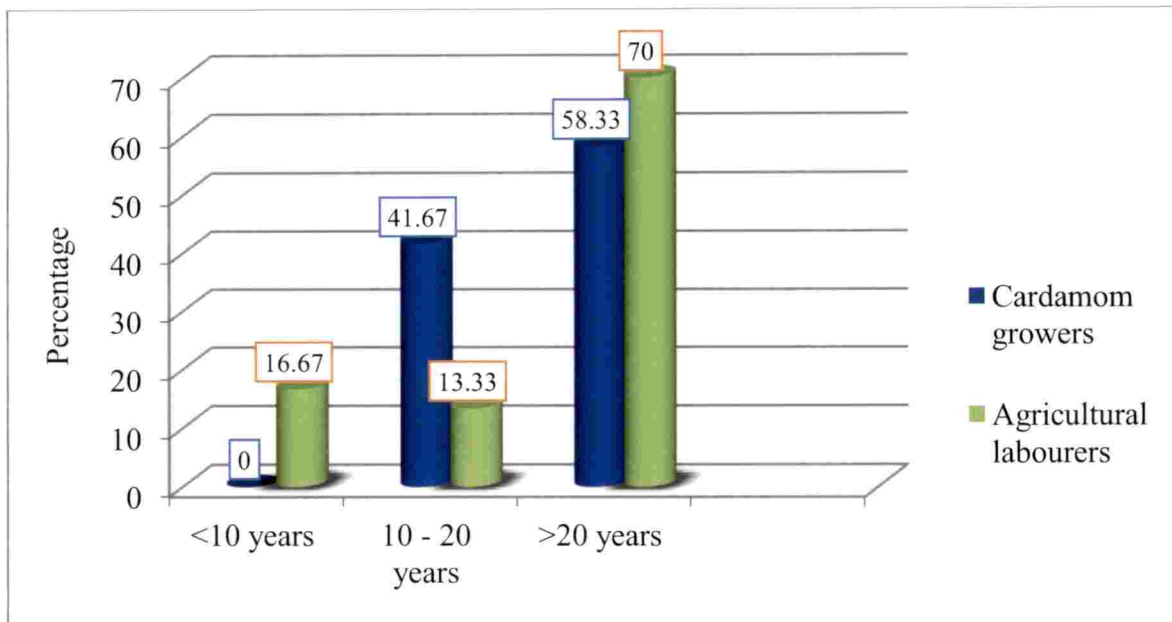


Fig 7. Distribution of cardamom growers and agricultural labourers based on farming experience

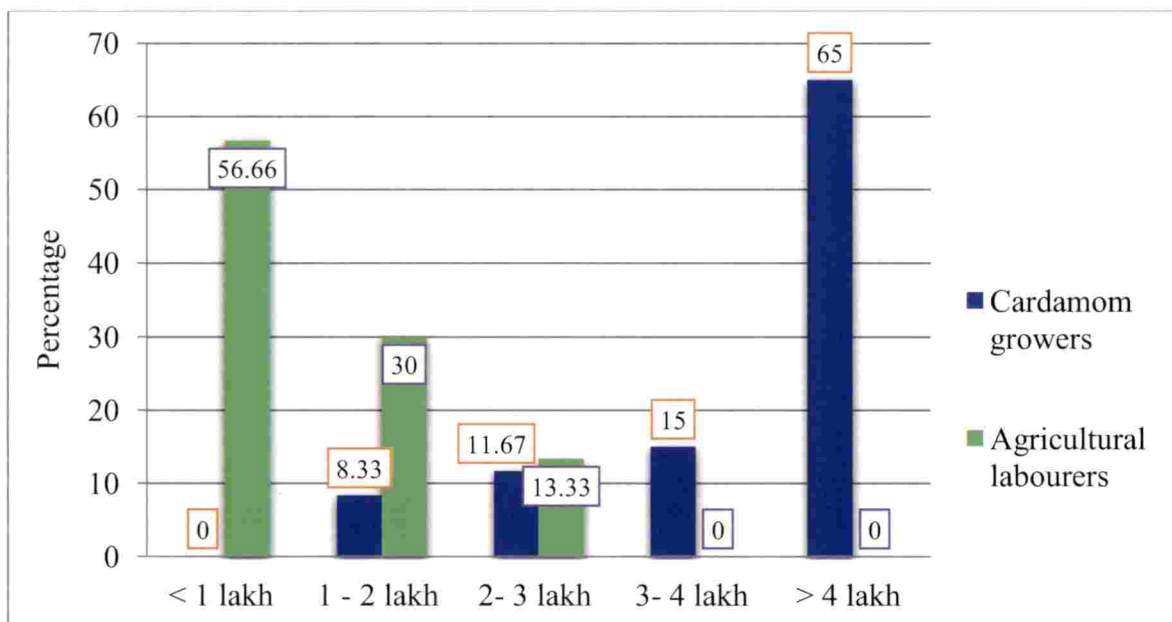


Fig 8. Distribution of cardamom growers and agricultural labourers based on annual income

### 4.3.7 Extension agency contact

Table 9. Distribution of cardamom growers based on extension agency contact  
(n=60)

Category	Regularly		Occasionally		Never	
	F	%	F	%	F	%
AO	49	81.67	8	13.33	3	5.00
Agril. Assistant	22	36.67	28	46.67	10	16.67
ADA	2	3.33	4	6.67	54	90.00
Agril. Scientist	23	38.33	31	51.67	6	10.00
KVK	12	20.00	2	3.33	46	76.67
ATMA	12	20.00	2	3.33	46	76.67

With respect to extension agency contact, a greater majority (81.67 %) of the cardamom growers had regular contact with Agriculture Officers. So it helps the respondents to gain information about plant protection management and new schemes of Department of Agriculture. Nearly half (46.67 %) of the growers were occasionally visiting agricultural assistants and about half (51.67 %) of them are occasionally visiting the agricultural scientist in Cardamom Research Station (CRS), Pampadumpara and Indian Cardamom Research Institute (ICRI), Myladumpara for getting information about new cultivation practices in cardamom. A greater proportion of cardamom growers did not have any contact with Additional Director of Agriculture (90.00 %), SMS of KVK (76.67 %) and ATMA (76.67 %).

Fig. 9 depicts the graphical representation of the distribution of cardamom growers based on extension agency contact.



#### 4.3.8 Mass media utilization/ ICT

Table 10. Distribution of cardamom growers based on mass media utilization  
(n=60)

Category	Regularly		Occasionally		Never	
	F	%	F	%	F	%
Radio	0	0.00	0	0.00	0	0.00
Television	60	100.00	0	0.00	0	0.00
Newspaper	60	100.00	0	0.00	0	0.00
Internet	11	18.33	32	53.33	17	28.33
Magazine	4	6.67	34	56.67	22	36.67
Bulletin	4	6.67	34	56.67	22	36.67
Kiosks	0	0.00	1	1.67	59	98.33
Mobiles	60	100.00	0	0.00	0	0.00

It could be evident from Table 10 and Fig. 10, majority of the cardamom growers (100 %) were regularly exposed to television programmes, newspaper and mobiles. Most of the farmers were interested in agricultural programmes like Krishidarshan, Kissan Krishideepam etc. It is observed that equal (56.67 % each) number of the respondents were occasionally using magazine and bulletin as the source of information while more than half (53.33 %) of the cardamom growers were occasionally using internet for getting information about agriculture. About 98.33 per cent of the cardamom growers never depend on information kiosks for information related to agriculture. This may be due to the lack of awareness of farmers on modern ICT facilities and its use. The results were in line with the findings of Reghunath (2016) and Namitha (2017).

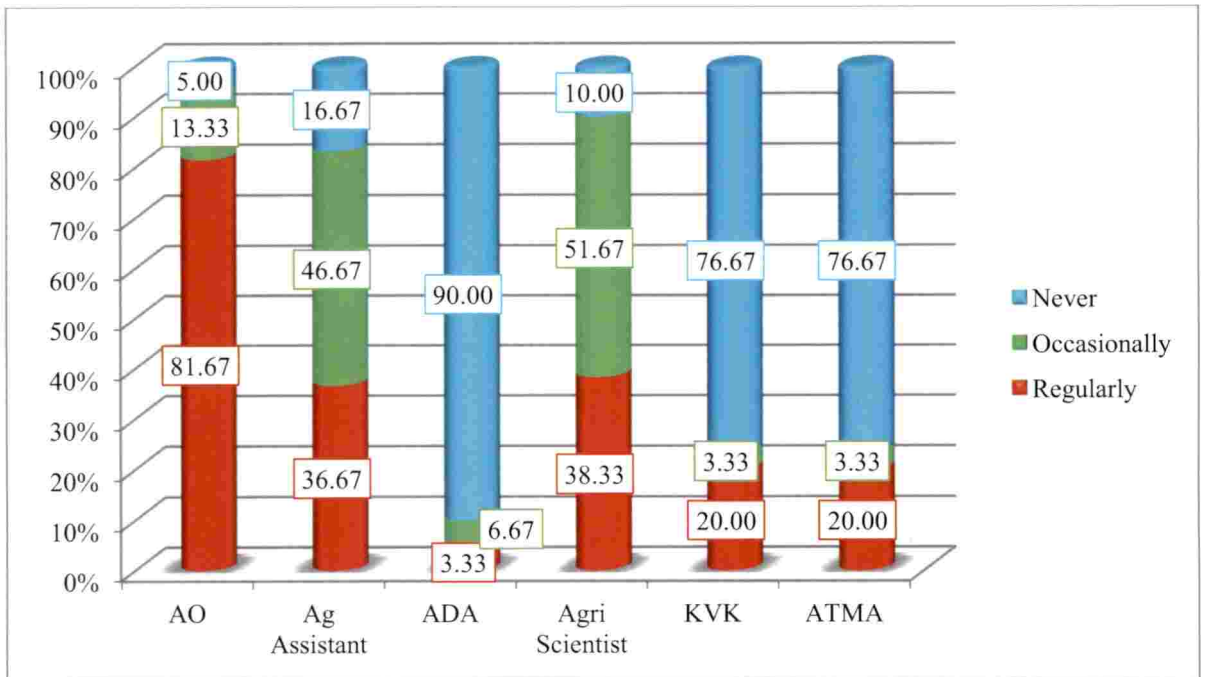


Fig 9. Distribution of cardamom growers based on extension agency contact

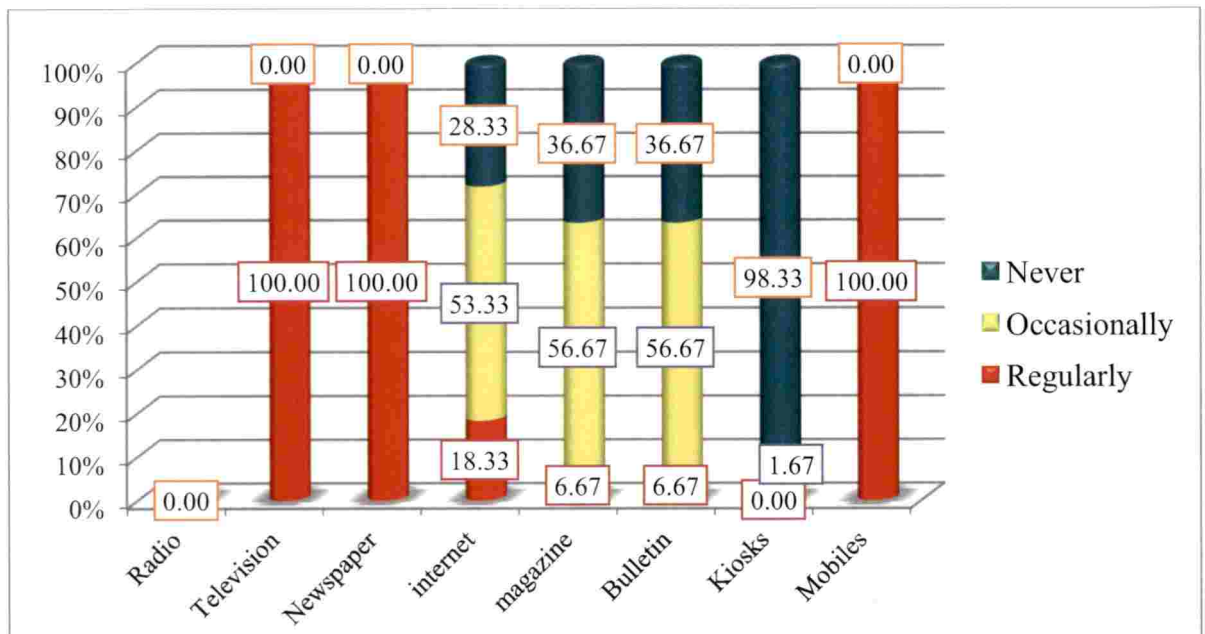


Fig 10. Distribution of cardamom growers based on mass media utilization

### 4.3.9 Economic motivation

Table 11. Distribution of cardamom growers based on economic motivation (n=60)

Category	Nedumkandam		Kattappana		Adimali		Total (%)
	F	%	F	%	F	%	
Low (<12)	3	15.00	1	5.00	3	15.00	11.67
Medium (12 to 16)	13	65.00	15	75.00	12	60.00	66.66
High (>16)	4	20.00	4	20.00	5	25.00	21.67
Mean= 14.45				SD= 2.02			

From Table 11 and Fig. 11, we can infer that a large number (66.66 %) of the cardamom growers had medium level of economic motivation, while 21.67 per cent and 11.67 per cent of the cardamom growers had high and low level of economic motivation respectively. The results were line with the findings of Jaganathan (2004), Namitha (2017).

### 4.3.10 Risk orientation

Table 12. Distribution of cardamom growers based on risk orientation (n=60)

Category	Nedumkandam		Kattappana		Adimali		Total (%)
	F	%	F	%	F	%	
Low (<8)	4	20.00	4	20.00	5	25.00	21.67
Medium (8 to 11)	13	65.00	15	75.00	13	65.00	68.33
High (>11)	3	15.00	1	5.00	2	10.00	10.00
Mean= 9.5				SD= 1.9			

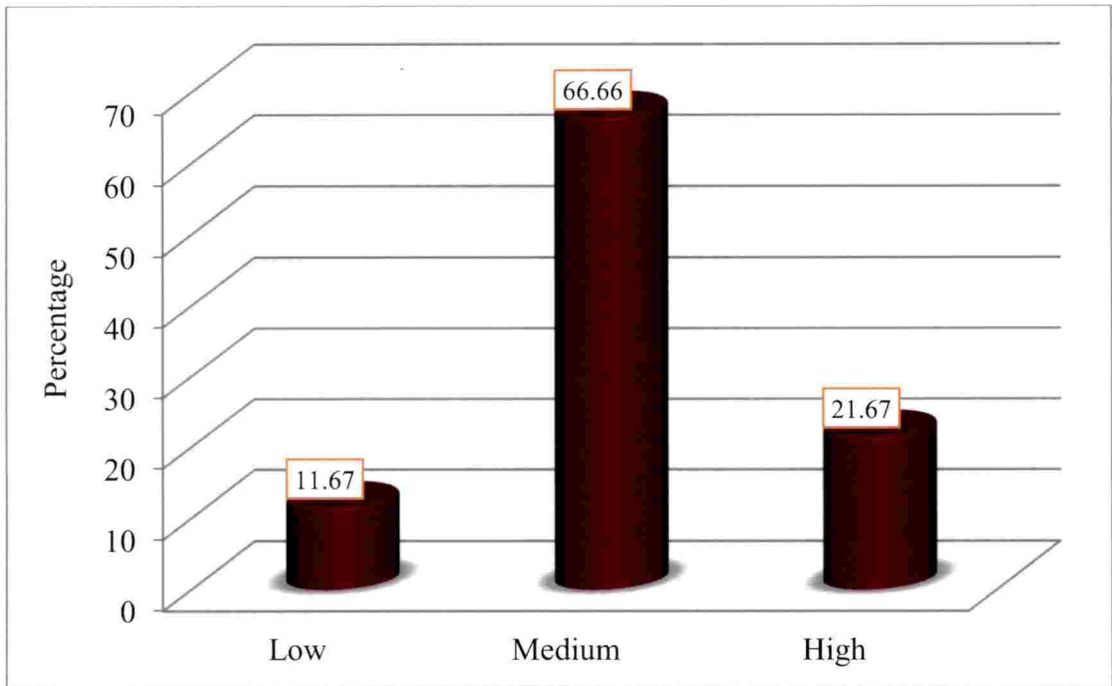


Fig 11. Distribution of cardamom growers based on economic motivation

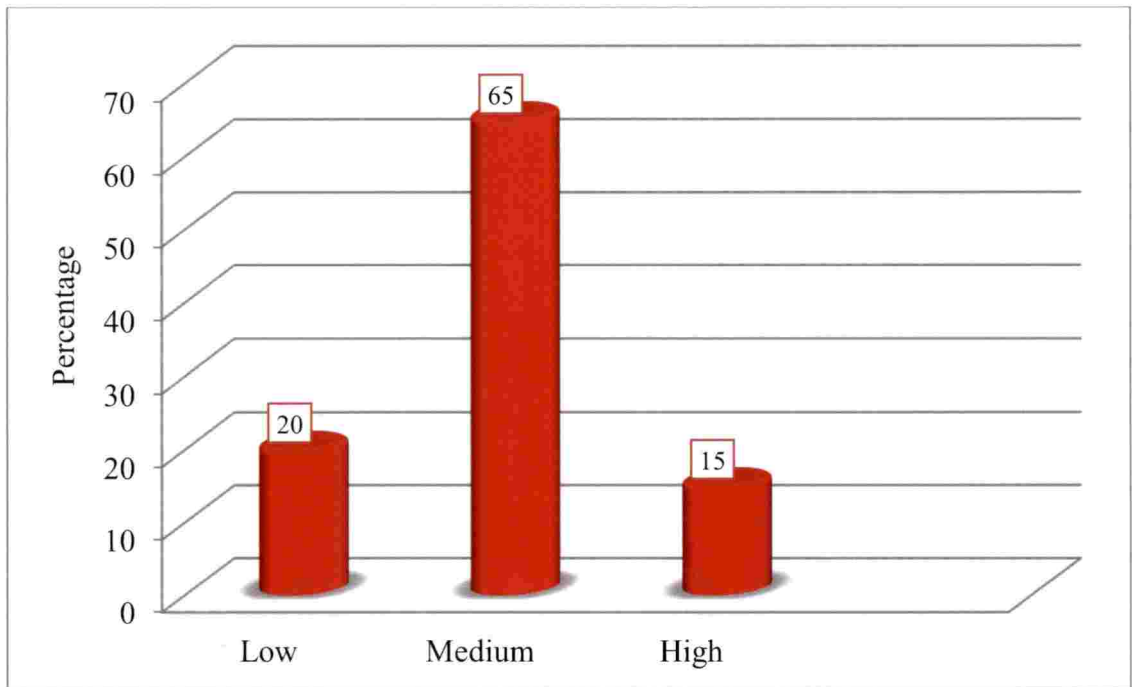


Fig 12. Distribution of cardamom growers based on risk orientation

Majority (68.33 %) of the cardamom growers had medium level of risk orientation followed by low (21.67 %) and high (10.00 %) level of risk orientation. This might be due to the willingness to take risks partly. Hence in general there is a necessity to stress about risk bearing capacity about the cardamom growers. The results are in line with the study done by Chetan (2011).

Fig. 12 depicts the graphical representation of the distribution of cardamom growers based on risk orientation.

#### 4.3.11 Scientific orientation

Table 13. Distribution of cardamom growers based on scientific orientation (n=60)

Category	Nedumkanda m		Kattappana		Adimali		Total (%)
	F	%	F	%	F	%	
Low (<13)	0	0.00	1	5.00	3	15.00	6.67
Medium (13 to 17)	17	85.00	15	75.00	12	60.00	73.33
High (>17)	3	15.00	4	20.00	5	25.00	20.00
Mean= 14.8				SD= 2.17			

Majority (73.33 %) of the cardamom growers had medium level of scientific orientation, whereas 20.00 per cent and 6.67 per cent of the cardamom growers had high and low level of scientific orientation respectively. Because they having regular contact with extension personnel in different agricultural institutions. The results were in line with results of Rakesh (2010).

Fig. 13 depicts the graphical representation of the distribution of cardamom growers based on scientific orientation.

### 4.3.12 Innovation proneness

Table 14. Distribution of cardamom growers based on innovation proneness  
(n=60)

Category	Nedumkandam		Kattappana		Adimali		Total (%)
	F	%	F	%	F	%	
Low (<10)	5	25.00	2	10.00	3	15.00	16.67
Medium (10 to 14)	12	60.00	16	80.00	14	70.00	70.00
High (>14)	3	15.00	2	10.00	3	15.00	13.33
Mean= 11.95				SD= 2.18			

Most (70.00 %) of the cardamom growers had medium level of innovation proneness, while 16.67 per cent and 13.33 per cent of the cardamom growers had low and high level of innovation proneness. The medium level of the respondents might be owing to their higher educational status, extension agency contact and better scientific orientation; hence they would like to achieve higher returns by adopting the innovations intensively. The results were line with the results of Reghunath (2016).

Fig. 14 depicts the graphical representation of the distribution of cardamom growers based on innovation proneness.

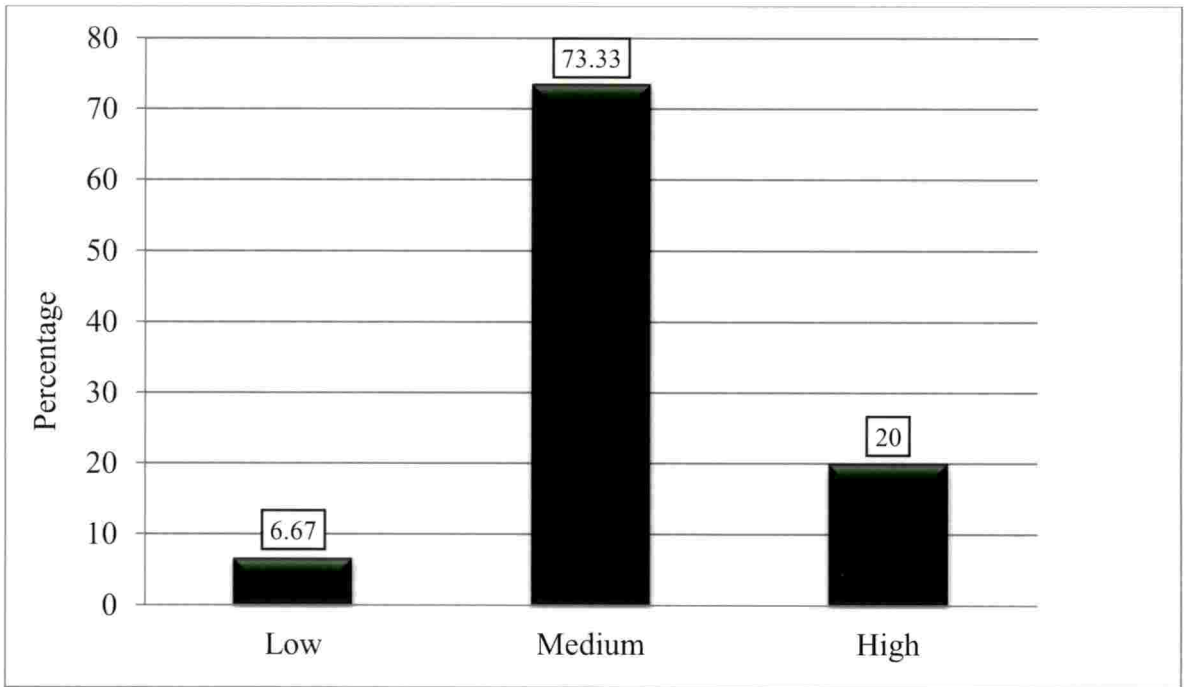


Fig 13. Distribution of cardamom growers based on scientific orientation

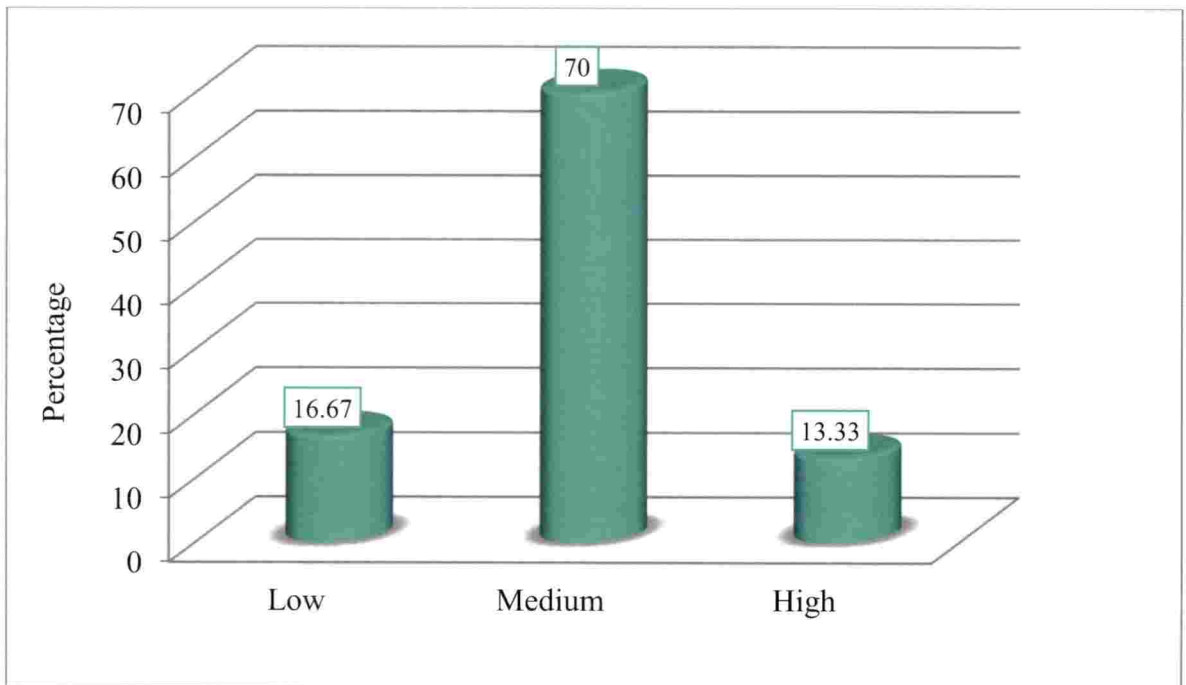


Fig 14. Distribution of cardamom growers based on innovation proneness

### 4.3.13 Decision making ability

Table 15. Distribution of cardamom growers based on decision making ability  
(n=60)

Category	Nedumkandam		Kattappana		Adimali		Total (%)
	F	%	F	%	F	%	
Low (<9)	3	15.00	3	15.00	2	10.00	13.33
Medium (9 to 13)	13	65.00	15	75.00	14	70.00	70.00
High (>13)	4	20.00	2	10.00	4	20.00	16.67
Mean= 10.6				SD= 1.9			

Majority (70.00 %) of the cardamom growers had medium level of decision making ability followed by high (16.67 %) and low (13.33 %) level decision making ability. The cardamom growers possessed higher level of education, medium to high level of scientific orientation which resulted in medium to high level of decision making ability. The results were in line with the results of Reghunath (2016).

Fig. 15 depicts the graphical representation of the distribution of cardamom growers based on decision making ability.

### 4.3.14 Credit orientation

Table 16. Distribution of cardamom growers based on credit orientation (n=60)

Category	Nedumkandam		Kattappana		Adimali		Total (%)
	F	%	F	%	F	%	
Low (<8)	2	10.00	1	5.00	1	5.00	6.67
Medium (8 to 10)	15	75.00	18	90.00	16	80.00	81.66
High (>10)	3	15.00	1	5.00	3	15.00	11.67
Mean= 8.15				SD= 1.78			



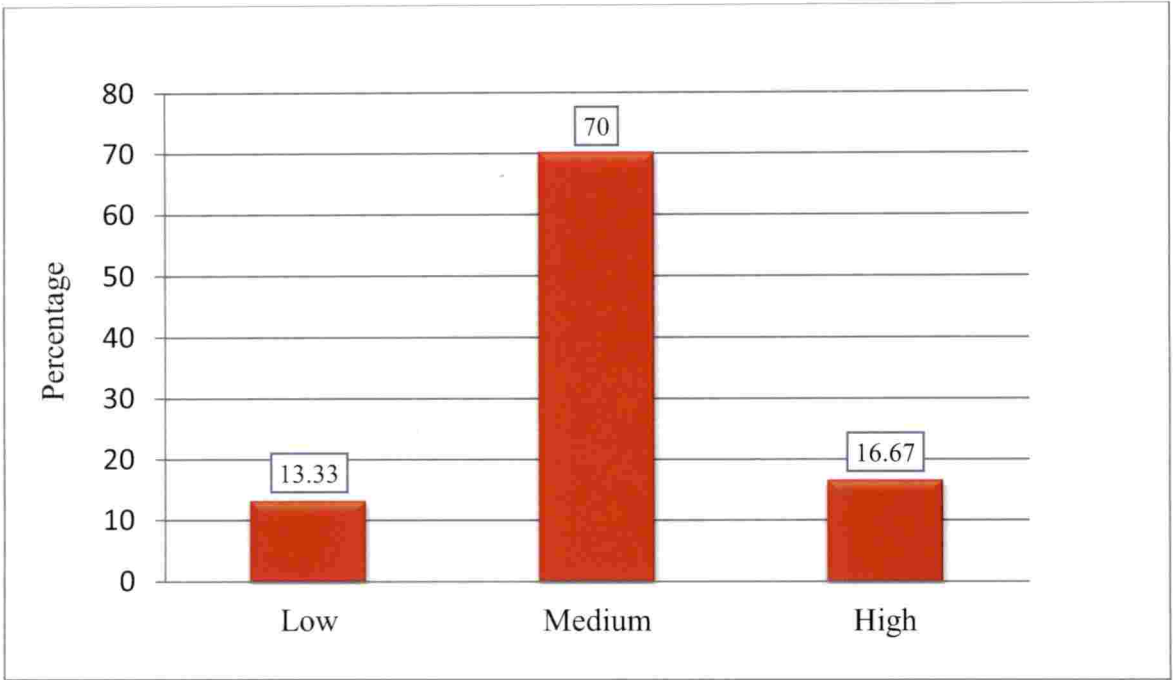


Fig 15. Distribution of cardamom growers based on their decision making ability

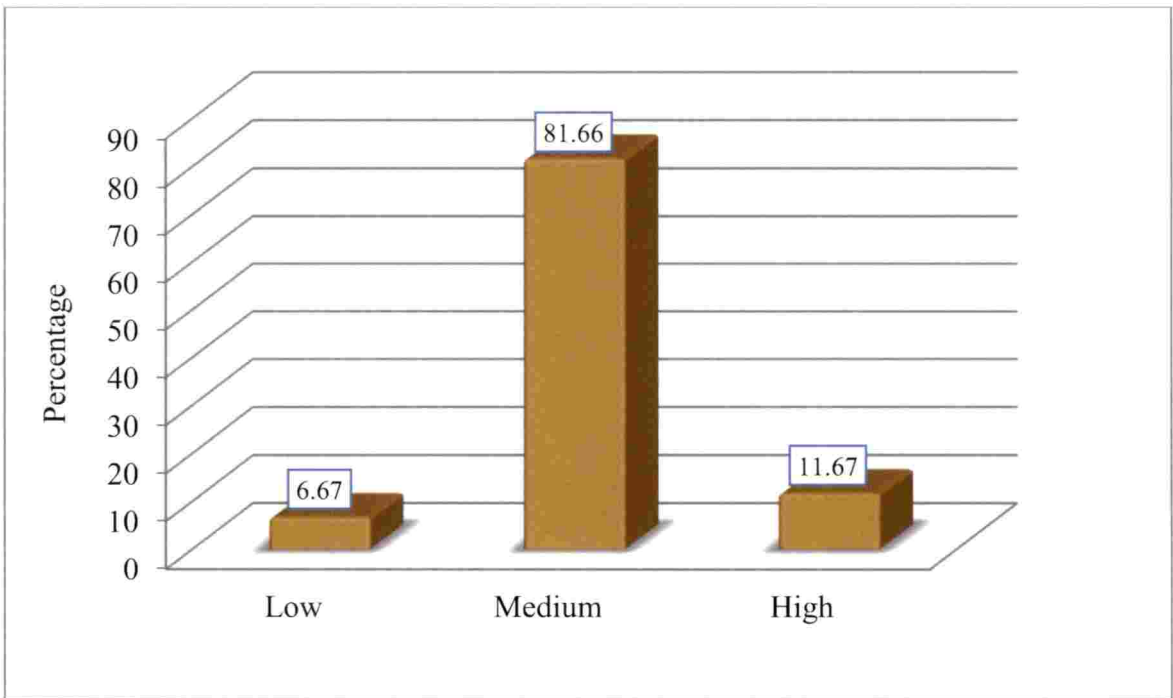


Fig 16. Distribution of cardamom growers based on their credit orientation

It could be observed that Table 16 that, majority (81.66 %) of the cardamom growers had medium level credit orientation, whereas 11.67 per cent and 6.67 per cent of the cardamom growers had high and low level of credit orientation. Cardamom is a high value crop where it involves costly inputs which are always linked to the investment pattern of growers; hence the growers are well exposed to the credit facilities available from different sources to take up the cultivation of cardamom. The result supports the study done by Athira (2017) and Namitha (2017).

Fig. 16 depicts the graphical representation of the distribution of cardamom growers based on credit orientation.

#### 4.3.15 Market orientation

Table 17. Distribution of cardamom growers based on market orientation (n=60)

Category	Nedumkandam		Kattappana		Adimali		Total (%)
	F	%	F	%	F	%	
Low (<2)	2	10.00	2	10.00	4	20.00	13.33
Medium (2 to 3)	18	90.00	16	80.00	16	80.00	83.33
High (>3)	0	0.00	2	10.00	0	0.00	3.33
Mean= 2.35			SD= 0.79				

Majority (83.33 %) of the cardamom growers had medium level of market orientation followed by low (13.33 %) and high (3.33 %) level of market orientation. Most of the cardamom growers are not going to the auction centres for selling their produce because of the lack of transportation facilities. So they are mostly relying on middleman. The results were in line with the results of Namitha (2017).

Fig. 17 depicts the graphical representation of the distribution of cardamom growers based on market orientation.

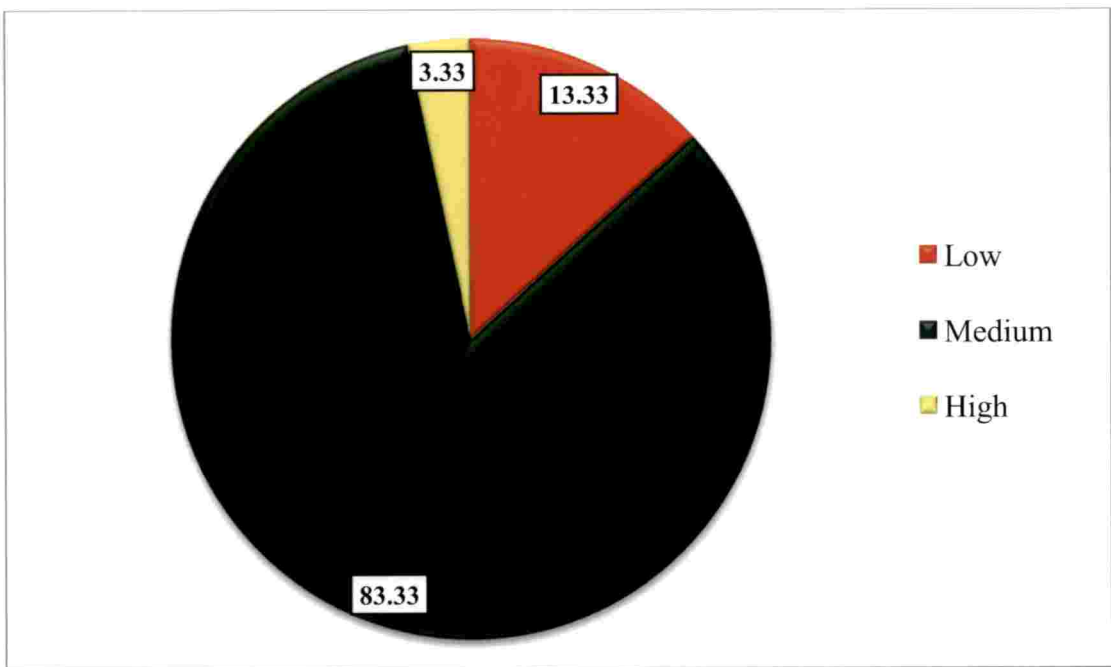


Fig 17. Distribution of cardamom growers based on their market orientation

#### 4.4 CORRELATION BETWEEN INDEPENDENT VARIABLE AND ADOPTION OF GOOD AGRICULTURAL PRACTICES

Correlation analysis of adoption of good agricultural practices with independent variable done and it is shown in the following Table 18.

Table 18. Correlation on adoption of good agricultural practices and profile characteristics of cardamom growers

<b>Independent variables</b>	<b>Correlation coefficient</b>
Age	-0.355**
Educational status	0.424**
Family size	-0.158
Occupation	-0.211
Farming experience	-0.413**
Annual income	-0.171
Extension agency contact	-0.066
Mass media utilization/ ICT	-0.212
Economic motivation	-0.095
Risk orientation	-0.095
Scientific orientation	-0.219
Innovation proneness	-0.057
Decision making ability	-0.229
Credit orientation	0.282*
Market orientation	0.179

\* Significant at 5 per cent level

\*\* Significant at 1 per cent level

Adoption of good agricultural practices positively correlated with educational status at 1 per cent level. This finding is in agreement with the findings of Anju (2016). Through level of education, knowledge of the farmer respondents were enhanced, which resulted in the adoption of good agricultural

practices. So it can be assumed that that direct and indirect effect of education might have contributed to the positive and significant relation with adoption.

Credit orientation was found to have positive and significantly correlated with adoption of good agricultural practices. Cardamom is a high value crop where it involves costly inputs which are always linked to the investment pattern of growers; hence the growers are well exposed to the credit facilities available from different sources to take up the cultivation of cardamom.

Farming experience was found to be negatively and significantly correlated with adoption of good agricultural practices. Majority of the farmers were belongs to middle aged category and the growers were having more than 20 years of experience in cardamom cultivation. It was assumed that experienced farmers have a higher profitability of using their own practices than compared to those with little experience in farming.

#### 4.5 DOCUMENTATION OF GOOD AGRICULTURAL PRACTICES (GAP) IN CARDAMOM PRODUCTION

Table 19. Documentation of the GAP adopted by the cardamom growers

Sl.no	Technology	F	%
1.	Variety	17	28.33
2.	Propagation	60	100.00
3.	Spacing	30	50.00
4.	Pit size	34	28.33
5.	Application of Manures	7	11.67
6.	Applicaton of N	1	1.67
7.	Application of P	1	1.67
8.	Application of K	1	1.67
9.	Weed management	0	00.00
10.	Trashing	0	00.00
11.	Earthing up	0	00.00

13.	Soil and water conservation technologies	0	00.00
14.	Shade regulation	0	00.00
15.	Plant protection – Pest	29	48.33
16.	Plant Protection- Diseases	30	50.00

The Good Agricultural Practices recommendation by KAU (2016), used by the cardamom growers were documented and inventoried based on their adoption. Table 19 reveals that 28.33 per cent of the growers were adopting the recommended varieties (PV-2, IISR- Avinash) by the KAU.

Cent per cent of the cardamom growers were propagating cardamom through suckers, were it is cheaper and the earliness in bearing and also gives 30-40 per cent higher yield than seedlings. About 50 per cent of the growers were adopting spacing of 3 cm x 3 cm or 2 cm x 3 cm based on the fertility of soil and 28.33 per cent of the growers were adopting the pit size of 60 cm x 60 cm x 35 cm.

In case the application of manures, only 11.67 growers were adopting the recommended GAP of KAU i.e., application of organic manures such as farmyard manure or cowdung or compost @ 5 kg/ plant or neem cake @ 1-2 kg/ plant. Only 1.67 per cent of the cardamom growers were adopting the recommended application of fertilizers i.e., N, P, K @ 75: 75: 150 kg ha<sup>-1</sup>. The reason for non-adoption of recommended fertilizer might be that at present the growers are observing the overgrowth of plants without applying fertilizers because of good soil health.

Nearly half (48.33 %) of the respondents were using the recommended practices for pest control. To control cardamom thrips (*Sciothrips cardamomi*), four spraying of quinalphos (0.05 %), phosalone (0.07 %) or dimethoate (0.05 %) were adopted. For controlling shoot/ capsule borer (*Conogethes punctiferlis*), application of quinalphose or dimethoate @ 0.05 % were adopted. Another pest

control measures were adopted was to control cardamom whitefly (*Dialeurodes cardamomi*), application of mixture of neem oil (500 ml) and triton (500 ml) in 100 litres of water in 15 days intervals @ 2- 3 times.

For controlling the diseases 50.00 per cent of the cardamom growers were adopting the good agricultural practices of KAU. The main fungal diseases found in the study area were azhukal. For controlling this disease, farmers were using Bordeaux mixture @ 1 per cent and for prophylactic measures application of *Pseudomonas flurescens* @ 2 per cent along with basal application of *Trichoderma viride* (50 g) per plant were adopted.

The growers were not adopted the recommended practices like weed management, trashing, earthing up, soil and water conservation technologies and shade regulation.

#### 4.5.1 Documentation of farmer practices

Growers are practicing the single sucker method. Instead of six suckers in traditional planting method, single sucker planting method was used where one sucker is planted in a pit. Some of the farmers do is that, as there is more space between the plants, they take some pits and cover it with plant waste, other materials etc. for eight to ten years and when old plants starting rotting or give fewer yields, such pits will be filled with new tillers (gap filling) and were the uneconomic plants are removed.

Covering the soil with thick mulch and adequate shade regulation is also reduces the thrips attack. Mixture of groundnut cake, neem cake and Cowdung at the rate of 20 kg, 50 kg and 100 kg kept for eight days and then they are using. It will also increase the yield of cardamom. Application of neem cake (500 g) + bonemeal (500 g) per plant at the interval of two weeks or application of Cowdung (1 kg) + neem cake (500 g) per plant at the interval of two weeks.

Now a day's most of the cardamom growers are practicing intercropping in cardamom. Mainly black pepper was intercropped intensively in the study area.



Other crops are nutmeg, clove, banana (for the first year of cardamom planting) and in discarded rubber plantations. The detailed list of farmer practices in cardamom as opined by the cardamom growers is presented in the Table 20.

Table 20. Documentation of the farmer practices used by the cardamom growers

Sl.no	Practices	F	%
1.	Single sucker method	48	80.00
2.	Pit less planting method	45	75.00
3.	Application of neemcake+ ground nut cake + cowdung	37	61.66
4.	Channel planting method	36	60.00
5.	Mulching	34	56.66
6.	A mixture of extracts of neemcake and tobacco waste is sprayed to control the stem borer and capsule borer in cardamom	32	53.33
7.	Zero soil disturbance	28	46.66

The main farmer practices done by the cardamom growers were single sucker method (80.00 %), pit less planting method (75.00 %), application of neemcake+ ground nut cake+ cowdung (61.66 %), channel planting method (60.00 %), mulching (56.66 %), a waste of extracts of neemcake and tobacco waste is sprayed to control the stem borer and capsule borer (53.33 %) and zero soil disturbance (46.66 %). These are the main practices done by the cardamom growers in the study area.



## 4.6 EFFECTS OF ECOLOGICAL AND CLIMATIC CHANGES

### 4.6.1 Environmental orientation of cardamom growers

Table 21. Distribution of cardamom growers based on environmental orientation  
(n=60)

Category	F	%
Low (<51)	0	0.00
Medium (51 to 64)	47	78.33
High (>64)	13	21.67
Mean= 58.12		SD= 6.18

Majority (78.33 %) of the cardamom growers had medium level of environmental orientation whereas 21.67 per cent of the cardamom growers had high level of environmental orientation. Even though most of the cardamom growers had less educational background, they were much concerned about their environment.

The consequences of overuse of chemicals and the continuous lopping of shade trees lead to the state of environment pollution and deforestation. These situations forced the people to think about importance of environmental conservation. This will be the reason for the medium level of environmental orientation of cardamom growers.

Fig. 18 depicts the graphical representation of the distribution of cardamom growers based on environmental orientation.

#### 4.6.2 Correlation between environmental orientation and independent variables

Correlation analysis of environmental orientation with independent variable done and it is shown in following Table. 22.

Table 22. Correlation on environmental orientation and profile characteristics of cardamom growers

Independent variables	Correlation coefficient
Age	0.056
Educational status	-0.114
Family size	-0.059
Occupation	-0.010
Farming Experience	-0.066
Annual income	-0.182
Extension agency contact	0.658**
Mass media utilization	0.382**
Economic orientation	0.186
Risk orientation	0.240
Scientific orientation	0.378**
Innovation proneness	0.538**
Decision making ability	0.563**
Credit orientation	-0.066
Market orientation	0.095

\* Significant at 5 per cent level

\*\* Significant at 1 per cent level

A perusal of Table 22 reveals that extension agency contact, mass media utilization, scientific orientation, innovation proneness and decision making ability were significantly and positively related to environmental orientation.

Extension agency contact was positively and significantly correlated with environmental orientation at 1 per cent level. This might be due to majority of the farmers were found medium to high extension agency contact which offers chance to the farmers to collect recent advances in farming.

Mass media utilization was positively and significantly correlated with environmental orientation at 1 per cent level. The reasons behind this due to the majority of farmers were using the mass media like Television, newspaper and mobiles. Thus the farmers with high level of mass media exposure might have got opportunities to collect the recent advances about environmental activities.

Scientific orientation was positively and significantly correlated with environmental orientation at 1 per cent level. Scientific orientation opened the mental horizon, which act as a catalyst in changing the behaviour of the farmers, which would have resulted into its significant influence on their awareness regarding environmental orientation.

Innovation proneness and decision making ability were positively and significantly correlated with environmental orientation at 1 per cent level. The farmers were having medium to high level of environmental orientation this might be due to the majority of the farmers were using environment friendly technologies for the cultivation.

#### 4.6.3 Climate change awareness of cardamom growers

Table 23. Distribution of cardamom growers based on climate change awareness (n=60)

Category	F	%
Low (<19)	5	8.33
Medium (19 to 25)	44	73.33
High (>25)	11	18.33
Mean= 21.63		SD= 3.03

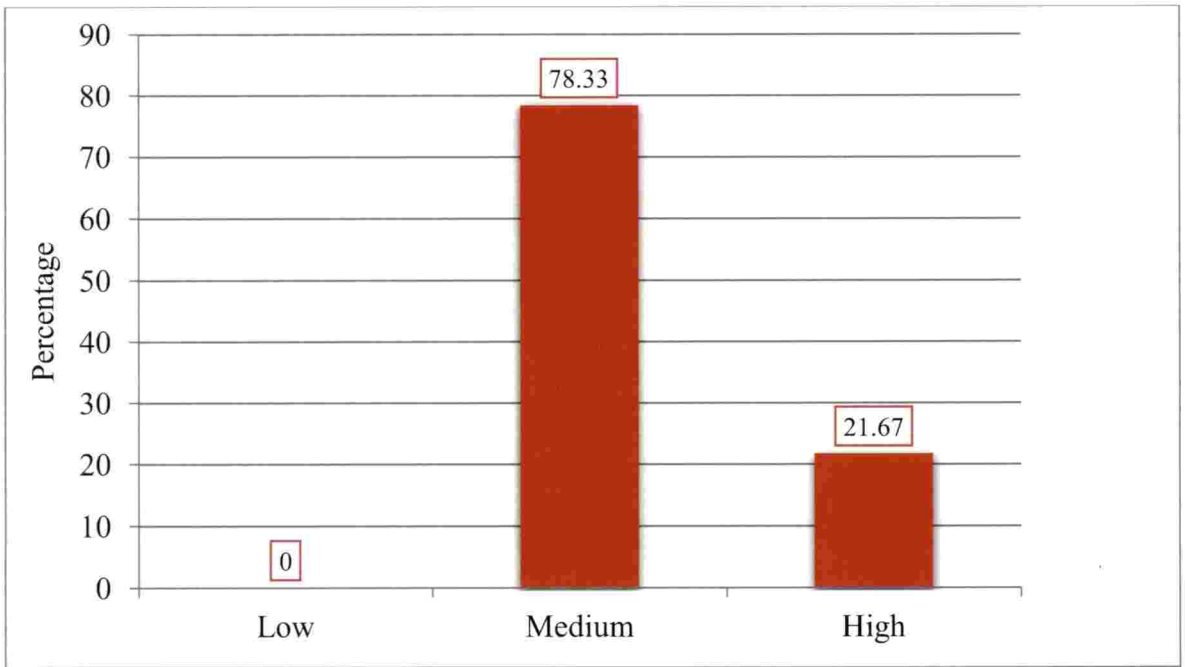


Fig 18. Distribution of cardamom growers based on environmental orientation

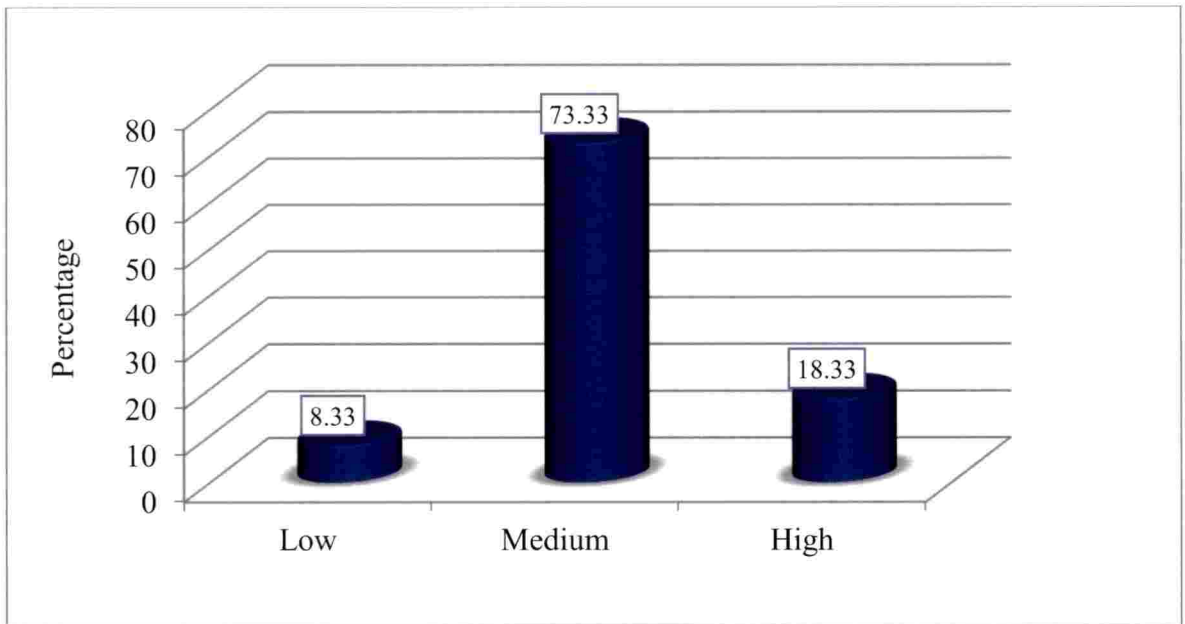


Fig 19. Distribution of cardamom growers based on climate change awareness

A series of questions were asked to the cardamom growers to study the awareness regarding climate change awareness with respect to climate, soil and water and crop related aspects. The results were presented Table 23. It reveals majority (73.33 %) of the cardamom growers had medium level of climate change awareness, while 18.33 per cent and 8.33 per cent had high and low level of climate change awareness.

Most of the respondents were aware about the climate change and its effect on cultivation of cardamom. The probable reasons that could be attributed for higher awareness of growers about climate change might be due to now a day's farming is a costly venture. Most of the agricultural inputs required for farming are very costly. The rainfall were less also they want irrigate their crop to get more yield and more conscious about pest and diseases. The farmers might have gathered as much as information from various individual or through mass media. Thereby their awareness of changes in climate change has been good.

Fig. 19 depicts the graphical representation of the distribution of cardamom growers based on climate change awareness.

4.7 DOCUMENTATION OF GOVERNMENTAL INTERVENTIONS IN CARDAMOM PRODUCTION

4.7.1 Indian Cardamom Research Institute

The Spices Board (the erstwhile Cardamom Board), at Myladumpara in the Idukki district of Kerala to carry out basic and applied research on all aspects of small and large cardamom was constituted under the Ministry of Commerce and Industry, Government of India, as an apex body for promoting Indian spices and spice products world-wide.

- 1. Plant material production: Availability of good quality planting materials of improved varieties/ cultivars for replanting/rejuvenation is the key to improve the productivity of cardamom. High yielding and disease free planting materials are to

be made available to facilitate replanting. Subsidy @ Rs. 2.50/- per sucker and seedling for a maximum 10,000 suckers in Kerala.

2. Re- Plantation: Presence of old and senile plantations is the prime reason for low productivity in cardamom. The programme is aimed at rejuvenating the old, diseased and uneconomic plantations (For 0-8 ha: Rs 70000/- per ha is given as subsidy in Kerala).
3. Improved Cardamom Curing Devices: Since traditional curing results in low quality produce, Board is popularising curing machines using fuels, viz., Diesel, LP Gas and energy from biomass which gives cardamom better colour and cost effective drying, also fetches premium price. 33.33% of the actual cost subject to a maximum of Rs.1,00,000/- per device is offered as subsidy.
4. Irrigation and land development programme
5. Supply of GAP kits: Cardamom needs intensive care and constant attention to prevent occurrence of pests and diseases. Indiscriminate use of pesticides, due to lack of awareness has resulted in pesticide residues in the end product. The Board therefore to supply bio-agents for farmers to take up prophylactic/control measures in cardamom. Fifty per cent of cost of bio-agents subject to a maximum of Rs.2500/- per ha is provided as subsidy.
6. Supply of bee- keeping boxes: Honeybees play an important role in pollination of cardamom flowers. By promoting bee keeping in cardamom plantations, productivity can be increased and also this will give an additional income to farmers. It is proposed to supply five bee boxes per hectare at 50% subsidy subject to a maximum of Rs.1880/- per box.
7. Mechanization: About 68 % of the cost of cultivation incurred per hectare in cardamom is accounted for the labour. Timely unavailability of labour cripples the cardamom sector leading to both plant loss as well as crop loss. The best initiative by the institute, which the labour cost and thereby the total production cost can be brought down, is by introducing mechanization wherever possible. Mechanization of cultural practices like pit making, weeding, plant protection etc. requires timely labour. Cleaning of the harvested produce, it's grading and polishing fetches a premium price for the farmer.

In order to assist the farmers to help them to take up timely cultural operations and to reduce the production cost, it is proposed to supply pit makers, weed cutters, plant-protection equipments, washing equipments, graders/sieves and polishers at 50% subsidy as below.

The divisions were working harmoniously for the promotion of the organic cardamom production. Various plant protection bio pesticides were standardized by the ICRI, an important example is the Neem Kernel Aqueous Extract (NKAE). ICRI also standardized the package of practices for organic cardamom production, especially for the agro climatic conditions of Kerala.

#### 4.7.2 Cardamom Research Station (CRS)

The research station is under the Kerala Agricultural University. They are acting as a facilitating agent for the promotion of the organic cardamom production. This institute standardized the package of practice of organic and inorganic cardamom production. Group farming approach is followed by CRS. Research also station is involved in the production of various technologies.

#### 4.8 DOCUMENTATION OF HEALTH EXTERNALITIES OF CARDAMOM GROWERS/ LABOURERS

Table 24. Distribution of cardamom growers and agricultural labourers based on their health concern

Category	Cardamom growers (n=60)		Agricultural labourers (n=30)	
	F	%	F	%
Low (<7)	10	16.66	5	16.67
Medium (7 to 12)	37	61.67	19	63.33
High (>12)	13	21.67	6	20.00
Mean= 9.50		SD= 2.13		

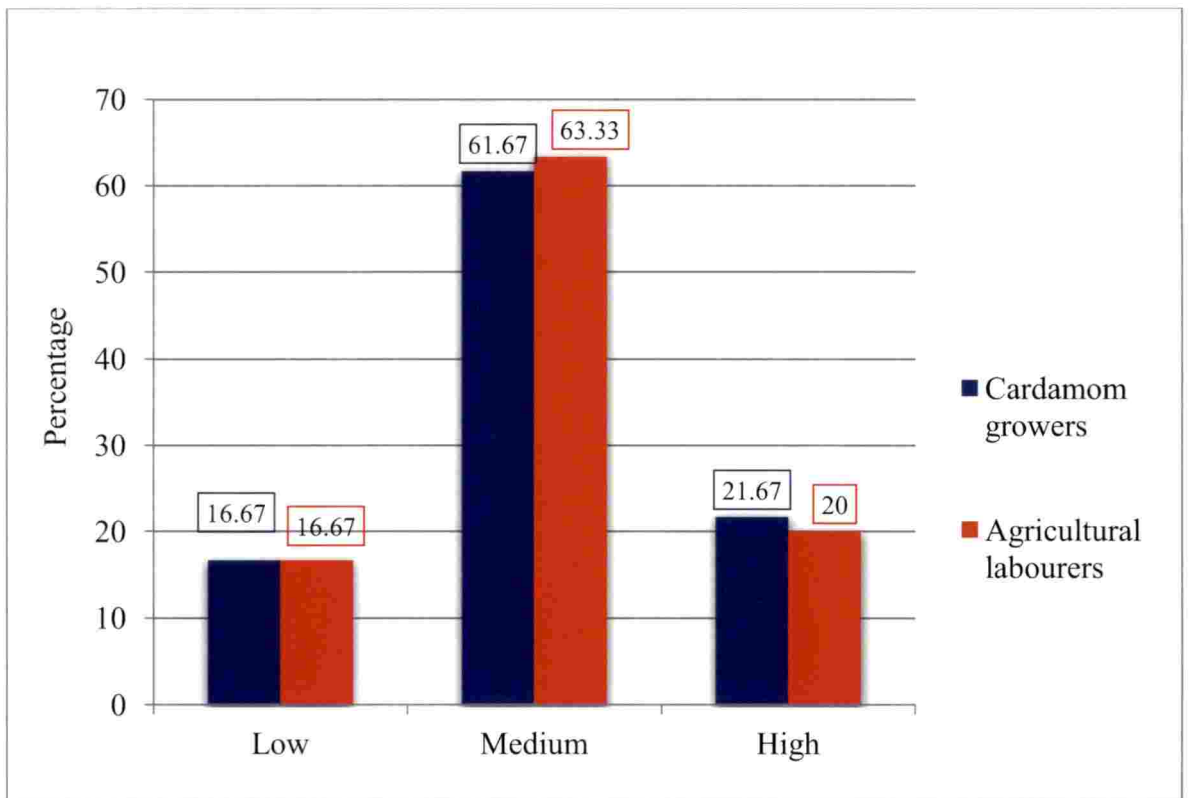


Fig 20. Distribution of cardamom growers and agricultural labourers based on health concern



More than half (61.67 %) of the cardamom growers had medium level of health concern, while 21.67 and 16.66 per cent had high and low level health concern respectively. In case of agricultural labourers, majority (63.33 %) of them had medium level health concern followed by high (20.00 %) and low (16.67 %) level health concern.

Fig. 20 depicts the graphical representation of the distribution of cardamom growers and agricultural labourers based on health concern.

Table 25. Health symptoms as a result of pesticide exposure

Symptoms	F
Itching	58
Breathing problems	52
Nausea	56
Eye irritation	78
Burning sensation	76

Source: District Medical Office, Painavu (2014)

Skin problems and eye irritation were reported as the most common problem. However, these were regarded as the minor illness and that often managed by the farmers by home remedies or they are not considered about the symptoms. From the study the F of symptoms like nausea and breathing problems were less and it shows that the cardamom growers and agricultural labourers are more concerned about their health.

#### 4.9 CONSTRAINTS IN CARDAMOM CULTIVATION

Table 26. Distribution of respondent based on the major constraints in three blocks

Sl.no	Constraints	F	Rank
1.	Non-availability and high cost of labour	58	1
2.	Fluctuating price and marketing problem	52	2
3.	Not getting the cardamom registration card a great concern of growers	52	2
4.	Cardamom grading facilities	48	3
5.	Lack of support price based on the cardamom production	48	3
6.	Uneven rainfall pattern and changing climate	46	4
7.	Lack of irrigation facilities	46	4
8.	Animal damage	45	5
9.	Increased rate of fertilizers other than nitrogen fertilizers	42	6
10.	Improper extension services at village level	35	7

The major constraints faced by cardamom growers are: not getting the cardamom registration card was a great concern among the growers, non-availability and high cost of labour, price fluctuation and marketing problem, lack of cardamom grading facilities, lack of support price based on the cardamom production, uneven rainfall pattern and changing climate, lack of irrigation facilities, man- animal conflicts, high production cost, inadequate extension services at village level.

#### 4.10 GENERAL SUGGESTIONS FOR IMPROVING THE CARDAMOM CULTIVATION

Establishment of cooperative societies for the procurement of cardamom will increase the direct selling of the produce through auction centers. The farmer will get the direct benefit through these cooperative societies by discarding the middleman. Minimum support price based on the production of cardamom as like of other food crops, then the cultivation of cardamom will increase and the farmer get the premium price. Crop demonstration about improved variety and improved technologies, which will increase the adoption of new technologies and reduce the cost of cultivation of cardamom. Subsidies on inputs like bio- fertilizers and pest control agent and to promote microbial products that are much cheaper and more sustainable and give best products and protect environment and the health of labourers and the local public.

Establishment of cardamom dryers and grading machines will help the farmer to dry their produce and to grade their produces on different grades mentioned by the spices board and they will get the premium price for different grades when they are given for auctioning.

Introduction of the oil extraction facilities or factories will help the farmer to manufacture oleoresins and cardamom oil which are easy to market and would get minimum premium prices in India and abroad. Value addition of spices before export also improves the export potential.

Eco-tourism/ Farm tourism to be promoted in well organized and professionally managed manner in cardamom plantation areas to provide additional income to farmers and value addition to Cardamom cultivated land.

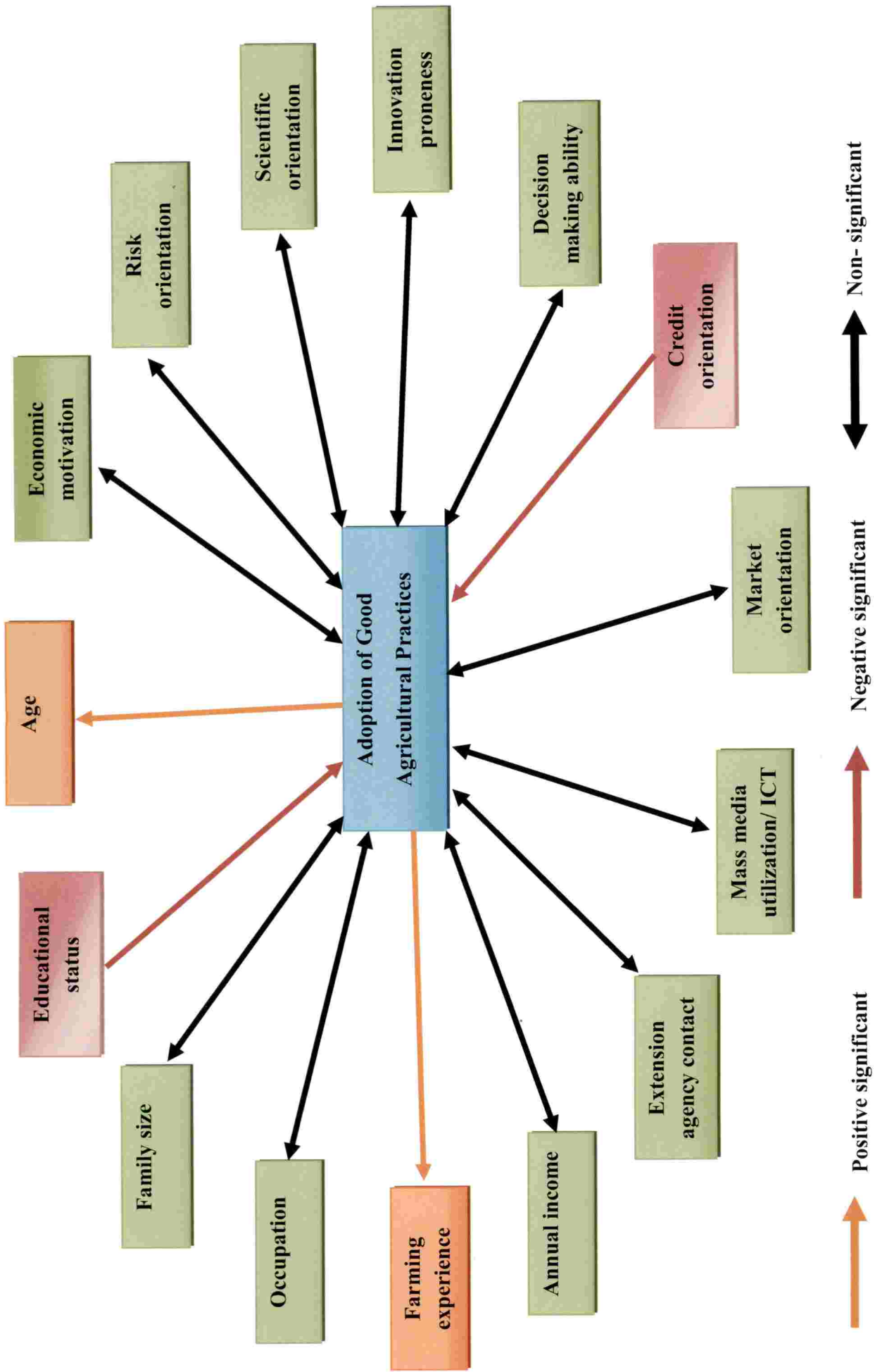


Plate 3. Empirical relationship between adoption of good agricultural practices and independent variable

## *Summary*

## 5. SUMMARY

New technology in agriculture has widened the horizons of productivity contours of various crops. But its performance on farmers' field is not satisfactory due to wide variations in the agro-climatic conditions. It causes the average yield on farmers' field continuous to be far below in the potential yield. This is one of the main concerns for those involved in the development of technology and spread of technology and also the administrators. At present, India is the second largest producer of cardamom in the world. Cardamom is one of the important spice crop cultivated in the regions of Cardamom Hill Reserves (CHR) of Idukki district, Kerala. Looking into the importance of cardamom and other spice crops, for increasing the production, research and developmental activities are carried out in the different agricultural institutions such as Kerala Agricultural University. For the study, KAU package of practices for the cardamom cultivation were taken as the good agricultural practices for cardamom. With this in view, a research study was initiated with specific objectives to study the current scenario of cardamom production system and analysis of the socio-economic situation among growers and good agricultural practices (GAP) and to enumerate the present challenges with respect to ecological, climatic changes as well as to explore the health externalities of cardamom growers and labourers.

The study was carried out in three blocks of Idukki district namely Kattappana, Nedumkandam and Adimali, which comes under Cardamom Hills Reserve (CHR) zone. Twenty growers and ten agricultural labourers were randomly selected from each of these blocks making a sample of ninety respondents. Data was collected using a of pre- tested and well- structured interview schedule. The data's were analysed using different statistical tools. Ex post facto research was conducted for the study. One dependent variable and fifteen independent variables were selected for the study. Adoption of good agricultural practices was the dependent variable and fifteen independent variables were selected based after judges rating.

## 5.1 SALIENT FINDINGS OF THE STUDY

- Area under cardamom cultivation has significantly reduced in the past years. Cardamom was cultivated in an area of 40,867 ha in 1997 and it declined to 39,080 ha by the year 2017. Productivity of cardamom in cardamom hills of Kerala has been spectacular for the last 20 years (1997-2016) period with 4 fold increase from 130 kg/ ha to 400 kg/ ha.
- Nearly half (48.33 %) of the respondents had low level of adoption of good agricultural practices in cardamom cultivation followed by medium (38.33 %) and high (11.67 %) level of adoption.
- Majority (60.00 %) of the cardamom growers belonged to middle aged group, whereas, 21.67 per cent and 18.33 per cent of them belonged to young and old age groups, respectively. In case of agricultural labourers, 66.67 per cent belonged to middle age group, while 20.00 per cent and 13.33 per cent were belonging to young and old age groups, respectively.
- More than half of the cardamom growers were educated upto high school level (53.33 %) followed by collegiate level (26.67 %), diploma and middle level at 10.00 per cent. About 56.67 per cent of agricultural labourers were educated upto high school followed by middle school (30.00 %) and primary school (13.33 %) level education. None of the respondents were observed to be illiterate nor can read and write category.
- More than half (53.33 %) of the cardamom growers had small size family whereas, 43.33 and 3.33 per cent of them belonged to medium and large size family respectively. In case of agricultural labourers, 56.67 per cent belonged to small size family and remaining 43.33 per cent belonging to medium size family.
- Majority of the cardamom growers (90.00 %) undertakes farming as their primary occupation due to high remunerative nature of the cardamom plantations and 6.67 per cent of the growers are doing farming with a small scale business. About 1.67 per cent of the growers are doing other services with farming activities and also doing farming with labour. All

the agricultural labourers (100 %) were doing farming along with labour as their sole occupation.

- Majority (58.33 %) of the cardamom growers had more than twenty years of farming experience, while 41.67 per cent of the growers had ten to twenty years of farming experience. A greater proportion (70.00 %) of the agricultural labourers had more than twenty years of farming experience. About 16.67 per cent and 13.33 per cent had less than ten years and ten to twenty years of farming experience respectively.
- Majority (65.00 %) of the cardamom growers had more than four lakh of annual income. It is due to most of the cardamom growers having farming as major source of income to the household. More than half (56.66 %) of the agricultural labourers had less than one lakh annual income and 30.00 per cent and 13.33 per cent of them had one to two lakh and two to three lakh income respectively.
- With respect to extension agency contact, a greater majority (81.67 %) of the cardamom growers had regularly visiting with agriculture officers. Nearly half (46.67%) of the growers were occasionally visiting the agricultural assistants and about half (51.67 %) of them were occasionally visiting the agricultural scientists. A greater proportion of cardamom growers did not have any contact with Additional Director of Agriculture (90.00 %), SMS of KVK (76.67 %) and ATMA (76.67 %).
- Majority of the cardamom growers (100.00%) were regularly exposed to television programmes, newspaper and mobiles to get the information related to agriculture. It is observed that equal (56.67 % each) number of the respondents were occasionally using magazine and bulletin as the source of information while more than half (53.33 %) of the respondents occasionally using internet for getting information about agriculture. About 98.33 per cent of the farmers never depend on information kiosks for information related to agriculture.
- A large number (66.66 %) of the cardamom growers had medium level of economic motivation, while 21.67 per cent and 11.67 per cent of the



cardamom growers had high and low level of economic motivation respectively.

- Majority (68.33 %) of the cardamom growers had medium level of risk orientation followed by low (21.67 %) and high (10.00 %) level of risk orientation.
- Majority (73.33 %) of the cardamom growers had medium level of scientific orientation, whereas 20.00 per cent and 6.67 per cent of the cardamom growers had high and low level of scientific orientation respectively.
- Most (70.00 %) of the cardamom growers had medium level of innovation proneness, while 16.67 per cent and 13.33 per cent of the cardamom growers had low and high level of innovation proneness.
- Majority (70.00 %) of the cardamom growers had medium level of decision making ability followed by high (16.67 %) and low (13.33 %) level decision making ability.
- Majority (81.66 %) of the cardamom growers had medium level credit orientation, whereas 11.67 per cent and 6.67 per cent of the cardamom growers had high and low level of credit orientation.
- Majority (83.33 %) of the cardamom growers had medium level of market orientation followed by low (13.33 %) and high (3.33 %) level of market orientation.
- Adoption of good agricultural practices was positively correlated with educational status at 1 per cent level. Credit orientation was found to have positive and significantly correlated with adoption of good agricultural practices and age and farming experience were negatively correlated and significant at 1 per cent level.
- Documentation of good agricultural practices adopted by the farmers in planting, cultural operations, manuring, harvesting and plant protection measures.

- Majority (78.33 %) of the cardamom growers had medium level of environmental orientation whereas 21.67 per cent of the cardamom growers had high level of environmental orientation.
- Correlation analysis of adoption of good agricultural practices with independent variable shows that extension agency contact, mass media utilization, scientific orientation, innovation proneness and decision making ability were significantly and positively related to environmental orientation.
- Majority (73.33 %) of the cardamom growers had medium level of climate change awareness, while 18.33 per cent and 8.33 per cent had high and low level of climate change awareness.
- Indian Cardamom Research Institute and Cardamom Research Station were mainly working for the research and development programmes of cardamom.
- More than half (61.67 %) of the cardamom growers had medium level of health concern, while 21.67 and 16.66 per cent had high and low level health concern respectively. In case of agricultural labourers, majority (63.33 %) of them had medium level health concern followed by high (20.00 %) and low (16.67 %) level health concern.
- Non-availability and high cost of labour acquired the first rank and it is considered as the most severe constraint faced by the growers. Other constraints were, fluctuating price and marketing problem, not getting the cardamom registration card a great concern of growers, cardamom grading facilities, lack of support price based on the cardamom production.

## 5.2 GENERAL SUGGESTIONS FOR IMPROVING THE CARDAMOM CULTIVATION

- Establishment of cooperative societies for the procurement of cardamom will increase the direct selling of the produce through auction centers.

- Minimum support price based on the production of cardamom as like of other food crops, then the cultivation of cardamom will increase and the farmer get the premium price.
- Crop demonstration about improved variety and improved technologies, which will increase the adoption of new technologies and reduce the cost of cultivation of cardamom.
- Subsidies on inputs like bio- fertilizers and pest control agent and to promote microbial products that are much cheaper and more sustainable and give best products and protect environment and the health of labourers and the local public.
- Establishment of cardamom dryers and grading machines.
- Introduction of the oil extraction facilities or factories.
- Eco-tourism/ Farm tourism.

Plate 4. Interaction with farmers



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**SCENARIO ANALYSIS OF CARDAMOM GROWERS IN CARDAMOM  
HILL RESERVES OF KERALA**

*by*

**ANJU S.**

**(2016-11-081)**

**Abstract of the thesis**

**Submitted in partial fulfillment of the  
Requirements for the degree of**

**MASTER OF SCIENCE IN AGRICULTURE**

**Faculty of Agriculture**

**Kerala Agricultural University**



**DEPARTMENT OF AGRICULTURAL EXTENSION**

**COLLEGE OF AGRICULTURE**

**VELLAYANI, THIRUVANANTHAPURAM- 695522**

**KERALA, INDIA**

**2018**

### ABSTRACT

The present study entitled “Scenario analysis of cardamom growers in cardamom hill reserves of Kerala” was conducted on March 2018 to April 2018 in three blocks of Idukki district with the objectives: to study the current scenario of cardamom production system and analysis of the socio-economic situation among growers and good agricultural practices (GAP) and to enumerate the present challenges with respect to ecological, climatic changes as well as to explore the health externalities of cardamom growers and labourers.

The study was carried out in three blocks of Idduki district namely Kattappana, Nedumkandam and Adimali, which comes under Cardamom Hills Reserve (CHR) zone. Twenty growers and ten agricultural labourers were randomly selected from each of these blocks making a sample of ninety respondents. Data was collected using a of pre- tested and well- structured interview schedule. The data’s were analysed using different statistical tools.

On the analysis of data, it was found that the area under cardamom cultivation has significantly reduced in the past years. Cardamom was cultivated in an area of 40,867 ha in 1997 and it declined to 39,080 ha by the year 2017. The productivity of cardamom had increased tremendously from 130 Kg/ha to 400 Kg/ha over a decade. The major findings of the study was that majority of the farmer respondents were middle aged with sufficient farming experience, with agriculture as their primary occupation and none of them were illiterate.

Majority (65.00 %) of the respondent farmers had an annual income of more than four lakh and 56 per cent of agricultural labourers had an annual income less than one lakh. Majority (66.66%) of the growers were in medium category of economic motivation, risk orientation, scientific orientation. Nearly three fourth of the growers had medium level of innovative proneness and decision making ability. As high as (81.66 %) of the growers had medium level of credit orientation and market orientation (83.33%).

Less than half (48.00 %) and 11.67 per cent of the growers had low and high level of adoption respectively. The data subjected to correlation analysis between good agricultural practices and fifteen independent variables revealed that two variables viz., age and farming experience had negative and significant correlation and education status and credit orientation had positive and significant correlation.

The major constraints faced by cardamom growers are: not getting the cardamom registration card was a great concern among the growers, non-availability and high cost of labour, price fluctuation and marketing problem, lack of cardamom grading facilities, lack of support price based on the cardamom production, uneven rainfall pattern and changing climate, lack of irrigation facilities, man-animal conflicts, high production cost, inadequate extension services at village level.

The suggestion to improve the cardamom cultivation were, establishment of cooperative societies for the procurement of cardamom will increase the direct selling of the produce through auction centers, minimum support price based on the production of cardamom as like of other food crops, then the cultivation of cardamom will increase and the farmer get the premium price, crop demonstration about improved variety and improved technologies, which will increase the adoption of new technologies and reduce the cost of cultivation of cardamom, subsidies on inputs like bio-fertilizers and pest control agent and to promote microbial products that are much cheaper and more sustainable and give best products and protect environment and the health of labourers and the local public, establishment of cardamom dryers and grading machines, introduction of the oil extraction facilities or factories, eco-tourism/ Farm tourism.



# *Appendices*

**APPENDIX- I**

**KERALA AGRICULTURAL UNIVERSITY**  
**COLLEGE OF AGRICULTURE**  
Department of Agricultural Extension  
Vellayani - 695 522  
Thiruvananthapuram

☎(O) 0471- 2383467

Dr. N. Kishore Kumar (FISEE)

(M) 9447471052

Professor & Head (TSS)

Department of Agricultural Extension

email: kishngl@yahoo.co.in

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Date: 19-12-2017

Sir/Madam,

Ms. Anju S (Ad. No. 2016-11-081), the post graduate scholar in the Department of Agricultural Extension, College of Agriculture, Vellayani is undertaking a research study entitled “Scenario analysis of cardamom growers in cardamom hill reserves of Kerala” as part of her research work. Variables supposed to have close association with the study have been identified after extensive review of literature.

Considering your vast experience and knowledge on the subject, I request you to kindly spare some of your valuable time for examining the variables critically as a judge to rate the relevancy of them. Kindly return the list duly filled at the earliest in the self-addressed stamped envelope enclosed with this letter.

Thanking you

Yours faithfully

Dr. N. Kishore Kumar

## OBJECTIVES OF THE STUDY

The objective of the study is to study the current scenario of cardamom production system and analysis of the socio-economic situation among growers and good agricultural practices (GAP) and to enumerate the present challenges with respect to ecological, climatic changes as well as explore the health externalities of cardamom growers and labourers.

### Table showing variables taken for the study

*Variables are given in bold cases and their respective meaning is explained for easy understanding of intended meaning. You may please rate the statement with a tick mark in the appropriate column against the statement with special reference to its importance to meet the objectives of the study*

Sl. no	Variable	Operational definition	Relevancy rating (R - relevant)				
			Most R	More R	R	Less R	Least R
1.	<b>Innovation proneness</b>	Refers to the behaviour pattern of respondent who have interest and desire to bring in sustainability in house terrace cultivation by introducing new techniques in crop selection and management.					
2.	<b>Scientific orientation</b>	Refers to the degree to which respondent is oriented to the use of scientific techniques for decision making in crop selection and its management.					
3.	<b>Market orientation</b>	Degree to which the respondent is oriented towards market i.e., practices for marketing purposes like planning, production etc.					
4.	<b>Risk orientation</b>	Refers to the degree to which respondent was oriented towards encountering risks and uncertainty in adopting new ideas in vegetable cultivation					
5.	<b>Economic motivation</b>	Refers to the extent to which respondent is oriented towards profit maximization and relative value he/she places on monetary gain.					

6.	<b>Irrigation potential</b>	Extent to which the respondent is able to irrigate his/her crop frequently					
7	<b>Extension participation</b>	Refers to participation of farmers in activities or programmes like meetings, seminars etc. organized by different agencies. Operationally defined as the extent of involvement of farmer in different extension activities.					
8	<b>Contact with extension agency</b>	The degree to which an individual have contact with research and extension agency for the purpose of obtaining information and advices.					
9	<b>Environmental orientation</b>	Environmental orientation is defined as a worldview. Worldview is made of a person's, beliefs, attitudes and perceptions, which are often garnered from their culture.					
10.	<b>Environmental soundness</b>	Extent to which respondent were interested in environmental sanitation and ecological protection.					
11.	<b>Environmental attitude</b>	How one feels about the natural world or issues pertaining to the natural world.					
12.	<b>Environmental issue awareness</b>	Refers to a person who has immediate experience with severe air pollution, deforestation, and landfill sites.					
13.	<b>Social participation</b>	Extent of participation of respondent in various formal social institutions either as a member or as an office bearer.					
14.	<b>Health orientation</b>	Defined as an individual's motivation to engage in healthy attitudes, beliefs, and behaviours					

15.	<b>Decision making ability</b>	The ability of the respondents to select the most efficient means from the available alternatives without depending on others.					
16.	<b>Cosmopolite -ness</b>	Refers to the degree to which respondent was oriented to his/her surrounding social system.					
17.	<b>Mass media utilization</b>	Operationally defined as the exposure of an individual respondent to mass media channels such as newspaper, farm magazine, radio, television and his degree of utilization with them.					
18.	<b>Farming group membership</b>	Refers to the involvement of the respondent in any farmer group either as a member or as an office bearer					
19.	<b>Other organization membership</b>	Refers to the involvement of the respondent in any organization other than the farmer group.					
20.	<b>Health care seeking behaviour</b>	It is operationally defined as sequence of remedial actions that individual under takes to rectify perceived ill- health					
21.	<b>Share of agriculture to household income</b>	Refers to the contribution of agriculture and allied sector of the respondent towards his/her family income.					
22.	<b>Water source</b>	Refers to the source of water to which the respondent is depending for meeting the farm and home requirements.					

23.	<b>Adoption of good agricultural practices.</b>	Adoption is a decision to continue maximum use of innovation. Adoption level refers to the level of adoption of good agricultural practices for the cardamom cultivation by the respondents.					
24.	<b>Awareness regarding pesticide usage</b>	Defined as the extent of information possessed by the respondent on pesticide usage.					
25.	<b>Credit orientation</b>	Refers to avail and utilize credit by the respondent for cultivation practices.					
26.	<b>Awareness of farmers on climate change</b>	Defined as the extent of information possessed by the respondent on climate change.					
27.	<b>Farmers perception about climatic change</b>	Farmers' responses about their perception based on the events of variations in temperature, rainfall/precipitation, drought, wind and crop yield.					
28.	<b>Age</b>	Refers to the number of calendar years completed by the respondent at the time of enquiry.					
29.	<b>Educational status</b>	Refers to the highest academic qualification possessed by the respondent through formal and informal education.					
30.	<b>Occupation</b>	Defined as the professional status of respondents.					
31.	<b>Family size</b>	Refers to the number of family members in each respondent's household.					
32.	<b>Family type</b>	Refers to the type of the family to which the respondent belongs to.					
33.	<b>Annual income</b>	Refers to the earnings of respondent per annum.					

34.	<b>Family labour</b>	Refers to the number of hours of family labour spent by each respondent in various cultivation aspects on cardamom.					
35.	<b>Total land holding</b>	The extent of land an individual possessed and cultivated is termed as land holding.					
36.	<b>Farming experience</b>	Operationally defined as the involvement of cardamom growers in farming.					
37.	<b>Experience in farming</b>	Refers to the total number of chronological years the respondent has been engaged in farming					
38.	<b>If any other, specify</b>						

## APPENDIX - II

### SCENARIO ANALYSIS OF CARDAMOM GROWERS IN CARDAMOM HILL RESERVES OF KERALA

Date:

Code:

#### Interview Schedule

1. Name of Block:
2. Name of Panchayat:
3. Name and address of respondent:
4. Age:
5. Educational status:  
Illiterate/ can read only/ can read and write/ primary/ middle/ high school/ graduate and above
6. Marital status: Single/ married/ divorce/ widow
7. Size of family: less than 3/ 3 to 4/ 4 to 5/ above 5
8. Occupation of respondent:

Sl. no	Category	Tick
1.	Farming as a sole profession	
2.	Farming+ Agri. labour	
3.	Farming+ business	
4.	Farming+ service	

9. Farming experience:
10. Total area of cultivation:  
Area owned:



Area leased:

11. Cost of cultivation of cardamom:

12. Yield per acre:

13. Total income obtained through Cardamom cultivation:

14. Adoption of Good Agricultural Practices

Sl. no	Technology	Extent of Adoption			
		No adoption	Partial adoption	Full adoption	Modified adoption
1.	Selection of planting materials				
a)	Improved variety				
b)	Local selection				
c)	Farmers selection				
2.	Propagation methods				
a)	Seedlings				
b)	Sucker				
3.	If rhizome multiplication- nursery preparation				
a)	Land preparation				
b)	Selection of young shoot				
c)	Fertilizer application 1. N:P <sub>2</sub> O <sub>5</sub> : K <sub>2</sub> O- 100:50: 200 kg ha <sup>-1</sup>				
4.	Planting in main field				
a)	Land preparation				
b)	Spacing				

	1. Mysore and Vazhukka type : 2m x 2m to 3m x 2m 2. Malabar: 1.5m x 1.5m to 2m x 2m				
c)	Pit size (60 cm x 60cm x 35cm)				
d)	Pit preparation (top soil +FYM/ compost/ leaf mould+ 100 g rock phosphate)				
e)	Planting time				
5.	Weed management				
a)	No weeding				
b)	Time of weeding				
c)	Type of weeding (sickle weeding)				
6.	Trashing				
a)	Method				
b)	Time (June- July)				
8.	Irrigation management				
a)	Irrigation time				
b)	Mulching (December)				
9.	Soil and water conservation technology				

a)	Type 1. Water harvesting 2. Bunding				
10.	Manuring				
a)	Time (June- July)				
b)	1. FYM i. Cow dung/compost @ 5 kg/ plant ii. Neem cake @ 1- 2 kg/ plant 2. Nutrient application: N:P <sub>2</sub> O <sub>5</sub> : K <sub>2</sub> O- 75: 75: 150 kg ha <sup>-1</sup>				
c)	Type Organic/ inorganic/ both				
11.	Shade regulation				
a)	Shade trees				
b)	Practices (Bee- keeping)				
12.	Plant protection-pest				
a)	Pest.....				
b)	Control measures				
c)	Method of application				
d)	Time				
13.	Plant protection-pathogen				

a)	Diseases.....				
b)	Control measures				
c)	Method of application				
d)	Time				
14.	Harvesting and processing				
a)	Time of harvesting				
b)	Post harvest operations				
	1. Sun drying 2. Bleaching				

15. Contact with extension agency

Sl. no	Extension agency	Frequency of contact		
		Regularly	Occasionally	Never
1.	Ag. Officers			
2.	Ag. Assistants			
3.	ADA/DDA			
4.	Agri. Scientist			
5.	KVK			
6.	ATMA			
7.	Any other			

16. Mass media utilization

Sl. no	Items	Regularly	Occasionally	Never
1.	Television			
2.	Radio			
3.	Newspaper			
4.	Internet			
5.	Magazine			
6.	Bulletin			
7.	Information Kiosk			
8.	Mobiles			
9.	Others			

17. Economic motivation

(Please give your opinion about following statements)

Sl. no	Statements	SA	A	UD	DA	SDA
1.	A farmer should work towards larger yields and economic profit					
2.	The most successful farmer is the one who makes the most profit					
3.	A farmer should try any new farming idea which may help him to earn more money					
4.	A farmer should grow cash crops to increase monetary profits rather than growing food crops for home consumption					

5.	It will be difficult for a farmer and his family to survive without getting enough profit					
6.	A farmer must earn his living but the most important thing in life cannot be defined in economic terms					

### 18. Risk orientation

(Please give your opinion about following statements)

Sl. no	Statements	SA	A	UD	DA	SDA
1.	A farmer should take more chances in making a big profit than the content with a smaller but less risky profit					
2.	A farmer who is willing to take greater risk than the average farmer usually does better financially					
3.	It is good for a farmer to take risk when he knows his chances of success is fairly high					
4.	It is better for a farmer not to try a new farming method unless most others in the locality have used it with success					

## 19. Scientific orientation

Sl. no	Statements	SA	A	UD	DA	SDA
1.	New method of farming gives better results to a farmer than old method					
2.	The way of farming by our fore father is still the best way to farm today					
3.	Even a farmer with lots of experience should use new methods in farming					
4.	A good farmer experiments with new ideas in farming					
5.	Though it takes time for a farmer to learn new methods in farming it is worth the efforts					
6.	The traditional methods of farming have to be changed in order to raise the standard of living of a farmer					

## 20. Innovation proneness

Sl. no	Statements	SA	A	UD	DA	SDA
1.	You would feel restless unless, you try out an innovative method which you have come across.					
2.	You are cautious about trying new practices.					
3.	You like to keep up upto date information about the subjects of your					

	interest.					
4.	You would prefer wait for others to try out new practices first.					
5.	You opt for the traditional way of doing things than go in for newer methods.					

21. Decision making ability

Sl. no	Statements	SA	A	DA	SDA
1.	I analyse the problems by considering the pros and cons and take decisions				
2.	I will not take a decision without consulting others				
3.	In general I prolong my decisions				
4.	Once I take a decision, I will stick on to it				
5.	I need lot of time to take a decision				
6.	I can take firm decision and initiate action when there are more alternative				

22. Credit orientation

- I. Do you think a farmer like you should borrow for agricultural purpose?  
Yes / no
- II. In your opinion, how difficult is to secure credit for agricultural purpose?  
Very difficult / difficult/ easy/ very easy
- III. How a farmer is treated when he goes to secure credit?  
Very badly/ badly/ fairly/ very fairly
- IV. There is nothing wrong in taking credit from institutional sources for increasing farm production?  
Strongly disagree/ disagree/ Undecided / Agree/ Strongly Agree



V. Did you use the credit in the last two years for crop production?

Yes/ No

### 23. Market orientation

Sl. no	Statements	A	DA
1.	Market is not useful to farmers		
2.	A farmer can get good price by eliminating the middle man		
3.	One should sell his produce to the nearest market irrespective of price		
4.	One should purchase his inputs from shops where his friends or relatives are purchasing		
5.	One should grow those crops which have more market demand		
6.	Co- operatives can help a farmer to get better price for his produce		

### 24. Documentation of health externalities of cardamom growers and agricultural labourers.

I. Usually visit hospitals/ health care centers even for minor illness?

Yes/ no

II. Usually visit hospitals/ health care centers when illness becomes serious/ chronic?

Yes/no

III. Do you think pesticides can have a negative effect on your health? If any negative effect is there, describe the situation?

Yes/ no

IV. Can you read and understand instructions on the pesticide containers?

Yes/ no

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- V. If you cannot read, do you seek help from others?  
Yes/no
- VI. Do you follow the instructions given on the label?  
Yes/ no
- VII. Are you aware of pesticide toxicity levels?  
Yes/ no
- VIII. Which sign marks the most dangerous pesticide?  
I don't know/ Green colour/ Blue colour/ Red colour/ Yellow colour
- IX. What do you wear doing pesticide spraying?  
Ordinary clothing/gloves/ boots/ mask/ hat/ long sleeved shirt
- X. Do you eat, drink or smoke while spraying pesticides?  
Yes/ no
- XI. Do you take precautions immediately after handling pesticides?  
Yes/ no
- XII. Do you take bath right after spraying?  
Yes/ no
- XIII. Do you change clothes right after spraying?  
Yes/ no
- XIV. Do you keep the pesticide bottle along with food items?  
Yes/ no
- XV. Do you store food items in pesticide bottle after use?  
Yes/no
- XVI. Do you wash the sprayer/bottle in the pond/canal/river/others?  
Yes/no
- XVII. Do you determine the wind direction first and then spray?  
Yes/no
- XVIII. Do you spray when it is windy?

Yes/no

XIX. How long does it take you to spray the field?

< 1 hour/ 1-3 hour/ > 3 hours

XX. Have you attended any training / workshop / discussions on pesticide use and care?

Yes/no

## 25. Environmental orientation

Sl.no	Statements	SA	A	UD	DA	SD
1.	Environment pollution leads to health hazards					
2.	Pesticides should not be sprayed on cardamom					
3.	Food additives are not hazardous to the health					
4.	Cutting of forests is necessary to increase the agriculture yield					
5.	The use of fertilizers is essential to increase agricultural yield					
6.	Toxic waste dumps located away from residential areas do not pose any safety risk					
7.	Green house gas emission is harmful for environment					
8.	Ozone layer depletion should be avoided					
9.	Conservation of resources is necessary for the sake of future generations					
10.	Recommended dose of agro chemicals in prescribed quantity can be used					
11.	One should use energy resources such as solar which cause least pollution					
12.	The government should ban the use of plastic containers and carry bags					
13.	The large sum of money spent on environment pollution control can be used for other purpose					

14.	Reduce, reuse and recycle should form the basic principle of waste management					
15.	Waste should be segregated and disposed					
16.	Encourage integrated system of conservation					
17.	There is truth in what environmental activist claim and we should lend our support to them					
18.	The present trend is to reduce the use of chemical control measures. Now do you think old methods were more safer than the present					
19.	Any unfair activity if noticed should be reported to the concerned authority					
20.	Intensive agricultural practices causes environmental hazards					
21.	Genetically modified crops should not be promoted					
22.	Proper care should be given to the common property resources					
23.	Organic farming should be used to reduce the toxic consumption					
24.	Quarantine laws and regulations should be strictly followed					

26. Awareness about change in climate

Sl. no	Climate change indicators	Awareness		
		Aware	Partially aware	Not aware
I.	Climate related			
1	Increase in average temperature			
2	Decrease in average rainfall			
3	Long dry spells			
4	Fluctuations in onset of monsoons			
5	Uneven distribution of rainfall			

6	Increased frequency of heat waves			
7	Increase in maximum and minimum temperatures			
8	Prolonged cold weather			
II.	Soil and water related			
9	Reduced soil fertility			
10	Depletion of ground water			
11	Reduced quality of water			
12	Disturbed soil texture			
13	Increased soil and water erosion			
14	Reduced water holding capacity			
III.	Crop related			
15	Reduction in crop duration			
16	Increased incidence of pests and diseases			
17	Susceptibility of the crop for drought			
18	Decreased fertilizer use efficiency			
19	Increased crop weed competition			
20	Increased water stress			
21	Reduced quality of produce			
22	Reduction in average productivity			

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