AUGMENTING THE LIVELIHOOD OF COCONUT FARMERS THROUGH RESILIENT EXTENSION APPROACH

by

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THESIS

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DECLARATION

I, hereby declare that this thesis entitled "**AUGMENTING THE LIVELIHOOD OF COCONUT FARMERS THROUGH RESILIENT EXTENSION APPROACH.**" is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis of the award to me any of degree, diploma, associateship, fellowship or other similar title, of any other university of society.

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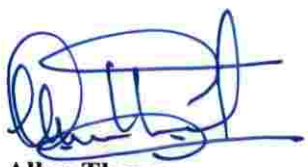

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Greeshma Susan Mathew

Dedicated to

Dr. N. Kishore Kumar

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LIST OF ABBREVIATIONS

Abbreviations	Full form
%	Percentage
<	Less than
>	Greater than
F	Frequency
M	Mean
Q	Quartile
Rs	Rupees
AEU	Agro Ecological Unit
ANOVA	Analysis of Variance
CDB	Coconut Development Board
CIMMYT	International Maize and Wheat Improvement Center
CPCRI	Central Plantation Crops Research Institute
FFS	Farmer Field Schools
FPO	Farmer Producer Organizations
GOK	Government of Kerala
ICT	Information and Communication Technology
INM	Integrated Nutrient Management
IPM	Integrated Pest Management
KAU	Kerala Agricultural University
NABARD	National Bank for Agriculture and Rural Development
SD	Standard Deviation
SHG	Self Help Groups

Introduction

1. INTRODUCTION

Coconut is considered as 'Kalpavriksha'- an all giving tree in the Indian classics. It is the most popular crop to the people of Kerala and crop plays an important role in the socio-economic development of the state. Among the leading coconut producing states in India, Kerala ranks first both in area and production. During 2012-13 coconut was cultivated in the state in an area of 808647 ha with a production of 5921 MT and productivity of 7322 kg/ha (GOK, 2016). Kerala's share in area and production of coconut in the country has declined over time. While Kerala accounted for 69.58 per cent of the area and 69.52 per cent of the production in the country in 1960-61, the corresponding shares declined to 40.2 per cent and 42.12 per cent respectively in 2011-12 (GOK, 2016).

The small size of holdings is the characteristic feature of land holdings in Kerala. Most of the holdings are less than 0.1 ha and only few farmers possess holdings of size above 0.40 ha. Since the size of holdings is small and most of these are homestead gardens it could not generate adequate income to support the dependent families. Shortage of farm workers and high labour charges also force the farmers to ignore the timely adoption of agronomic practices and regular harvesting. This results in the neglect of adoption of management practices especially in small holdings leading to low productivity and high cost of production (Jnanadevan, 2013).

Also, shift in cultivation to other remunerative crops like rubber, high cost of cultivation and low returns from coconut, prevalence of pests and diseases like root wilt, bud rot and alike could be the reasons for the negative growth rate in area and production yield. To overcome these constraints and boost up the production and productivity of the crop, a number of development activities have been introduced and implemented in the State by the State Department of Agriculture and Coconut Development Board (CDB). Technology integration in small and marginal coconut holdings for higher productivity and

income through community based organizations approach led to increase in average yield and income (Thamban *et al.,* 2016).

Considering the above facts, study was undertaken on the topic 'Augmenting the Livelihood of Coconut Farmers through Resilient Extension Approach' with predetermined objectives.

1.1 Objectives of the study

To study the extent of knowledge and adoption of technologies among the coconut farmers, to study the impact of the different extension approaches being used by different extension agencies in coconut farming and identify the resilient one, to identify the constraints faced by the coconut farmers and to suggest methods to augment the livelihood of coconut farmers.

1.2 Main observations made

1. Profile characteristics of coconut farmers.
2. Delineation of technologies in coconut cultivation to augment the livelihood of coconut farmers.
3. Extent of knowledge and adoption of technologies by the coconut farmers.
4. Inventorisation of different extension approaches in coconut farming.
5. Impact of the different extension approaches in coconut farming and find the resilient extension approach.
6. Constraints and issues faced by the coconut farmers.
7. Suggest strategies to augment the livelihood of coconut farmers.

1.3 Limitations of the study

Even though utmost care has been taken to ensure that the study was conducted in the perfect manner possible, inherent limitations of time and resources might have affected the study. The data was collected from coconut farmers. This will give only their perception, and such opinions might have an effect on the research outcome.

1.4 Presentation of the study

The study report has been presented with the help of five chapters. Introduction comes in the first chapter, which deals with the brief of the topic, statement of problem, objectives of study, its importance and the limitations faced by the researcher. The major literature available with respect to the topic, objectives and variables selected are covered in the second chapter, titled review of literature.

Third chapter presents the methodology concerned with process of investigation, method of data collection, sample size, sampling design, variables to be measured and statistical methods used. The results of the study with suitable discussions and inferences are presented in the fourth chapter which is named results and discussions. The work is summarised in the fifth chapter named summary. References and appendices are given at the end of the report.

Review of Literature

2. REVIEW OF LITERATURE

When a person undertakes a research study it is essential to go through existing literature in order to have a strong foundation for scientific investigation. The knowledge on what others have found in the related area and how they have done the same shall motivate one to contribute something new to existing knowledge. The process of searching through the selected literature improves the confidence of the researcher and consequently the investigation would get a clear picture of the area or problem (Agarwal, 1966).

The review of literature connected with the present study is arranged under the following headings.

2.1 Independent and dependent variables of the study

2.2 Impact of extension approaches

2.3 Constraints and suggestions as perceived by the farmers

2.1 INDEPENDENT AND DEPENDENT VARIABLES OF THE STUDY

2.1.1 Age

An individual's age is the number of calendar years that has been completed by the individual till the point of observation.

After assessment of techno-socio-economic practices of farming in the cultivation of bitter gourd, Manjusha (1999) found that, there was a non-significant relationship between age and adoption of recommended practices by the farmers in bitter gourd cultivation.

According to Thomas (2000), the relationship between age and knowledge was positive and significant as reported in his study problems and prospects of medicinal plant cultivation in Thiruvananthapuram district.

Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers reported that age had positive and non-significant relation with knowledge level of the farmers and extent of adoption of recommended package of practices of coconut.

Jayawardhana (2007) in his study on organic agricultural practices in coconut based homesteads reported that majority of the coconut farmers (84%) belonged to old age category.

After analysing the managerial efficiency of coconut plantation growers, Nayabhai (2011) reported that more than three fourth (77.33%) of the respondents were in middle and old age group.

Most of the precision farmers (80%) belonged to old age category and most of the conventional farmers (63.33%) belonged to middle age category as reported by Hanjabam (2013) in his study related to precision farmers in Kerala.

Arul *et al.* (2014) stated that majority of the women of self-help groups (SHGs) which focused on agricultural and activities belonged to the middle age group.

2.1.2 Means of livelihood

Farmer's vocation at the time of interview is considered as the means of livelihood of that farmer.

A study on extent of adoption of integrated pest management revealed that means of livelihood and extent of adoption of integrated pest management practices had a non-significant relationship (Rathinasabhapathi, 1978).

Karpagam (2000), after his research on adoption behaviour of turmeric growers in Tamil Nadu, found that 71.66 per cent of the respondents had agriculture as their occupation.

Shinde *et al.* (2000), after his study on adoption of indigenous agricultural practices, stated that over 90 per cent of the respondents had farming as main vocation.

Raju (2002), after analysing the selected factors responsible for sustainability of major crops under watershed environment found that under watershed environment, 57.5% of the respondents had farming as their main occupation.

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that means of livelihood had positive and significant relation with knowledge level of the farmers and extent of adoption of recommended package of practices of coconut.

Jayawardana and Sherief (2010), after their study on adoption of organic farming practices in coconut based homesteads in humid tropics, reported that age had negative and non-significant correlation with adoption of organic farming practices among the coconut based homestead farmers.

After the study on attitudes and perceptions of organic and non-organic coconut growers towards organic coconut farming, Herath and Wijekoon (2013) reported that in terms of time spent on farming, the majority of growers were part-time farmers among the both organic and non-organic growers.

In a study related to home gardens, it was concluded that 60 per cent of home garden farmers were dependent on agriculture as major source of income (Rahul, 2013).

2.1.3 Educational Status

A person's educational status is defined as the academic qualification obtained by the individual through formal and informal means through by he/she can understand and interpret information.

Manju (1997) stated that there was a high positive and significant relationship between educational status and knowledge, in her work on indigenous practices in coconut farming.

Sherief (1998), after his study on homestead farming in Kerala, reported that educational status and knowledge of homestead farmers were related significantly.

After analysing organic farming practices in vegetable cultivation in Thiruvannanthpuram district, Jaganathan (2004) found that education status is positively related with knowledge and adoption of organic farming practices.

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that educational status had positive and significant relation with knowledge level of the farmers and extent of adoption of recommended package of practices of coconut.

According to Sasankan (2004) in his study about cassava farmers nearly half of the farmers (49%), had an education up to secondary level and there were less than 2 per cent of illiterate farmers which were negligible.

Ahmad *et al.* (2007) pointed that the rate of adoption of various agricultural practices were positively correlated to education of the farmers. It was one of the most important factors contributing to the acceptance, rejection of adoption and transfer of information to others.

Jayawardana and Sherief (2010), after their study on adoption of organic farming practices in coconut based homesteads in humid tropics, reported that the educational status had significant correlation with adoption of organic farming practices among the coconut based homestead farmers.

Nayabhai (2011) after his study on managerial efficiency of coconut plantation growers, pointed out that 34 per cent of them were educated up to primary and middle level education.

Rahul (2013) after his study on specialized home gardens, reported that 80 per cent of the home garden farmers have qualification ranging from high school to college level.

2.1.4 Area under coconut cultivation

Area is operationally defined as the actual land possessed by the farmer under coconut.

A study on knowledge and adoption of plant protection measures in coconut cultivation by farmers revealed that 48.75 per cent of the coconut growers were small farmers with less area under coconut (Thippeswamy, 2007).

After the study on attitudes and perceptions of organic and non-organic coconut growers towards organic coconut farming, Herath and Wijekoon (2013) reported that the average farm size of organic growers was 31.29 acres which was greater than for non-organic growers.

A study on technology assessment of the production practices in economically dominant crops in homegardens pointed out that almost half of the respondents had less than 1 acre of effective homegarden (Jacob, 2015).

2.1.5 Experience

Experience refers to the number of years the respondent has been engaged in coconut farming.

In a study on adoption of organic farming practices in coconut based homesteads in humid tropics, it was concluded that the experience in coconut farming had negative and non-significant correlation with adoption of organic farming practices among the coconut based homestead farmers (Jayawardana and Sherief, 2010).

Jacob (2015) in his study on technology assessment of the production practices in economically dominant crops in homegardens reported that 54 per cent of the respondents had more than 20 years of experience in farming.

2.1.6 Annual income

Annual income is calculated as the earning of the respondent for a period of one year.

Rajendran (1992), after his research on utilization of agricultural technologies by scheduled caste farmers, reported that income from crops was the major source of income of the farm household and also it constitute about 82 per cent of the gross income of family.

A study on knowledge and adoption of plant protection measures in coconut cultivation by farmers revealed that 68.75 per cent of the coconut growers were having medium annual income (Thippeswamy, 2007).

Nayabhai (2011) after his study on managerial efficiency of coconut plantation growers, reported that majority of them had their earnings of more than fifty thousand rupees per year (89.33 per cent).

Wealthier farmers may be the first to try a new technology and farmers who do not adopt may complain of cash and credit as the limiting factor for adoption (CIMMYT, 2009).

In his study on innovations in technical backstopping for the Thiruvananthapuram district, Esakkimuthu (2012), reported that 76.6 percent of his respondents had annual income in the range of Rs.50,001-1,00,000 and over 21 per cent of the respondents had it up to Rs.50,000 and only one belonged to high category, with income above Rs.1,00,000.

2.1.7 Innovation Proneness

Innovation proneness refers to the keenness of the respondent in accepting new ideas and seeking changes in farming techniques and to introduce such changes into their farming operations when practical and feasible.

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that variables like

innovativeness had positive and significant relation with extent of adoption of the farmers about recommended package of practices of coconut.

A study on knowledge and adoption of plant protection measures in coconut cultivation by farmers revealed that majority of the coconut growers were having medium level of innovation proneness (Thippeswamy, 2007).

Nayabhai (2011) after his study on managerial efficiency of coconut plantation growers pointed out that majority (37.33%) of coconut plantation growers reported that they had adopted the innovation immediately after they had seen it.

2.1.8 Information seeking behaviour

Ghadim and Pannell (1999) in a study related to adoption of an agricultural innovation, reported that farmers who can access more technical information through their extension agency contact have more accurate knowledge of the techniques.

Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that information seeking behaviour had positive and significant relation with knowledge level of the farmers about recommended package of practices of coconut and also had positive but non-significant relationship with extent of adoption of recommended package of practices of coconut.

Thippeswamy (2007) after his study on knowledge and adoption of plant protection measures in coconut cultivation by farmers revealed that majority of the coconut growers were having medium level of information seeking behaviour .

Jayawardana and Sherief (2010), after their study on adoption of organic farming practices in coconut based homesteads in humid tropics, reported that information seeking behaviour had significant correlation with adoption of organic farming practices among the coconut based homestead farmers.

A study on technology assessment of the production practices in economically dominant crops in homegardens pointed out television was perceived to be most useful mass media followed by newspaper and magazines (Jacob, 2015).

2.1.9 Decision making ability

Decision making ability is operationally defined as the ability of the farmer to take decision on crop production from the available alternatives.

According to Stoner *et al.* (1996) in his book titled 'Management', decision making is the process of identifying and selecting a course of action to solve a specific problem.

In a study on decision making ability of chilli growers, Mishra *et al.* (2014) reported that age, knowledge level and use of information sources were found to have positive and significant relationship with decision making ability.

2.1.10. Social participation

Social participation is operationally defined as the degree of involvement and participation of member farmers in various formal and informal organisations, either as a member or as an office bearer other than having a membership in the organisation.

Govind (1984) after studying the participation of farm women in farm activities found that extent of involvement in farm activities had negative association with social participation of farm women.

Outside the social system, old farmers are likely to loose interest in active participation as reported by Sindhu (2002), after doing social cost benefit analysis in vegetable programmes in Kerala.

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that social participation had positive and significant relation with knowledge level of the farmers and their extent of adoption of recommended package of practices of coconut.

Sasankan (2004) argued that social participation in credible institutions/ organisations of cassava farmers were in the medium level.

Nayabhai (2011) after his study on managerial efficiency of coconut plantation growers, reported that majority of them had medium social participation (66.67%).

2.1.11 Scientific orientation

Scientific orientation refers to the degree to which a farmer is oriented to the use of scientific methods in decision making.

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that scientific orientation had positive and significant relation with knowledge level of the farmers and extent of adoption of recommended package of practices of coconut.

Naveenkumar and Sendilkumar (2018) in his study on adoption of eco-friendly technologies by FFS in rice farming, reported that scientific orientation have shown significant and positive relationship with adoption of eco-friendly technologies in rice.

2.1.12 Risk orientation

Risk orientation refers to the degree to which the farmer is oriented towards encountering risks and uncertainity in adopting new ideas.

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that risk orientation had positive and significant relation with knowledge level of the farmers about recommended package of practices of coconut and it also expressed positive but non-significant relationship with extent of adoption of recommended package of practices of coconut.

Jayawardana and Sherief (2010), after their study on adoption of organic farming practices in coconut based homesteads in humid tropics, reported that the

risk orientation had significant correlation with adoption of organic farming practices among the coconut based homestead farmers.

Nayabhai (2011) after his study on managerial efficiency of coconut plantation growers, reported that majority of them had medium risk orientation (56.67%).

2.1.13 Extension agency contact

Extension agency contact refers to the degree to which the respondents meet the extension agents for information related to various aspects of cultivation.

In a study conducted to assess the impact of integrated pest management on Khariff paddy growers, by Valand (1997) majority of trained (75%) and untrained (88.75%) respondents had medium level of extension contact.

Ghadim and Pannell (1999) in a study related to adoption of an agricultural innovation, reported that farmers who can access more technical information through their contact with extension workers have more accurate knowledge of the techniques of organic farming.

Ramana *et al.* (2000) after analysing the motivation factors and constraints of hybrid sunflower seed growers, concluded that, 70 per cent of farmers in his study showed medium extension agency contact and 30 per cent high extension contact.

Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers, reported that extension agency contact had positive and significant relation with knowledge level of the farmers and extent of adoption of recommended package of practices of coconut.

Suman (2017) after analysing relationship between profile characteristics and knowledge level of state department of agriculture and farmer practices on nutrient management in vegetables cultivation stated that, as entire extension process is dependent on the extension workers ability since effectiveness of the

extension process is dependent on transfer of information from extension organisation to the clients.

2.1.14 Extension participation

Extension participation refers to the degree to which the respondent participates in various extension activities or programmes like meetings, seminar, and alike.

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that majority of them had medium level of extension participation (71.43%).

Nayabhai (2011) after his study on managerial efficiency of coconut plantation growers, reported that majority of them had medium level of extension participation (54.67%).

2.1.15 Extent of knowledge

Christian (2001) after analysing extent of adoption of IPM strategy by cotton growers, pointed out that independent variables like age, education, land holding, economic motivation and agricultural belief were non-significantly correlated with knowledge.

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that variables like education, farming experience, occupation, social participation, extension agency contact, scientific orientation and risk orientation had positive and significant relation with knowledge level of the farmers about recommended package of practices of coconut.

Thippeswamy (2007) after his study on knowledge and adoption of plant protection measures in coconut cultivation by farmers reported that a positive and significant relationship was observed between knowledge level and education, annual income, social participation and extension participation.

Thorat (2005) reported that age and annual income were positively and non-significantly correlated with knowledge level about poultry management practices.

Jayawardana and Sherief (2010), after their study on adoption of organic farming practices in coconut based homesteads in humid tropics, reported that knowledge level of the farmers had significant correlation with adoption of organic farming practices among the coconut based homestead farmers.

In case of coconut farmers, the variables social participation, extension agency contact, extension participation and mass media exposure were significantly correlated with farmer's knowledge, as reported by Anithakumai *et al.* (2015) in their study on community extension approach in bio-management of rhinoceros beetle. They also pointed out that age, education status, farm experience were not significantly correlated with knowledge of farmers.

The impact analysis of Farmer Field Schools (FFS) in coconut crop revealed that the mean average knowledge index of the FFS farmers (51.31) was 65 per cent more than the non-FFS farmers (31.10) (Anithakumari and Mohan, 2017).

2.1.16 Adoption of technologies

According to Kumar (2004), in his study on adoption of recommended package of practices by the coconut farmers concluded that variables like education, farming experience, farm size, occupation, social participation, extension agency contact, economic motivation, scientific orientation, innovativeness, achievement motivation and training undergone of the subjects had positive and significant relation with extent of adoption of the farmers about recommended package of practices of coconut. However, age, mass media exposure and risk orientation expressed positive but non-significant relationship with the predicted variable.

Thippeswamy (2007) after his study on knowledge and adoption of plant protection measures in coconut cultivation by farmers reported that a positive and significant relationship was observed between adoption behaviour and education, land holding, annual income, mass media participation and extension participation.

A study on technology assessment of the production practices in economically dominant crops in homegardens pointed out that majority of homegarden farmers had medium level of adoption and level of adoption of scientific production technology was influenced by age, experience, knowledge, and mass media exposure (Jacob, 2015).

In a study on impact of e-Velanmai model of extension service in Tamil Nadu, Prabha, *et al.* (2017) pointed out that the beneficiary respondents were significantly higher in their extent of adoption of recommended technologies than that of the non-beneficiary respondents.

Naveenkumar and Sendilkumar (2018) in his study on adoption of eco-friendly technologies by FFS in rice farming, reported that education, innovativeness, scientific orientation, risk orientation, extension participation, institutional support, mass media utilization, trainings attended, group interaction and knowledge have shown significant and positive relationship with adoption of eco-friendly technologies in rice.

2.2 IMPACT OF EXTENSION APPROACHES

Rodriguez, *et al.* (2007) in his study on impacts of an agricultural development program for poor coconut producers, reported that the development program was found to have significant effect in meeting the technological gap among the farmers.

After evaluating the impact of agricultural extension on farms' performance, Dinar *et al.* (2007) reported that extension was found to have a statistically significant effect on closing both the technology and management gaps. Public and private extension services were found to be competitive in the production function and complementary in the technical inefficiency effect function. In addition, farms using both public and private extension services achieved a higher degree of technical efficiency than those using either public or private extension services, and farms with no extension services were found to be the least efficient.

Anithakumai *et al.* (2015) in their study on community extension approach in bio-management of rhinoceros beetle reported that the impact on improvement in knowledge, research/extension linkage, extension contact, extension participation, trainings attended was statistically significant after the extension interventions. The learning experience asserted that technology package supported with appropriate extension mechanisms based on socio-economic situations and technical parameters resulted in wide spread awareness and adoption of technology.

In a study on impact of e-Velanmai model of extension service in Tamil Nadu, Prabha, *et al.* (2017) pointed out that majority of the respondents had expressed medium level of social impact.

2.3 CONSTRAINTS AND SUGGESTIONS AS PERCEIVED BY THE FARMERS

Constraints are defined as the state or quality of sense of being restricted to a given course of action. The production constraints could be classified into biological and socio-economic constraints. The biological constraints include all farm level problems, while socio-economic constraints comprised of knowledge, credit and input availability, economic behaviour, traditions and risk aversion. (Nikhade and Bhople, 1989).

As farmer's decisions are based on their perceptions, their resource allocation and technology choice will deviate from the social optimum if perceptions do not coincide with the correct attributes of the technology (Birkhaeuser *et al.*, 1991).

Truong (2002) pointed out that though farmers perceived technology as a good thing, they still faced problems in adoption and application of technologies. These include lack of capital and lack of support from government and extension agencies.

According to Mendola (2007), farmers try to innovate or adopt existing innovations depending on available resources, when faced with difficulties in implementing their farm activities.

In a study on knowledge and adoption of plant protection measures in coconut cultivation by farmers reported that the problems faced by majority of the respondents were high cost of chemicals (89.75%), lack of technologies of application (83.13%) and complicated name of the chemicals (72.50%) in the adoption plant protection measures in coconut. Also, the major suggestions expressed supply of plant protection inputs at cheaper/subsidized price (90.63%), demonstration of plant protection technology in every village (85.63%), providing training on plant protection technologies (60.00%) and providing detailed information on plant protection measures before commencement of season (37.00%) (Thippeswamy, 2007).

Nayabhai (2011) after his study on managerial efficiency of coconut plantation growers reported that high cost of insecticides and pesticides, unremunerative price for tender nuts and mature nuts, complicated method and delay / insufficient facilities of loan and subsidies, lack of timely availability of fertilizers, lack of emphasis on value addition training, and lack of knowledge about coconut based industry were the important constraints faced by the coconut plantation growers. The most important suggestions offered by majority of the coconut plantation growers were creating awareness about damaged and deteriorated quality of coconut caused by pests and diseases, establishment of market facilities at local level, fixing reasonable price of pesticides and fertilizers, providing subsidy for chemical fertilizer by government and conducting short term training programme on use of herbicide and plant protection measures.

In a study on attitudes and perceptions of organic and non-organic coconut growers towards organic coconut farming, Herath and Wijekoon (2013) pointed out that participatory extension programs and better extension approaches such as

farmer field schools could be recommended to change growers' attitude, knowledge and skills towards organic coconut farming.

Etwire *et al.* (2013) opined agricultural development programmes should target farmer based organizations as well as support them with technical trainings to enhance their technology uptake, in agreement with findings of this study. But it requires continued efforts and components for sustainability and acceptability among coconut farmer's communities.

Anithakumai *et al.* (2015) in their study on community extension approach in bio-management of rhinoceros beetle put forward the need for technology/ crop/ community based appropriate extension approaches for better technology utilization.

Methodology

3. METHODOLOGY

A systematic research becomes systematic only with a sound research methodology. It elaborates and justifies the steps and methods used for completing such a research. This chapter deals with the methods adopted towards completion of the research under suitable subheadings.

3.1 Research Design

3.2 Locale of Study

3.3 Sampling Procedure

3.4 Data Collection Methods and Tools

3.5 Operationalization of variables and their measurements

3.6 Statistical tools used

3.7 Hypothesis for the study

3.1 RESEARCH DESIGN

Plan or proposal to conduct research is known as a research design. Research design can be selected based on philosophical paradigms and strategic of inquiry. Ex post facto research design was adopted for conducting the study. This is a category of research design, where the investigation is done after the phenomenon. It is also called after the fact research. Ex post facto is primarily a quasi-experimental study, which examines how a dependent variable is affected by independent variables, which was present prior to study of the participants. According to Kerlinger (1973), scientists do not have direct control over the variables because they already have been exposed and cannot be manipulated.

3.2 LOCALE OF STUDY

The district of Kozhikode was purposely selected as it had the maximum area under coconut cultivation in the state.

3.3 SAMPLING PROCEDURE

3.3.1 Selection of blocks

Kozhikode district was divided into 12 blocks and of these four blocks were selected for the study because of their large area under coconut cultivation. The four blocks selected were Koduvally, Balussery, Thuneri and Kunnumel after consultation with the Assistant Director Offices.

3.3.2 Selection of panchayats

A list of all the panchayats under the selected four blocks along with area and production details of coconut cultivation was prepared. As such two panchayats with maximum coconut farmers were selected from each block. The panchayats were Thamarassery, Kizhakkoth (from Koduvally block), Koorachund, Panangad (from Balussery block), Valayam, Vanimel (from Thuneri block) and Naripatta, Kayakkodi (from Kunnumel block).

3.3.3 Selection of respondents

A comprehensive list of coconut farmers from each panchayat were collected from the respective krishi bhavans in consultation with the agricultural officers. On the basis of the lists, 15 farmers were selected randomly from each selected panchayat, thus making a total of 120 respondents

3.4 DATA COLLECTION METHODS AND TOOLS

Data collection was done using a pretested structured interview schedule prepared after discussion with extension experts. The interview schedule was prepared in consideration with the scope and objectives of the study.

3.5 OPERATIONALIZATION OF VARIABLES AND THEIR MEASUREMENTS

3.5.1 Age

Age of an individual is the number of calendar years he/she has completed till the point of observation. The following coding pattern was used.

Category	Code
Young (Less than 42 years)	1
Middle (42-57 years)	2
Old (More than 57 years)	3

The distribution of respondents based on the age was then classified as frequency and percentage.

3.5.2 Means of livelihood

The main vocation of the farmer at the time of the interview will be considered as his/her means of livelihood. Coding pattern developed by Anandraja (2002) and followed by Anju (2018) with slight modification was used.

Category	Code
Farming as a sole profession	2
Farming + others	1

The distribution of respondents based on their means of livelihood was classified as frequency and percentage.

3.5.3 Area under coconut cultivation

It is operationally defined as the actual land possessed by the farmer under coconut and it was expressed as cents.

3.5.4 Educational Status

Operational definition of the variable was given as the academic qualification obtained by the individual through formal and informal education that helps that person to understand information and interpret it is the educational status of the individual. Scoring Pattern adopted by Fayas (2003) and modified by Sayooj (2012) was used. The scoring pattern is as follows.

Category	Score
Middle school	1
High school	2
Higher secondary	3
Diploma	4
Degree and above	5

The distribution of respondents based on their educational status was classified in terms of frequency and percentage.

3.5.5 Experience in coconut farming

Expereience refers to the number of years the respondent has been engaged in coconut farming.

3.5.6 Annual Income

Annual income is operationally defined as the total earnings of the respondent from coconut cultivation for a period of one year.

3.5.7 Innovation proneness

Refers to the keenness of the respondent in accepting new ideas and seeking changes in farming techniques and to introduce such changes into their farming operations when practical and feasible.

This will be measured using the scale used by Gurubalan (2007) and Athira (2017). The scale consists of five statements with two positive and three negative

statements. The respondents will be asked to give their agreement (or) disagreement on a five point continuum as 'Strongly agree', 'Agree', 'Undecided', 'Disagree and 'Strongly disagree' with the scoring 5, 4, 3, 2 and 1 respectively in the case of positive statements and vice-versa in the case of negative statements.

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 out new practices					
3	You like to keep up to date information about the subjects of your interest					
4	You would prefer to 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					

3.5.8 Information seeking behaviour

Information seeking behaviour refers to the sources or channels from which the respondents get technological information regarding agriculture and related area. This was measured using the scoring procedure followed by Anupama (2014) with slight modification.

In this scale the responses were collected on a three point continuum, with score ranging from 3 to 1 for 'regularly' to 'never'. The possible scores ranges from 'nine' to 'twenty seven'.

Sl. No.	Category	Regularly (3)	Occasionaly (2)	Never (1)
1	Radio			
2	Television			
3	Newspaper			
4	Magazines			
5	Agrl. Literatures			
6	KIOSKs			
7	Mobile phone applications			
8	Krishi Bhavan			
9	Fellow growers			

3.5.9 Decision making ability

It was operationally defined as the ability of the farmer to take decision on crop production from the available alternatives. It was measured using a scale developed by Parimaladevi (2004), used by Athira (2017). The scale comprised of 6 statements of which three were positive and three were negative statements. It was measured on a five point continuum, strongly agree, agree, undecided, disagree and strongly disagree. A score of 5, 4, 3, 2 and 1 was given for positive statements, and scoring was reversed for negative statements.

Sl. No.	Statements	SA	A	UD	DA	SDA
1	I interpret problems by examining the pros and cons and make decisions					
2	I will not take a decision without conferring others					
3	In general, I prolong my choices					
4	Once I take a decision, I will stick on it					

5	I need more time to take a decision					
6	I can take firm decision and initiate action when there are more alternatives					

The scores were added to measure the decision making capacity of the respondents. The score ranges from 6-30.

3.5.10 Social participation

This variable was operationally defined as the degree of involvement and participation of member farmers in various formal and informal organisations, either as a member or as an office bearer other than having a membership in the organisation. Method used by Ajith (2018) is used. Scale has two dimensions namely,

1. Nature of Participation

   Nature of participation refers to the membership position of members in social organisations.
2. Frequency of Participation

   Frequency of participation refers to the nature of participation of members in social organisations.

The scoring pattern followed is given below:

For nature of participation:

No membership in organization	3
Member in each organization	2
Office bearer in each organization	1

For frequency of participation:

Never attending any meeting	3
Sometimes attending meeting	2
Regularly attending meeting	1

The scores obtained by each respondent were multiplied across each item to obtain his total social participation score. The minimum and maximum score that could be obtained by the respondent was 'six' and 'two' respectively.

3.5.11 Scientific orientation

Scientific orientation refers to the degree to which a farmer is oriented to the use of scientific methods in decision making.

It was measured using the scale developed by Supe (1969) and followed by Athira (2017). The scale comprised of six statements of which five were positive and one was negative statement. It was measured on a five point continuum, strongly agree, agree, undecided, disagree and strongly disagree. A score of 5,4,3,2 and 1 was given for positive statements, and scoring was reversed for negative statements.

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 fathers is still the best way to farm today					
3	Even a farmer with a lot of experience should use new methods in farming					
4	A good farmer experiments with new ideas in farming					
5	Though it takes time for 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					

The scores obtained by each respondent were multiplied across each item in the scale 1-5. The minimum and maximum score that could be obtained by a respondent for each statement was 'five' and 'one' respectively. Thus for six statements, the minimum and maximum attainable score would be 6 and 30 for a respondent.

3.5.12 Risk orientation

Risk orientation refers to the degree to which the farmer is oriented towards encountering risks and uncertainity in adopting new ideas.

It was measured using the scale developed by Supe (1969). The scale comprised of six statements of which five were positive and one was negative statement. It was measured on a five point continuum, strongly agree, agree, undecided, disagree and strongly disagree. A score of 5, 4, 3, 2 and 1 was given for positive statements, and scoring was reversed for negative statements.

Sl no	Statements	SA	A	UD	DA	SDA
1	A farmer should grow intercrops to avoid risks involved in growing coconut alone					
2	A farmer should take more chance in making a big profit than to be content with smaller but less risky profit					
3	A farmer who is willing to take greater risk than the average farmer usually does better financially					
4	It is good for a farmer to take risk when he knows his chance of success is fairly high					

5	It is better for a farmer not to follow commercial coconut cultivation practices unless most of the farmers in the locality have used it with success					
6	Trying an innovative coconut farming technique is beneficial even though an element of failure is involved in it					

The scores obtained by each respondent were multiplied across each item in the scale 1-5. The minimum and maximum score that could be obtained by a respondent for each statement was 'five' and 'one' respectively. Thus for six statements, the minimum and maximum attainable score would be 6 and 30 for a respondent.

3.5.13 Extension Agency Contact

Operational definition of this variable refers to the degree to which the respondents meet the extension agents for information related to various aspects of cultivation. The scoring procedure used by Manoj (2000) was followed after modifications. Scores for both dimensions were in the order of 1, 2 and 3 for the responses 'Never', 'Occasionally' and 'Regularly' respectively.

Extension personnel	**Frequency of contact**		
	Regularly (3)	**Occasionally (2)**	**Never (1)**
Agricultural Scientist			
Agricultural Officer			
Agricultural Assistant			
KVK			
ATMA			

The scores obtained by each respondent were multiplied across each item in the scale 1-3. The minimum and maximum score that could be obtained by a respondent for each category of extension personnel was 'three' and 'one' respectively. Thus for five category of extension personnel, the minimum and maximum attainable score would be 5 and 15 for a respondent.

3.5.14 Extension participation

Extension participation refers to participation of farmers in activities or programmes like meetings, seminar, and alike. The scoring pattern used by Jaiswal *et al.* (1971) followed by Sobha (2013) and Athira (2017) with slight modification was used.

Activities	Frequency of participation		
	Regularly (3)	Occasionally (2)	Never (1)
Seminars			
Exhibitions			
Demonstrations			
Exposure visit			

The scores obtained by each respondent were multiplied across each item in the scale 1-3. The minimum and maximum score that could be obtained by a respondent for each activities was 'three' and 'one' respectively. Thus for the four activities under study, the minimum and maximum attainable score would be 4 and 12 for a respondent.

3.5.15 Extent of knowledge

Refers to the extent of knowledge possessed by the coconut farmers on the recommended practices. In order to determine the extent of knowledge of the coconut farmers, a teacher made knowledge test was used (Interview Schedule – Appendix II). Major practices as per the package of practice recommendation of coconut were included in the knowledge test to understand the existing knowledge of the respondent about coconut cultivation. Scores of 'one' and 'zero' were given

to the correct and wrong answers respectively. The respondents were categorized into three groups based on the range of score attained and the mean value of the respondents.

3.5.16 Adoption of technologies

In the study, adoption level refers to the adoption of recommended cultivation practices of coconut by the farmers. 17 recommended practices were used for the measurement of adoption (Interview schedule – Appendix II). The scoring was on a three point continuum ranging from 'fully adopt', 'partially adopt' and 'not adopt' with scores of 3, 2, and 1 respectively.

The adoption index was calculated by using the formula:

$$\text{Adoption Index} = \frac{\text{Total adoption score obtained}}{\text{Maximum obtainable score}} \times 100$$

Based on the total adoption index, its mean and standard deviation the respondents were categorised as high, medium and low adopters.

3.5.17 Inventorisation of extension approaches

In consultation with the agriculture officers, the different extension approaches in coconut were inventorised and documented.

3.5.18 Impact of the different extension approaches in coconut farming

The delineated extension approaches were tested for its impact in terms of social, technological and economic impacts. The respondents were asked to score the approaches under each impact on a ten-point scale (Interview schedule – Appendix II). The cumulative scores were calculated for each approach.

3.5.19 Resilient extension approach

The extension approach with maximum social, technological and economic impacts was found to be the resilient extension approach.

3.5.20 Constraints faced by farmers and suggestions for improvement

Constraints faced by the farmers in coconut farming were identified through discussion with farmers and through data from relevant review of literature. These constraints were enlisted (Interview schedule- Appendix II) and the respondents were asked to rank them. Based on the cumilative score, the constraints were ranked from most important to least important. Later suggestions and strategies to overcome these constraints were given on the basis of discussion with farmers.

3.6 STATISTICAL TOOLS USED IN THE STUDY

3.6.1 Frequency and percentage analysis

For simple comparison and classification of the respondents, the selected variables were subjected to and interpreted using frequency and percentage analysis, wherever it was found necessary. First frequency was calculated and the percentage was obtained by multiplying it with 100 and then further dividing it with total number of respondents.

3.6.2 Mean and Standard Deviation

Mean (M) of the data and standard deviation (SD) of the data was found out to classify respondents in to low, medium and high, in case of market orientation. Values less than M-SD was categorised as low and values falling under M±SD was categorised as medium. Values greater than M+SD was categorised as high.

3.6.3 Standard Error

Standard error was used to measure the statistical correctness of an approximate in the standard deviation results.

3.6.4 Quartile Analysis

Based on the first quartile (Q1) and the third quartile (Q3) a normally distributed data can be divided into three categories of low, medium and high. Values under 25 per cent are represented by Q1, and 50 per cent is represented by

the range from Q1 and Q2, while Q3 gives the next 25 per cent values. Low category was assigned to observations below Q1, and medium category was assigned to observations between Q1 and Q3. Those observations above Q3 were considered as high.

3.6.5 Correlation Analysis

The relationship between the dependent variables and independent variables were found out using correlation analysis.

3.6.6 Two-way ANOVA

Two-way ANOVA was employed to test whether there was any significant difference between the delineated extension approaches as well as between the social, technological and economic impacts.

3.6.7 Weighted mean

The weighted mean is a type of mean that is calculated by multiplying the weight (or probability) associated with a particular event or outcome with its quantitative outcome and then summing all the products together.

3.7 HYPOTHESIS FOR THE STUDY

Hypothesis is a hunch, guess, imaginative idea which becomes the basis for action or investigation (Lundberg, 1942).

In the view of deliberations made in the chapter on review of literature and prospective arguments that could arise out of the study, the following hypotheses were set up and investigation was made to test these hypotheses.

H_1: There exist no significant difference between profile characteristics of the respondents and extent of knowledge.

H_2: There exist no significant difference between profile characteristics of the respondents and adoption of technologies.

H_3: There exist no difference between the impacts of delineated extension approaches.

H_4: There exist no difference between the social, technological and economic impact made by the different approaches.

For testing the hypotheses, suitable analysis like correlation and two-way ANOVA were done.

Results & Discussions

4. RESULTS AND DISCUSSIONS

The chapter deals with the results and discussion based on the analysis of the data obtained. The results of the study and corresponding discussions are presented in sections given below.

4.1 Distribution of coconut farmers based on independent variables

4.2 Distribution of coconut farmers based on dependent variables

4.3 Inventorisation of different extension approaches

4.4 Impact of different extension approaches

4.5 Constraints faced by the farmers and strategies to overcome them

4.6 Validation of hypothesis

4.1 DISTRIBUTION OF COCONUT FARMERS BASED ON INDEPENDENT VARIABLES

4.1.1 Age

Age of an individual is operationally defined as the number of calendar years he/she has completed till the point of observation. The distribution of farmers based on their age are presented in Table 1.

Table.1 Distribution of the respondents based on age

Category	Farmers (N=120)		
	Male	Female	Overall
Young age <42 years	8 (7.62)	6 (40.00)	14 (11.67)
Middle age 42-57 years	82 (78.09)	8 (53.33)	90 (75.00)
Old age >57 years	15 (14.29)	1 (6.67)	16 (13.33)

Total	105	15	120
Mean=49.85, S.D=7.08, SE=0.646			

*( ) is value in percentage

The results in Table 1 suggest that 75 per cent of the respondents belonged to the age group of 'middle' that range between 42 to 57 years of age. The mean age of the coconut farmers was 49.85. However, 13.33 per cent of farmers belonged to the category of old age. Majority of the female farmers (73.33%) belonged to the category of young to middle age. However, in case of male, majority (92.38) belonged to middle to old age category. Similar results were reported by Nayabhai (2011).

4.1.2 Means of livelihood

The main vocation of the farmer at the time of the interview was considered as his/her means of livelihood. The distribution of coconut farmers based on their means of livelihood were recorded and are presented in Table 2.

Table.2 Distribution of respondents based on 'means of livelihood'

Category	Frequency	Percentage
Farming as a sole profession	65	54.17
Farming + other activities	55	45.83
Total	120	100

From the table 2 it was clearly evident that 54.17 per cent of the respondents had farming as their sole means of livelihood and 45.83 per cent of the farmers did farming along with other activities. The higher percentage of farmers with farming alone as means of livelihood may be attributed due to their continuation of ancestral

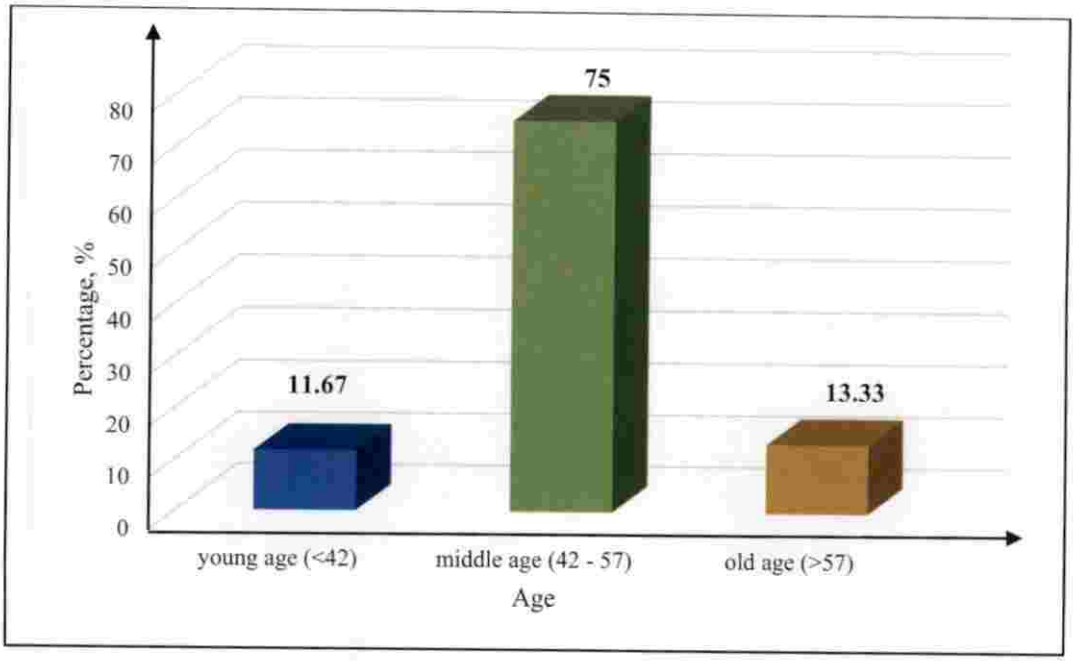


Fig 1: Distribution of farmers based on age

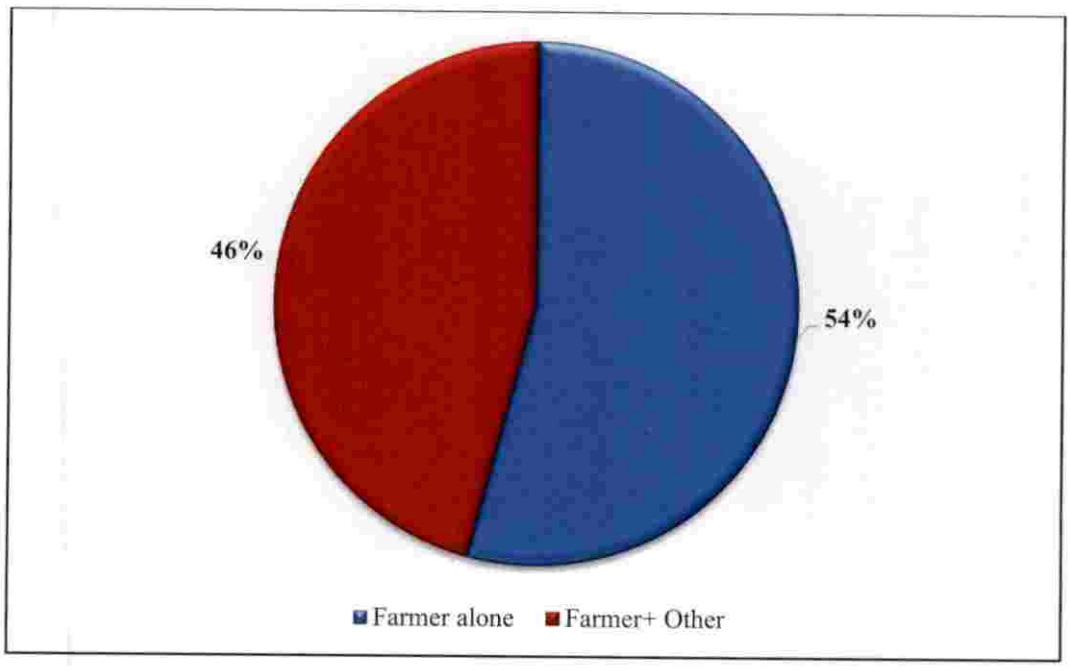


Fig 2: Distribution of farmers based on means of livelihood

occupation in agriculture. This results of the study was in line with the findings of Shinde *et al.* (2000) and Mishra (2007).

4.1.3 Area under coconut cultivation

The area was operationally defined as the land possessed by the farmer under coconut. The distribution of coconut farmers based on the size of land holding were recorded and are presented in Table 3.

Table.3 Distribution of respondents based on area under coconut cultivation

Category	Frequency	Percentage
Less than 51 cents	20	16.67
51 to 111 cents	81	67.50
Greater than 111 cents	19	15.83
Total	120	100
Mean= 80.5 cents; Min-Max= 45-180		

From the table 3 it was clear that the minimum area possessed by the respondents under coconut cultivation was 45 cents and maximum was 180 cents. Majority of the respondents (67.5%) had a cultivated area between 51 to 111 cents.

The result also showed that majority of the farmers were small and marginal farmers with an average area of 80.5 cents under cultivation. In Kerala, the land is increasingly being used for non-agricultural purposes because of the rising demand for land for industrial and other sectors. Hence the area under cultivation shows a declining trend. The result was in line with the findings of Ganiger (2012).

4.1.4 Educational status

Educational status was operational defined as the academic qualification obtained by the individual through formal and informal education that helps that

person to understand information and interpret. The distribution of coconut farmers based on their educational status were recorded and are presented in Table 4.

Table.4 Distribution of respondents according to educational status

Category	Frequency	Percentage
Middle school	24	20
High school	47	39.17
Higher secondary	25	20.83
Diploma	11	9.17
Degree	13	10.83

More than half of the total respondents (60%) had educational qualification up to high school or higher secondary, followed by respondents with qualification up to middle school (20%). The next group of respondents were possessing degree or above qualification (10.83%).

The results were in line with the findings of Kumar (2004), as in his study, more than half of respondents (63.45%) had high school or higher secondary education. The result can be considered as a true reflection of the higher literacy status of Kerala.

4.1.5 Experience in coconut cultivation

Experience was operationally defined as the number of years the respondent was engaged in coconut farming. The distribution of coconut farmers based on their experience in coconut cultivation were recorded and are presented in Table 5.

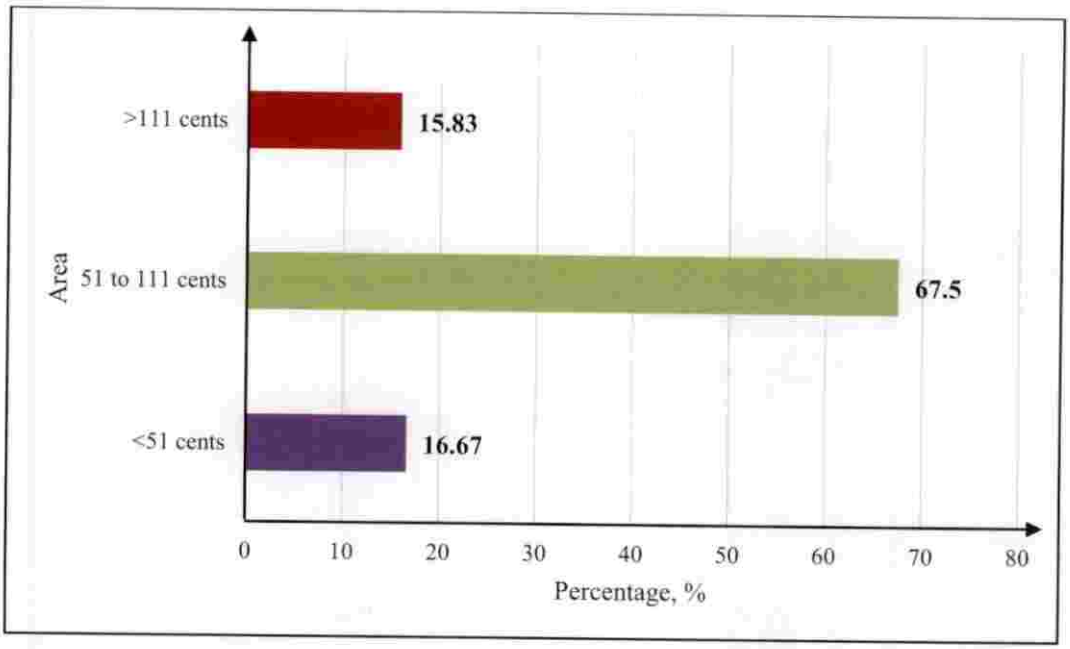


Fig 3: Distribution of farmers based on area under coconut cultivation

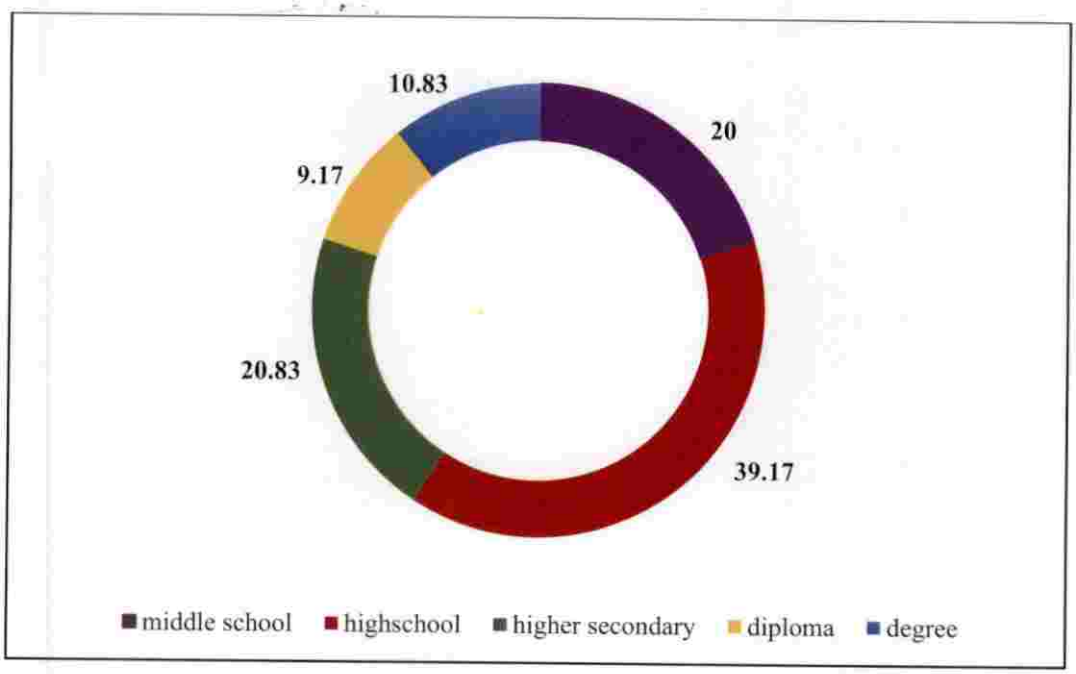


Fig 4: Distribution of farmers based on their educational status

Table.5 Distribution of respondents according to experience

Category	Frequency	Percentage
Less than 10 years	0	0
10-15 years	18	15
16-20 years	35	29.17
21-25 years	34	28.33
26-30 years	20	16.67
More than 30 years	13	10.83

From the table 5 it was clearly evident that all the respondents had more than ten years of experience in coconut farming. More than half of the respondents (57.5%) had 16 to 25 years of experience. The result can be ascribed to the fact that majority of the respondents belonged to middle age group and farming was their sole means of livelihood. Also, homegardens of Kerala are mainly coconut based and hence, majority of the farmers might have more than 20 years of experience in coconut based intercropping system. The result was in agreement with findings of Jacob (2015).

4.1.6 Annual income

Annual income was operationally defined as the total earnings of the respondent from coconut cultivation for a period of one year. The distribution of coconut farmers based on their experience in coconut cultivation were recorded and are presented in Table 6.

Table.6 Distribution of respondents based on annual income

Category	Frequency	Percentage
Low (<Q1)	30	20.00

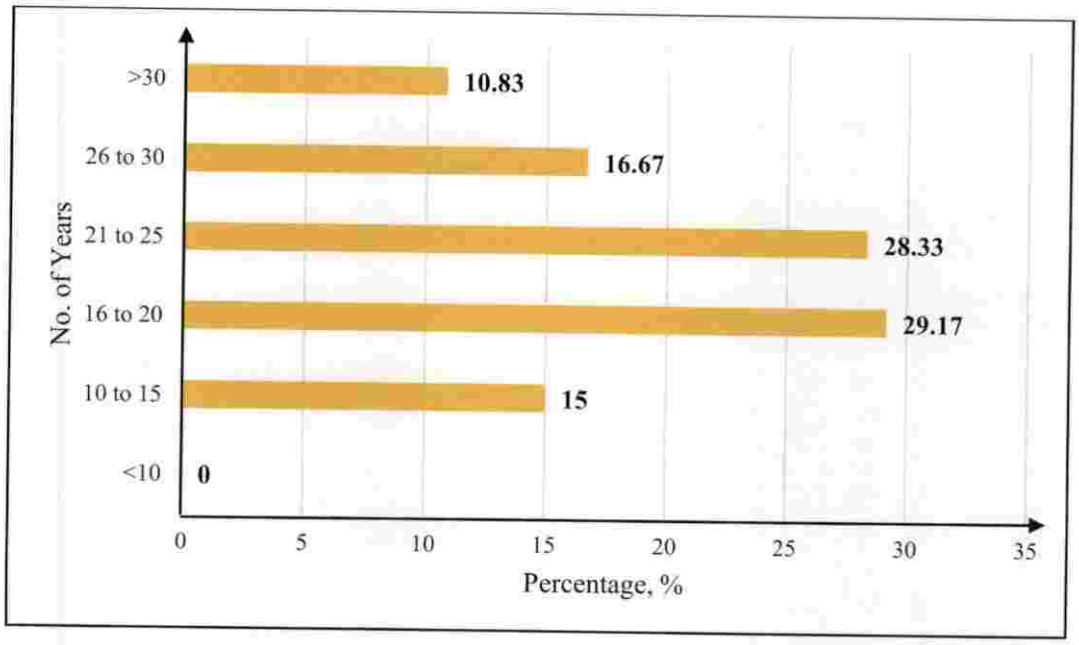


Fig 5: Distribution of farmers based on their experience in coconut farming

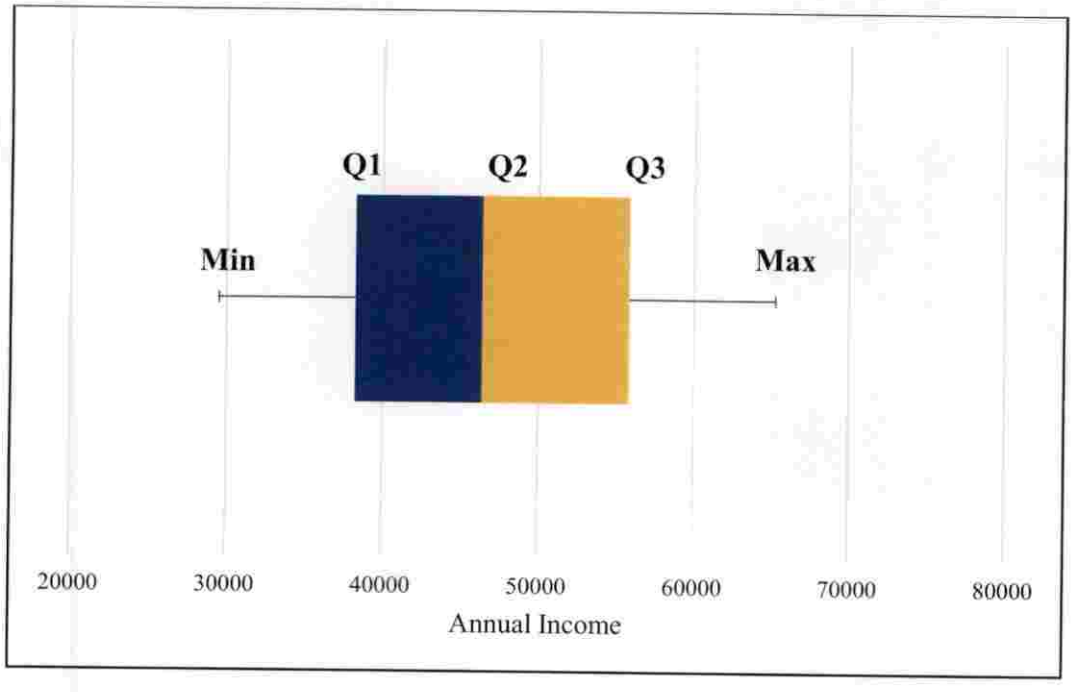


Fig 6: Distribution of farmers based on annual income (BOX PLOT)

Medium (Q1-Q3)	69	50.83
High (>Q3)	21	24.17
Total	120	100
Q1=Rs.38,250; Q3=Rs.55,840 Mean=Rs.52,125.08 Min-Max= Rs.29,520-Rs.1,35,000		

From table 6 it was revealed that, the mean annual income was Rs.52,125. The annual income ranges from a minimum of Rs.29,520 to a maximum of Rs.1,35,000. However, About 50 per cent of the respondents belonged to medium category of annual income (Rs.38,250- Rs.55,840). Among the other two categories more farmers (24.17%) belonged to higher income class (> Rs.55,840) compared to lower income class (<Rs.38,520) farmers (20%).

In Kerala, the cropping systems are based on coconut. The result attributes to the fact that cultivation of coconut alone may not increase the income of the farmers. Hence, intercropping in coconut plantations may be advised to increase the remuneration for the farmers. The result was in agreement with findings of Thippeswamy (2007).

4.1.7 Innovation proneness

Innovation proneness was operationally defined as the keenness of the respondent in accepting new ideas and seeking changes in farming techniques and to introduce such changes into their farming operations when it is practical and feasible. The distribution of coconut farmers based on innovation proneness were recorded and are presented in Table 7.

Table 7. Distribution of respondents based on innovation proneness

Category	Frequency	Percentage
Low (5-12)	21	17.50

Medium (12-19)	89	74.17
High (19-25)	10	8.33
Total	120	100
Mean=14.36; Range= 20		

From the table 7 it was clear that the innovation proneness of the respondents was low as the mean value is 14.36. Majority of the respondents (74.17%) fell under the medium category.

The farmers try out new ideas only after seeing the success of these innovations from others. This may be the reason for the majority of the respondents (90%) belonging to medium and low categories. Similar results were reported by Thippeswany (2007) and Oluwasuzi (2014).

4.1.8 Information seeking behaviour

The distribution of coconut farmers based on their information seeking behaviour was recorded and are presented in Table 8.

Table 8. Distribution of respondents based on information seeking behaviour

Category	Frequency	Percentage
Low (10-17)	18	15
Medium (17-24)	73	60.83
High (24-30)	29	24.17
Total	120	100
Mean=19.94; Range= 30		

From the table 8, it was evident that 60.83 per cent of the respondents belonged to medium category based on their information seeking behaviour. 24.17

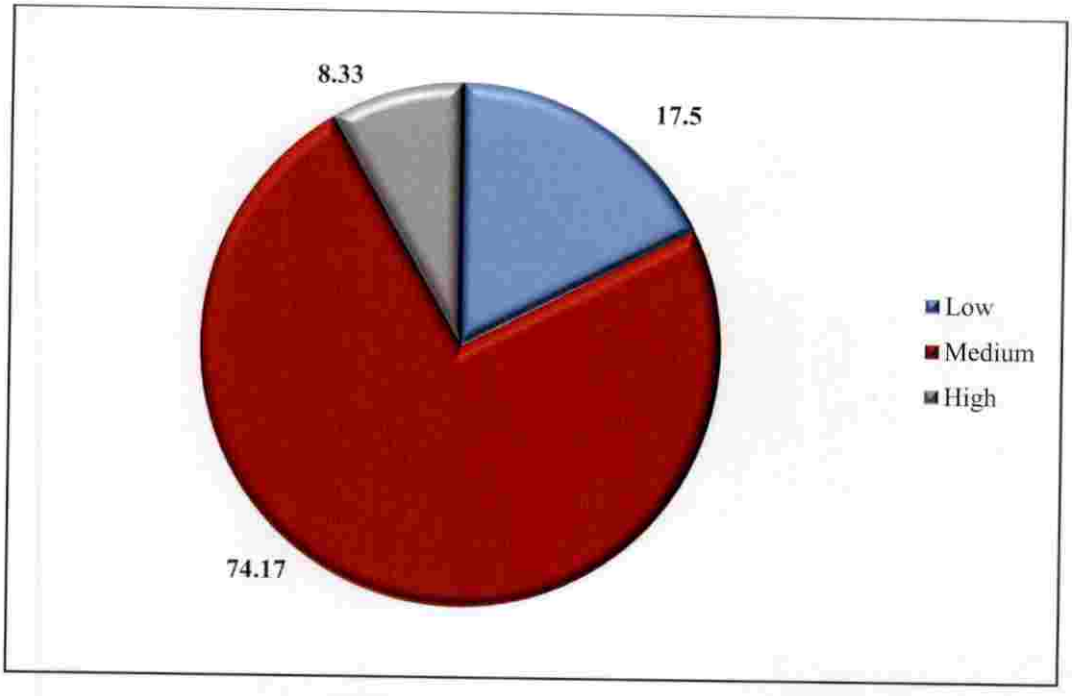


Fig 7: Distribution of farmers based on innovation proneness

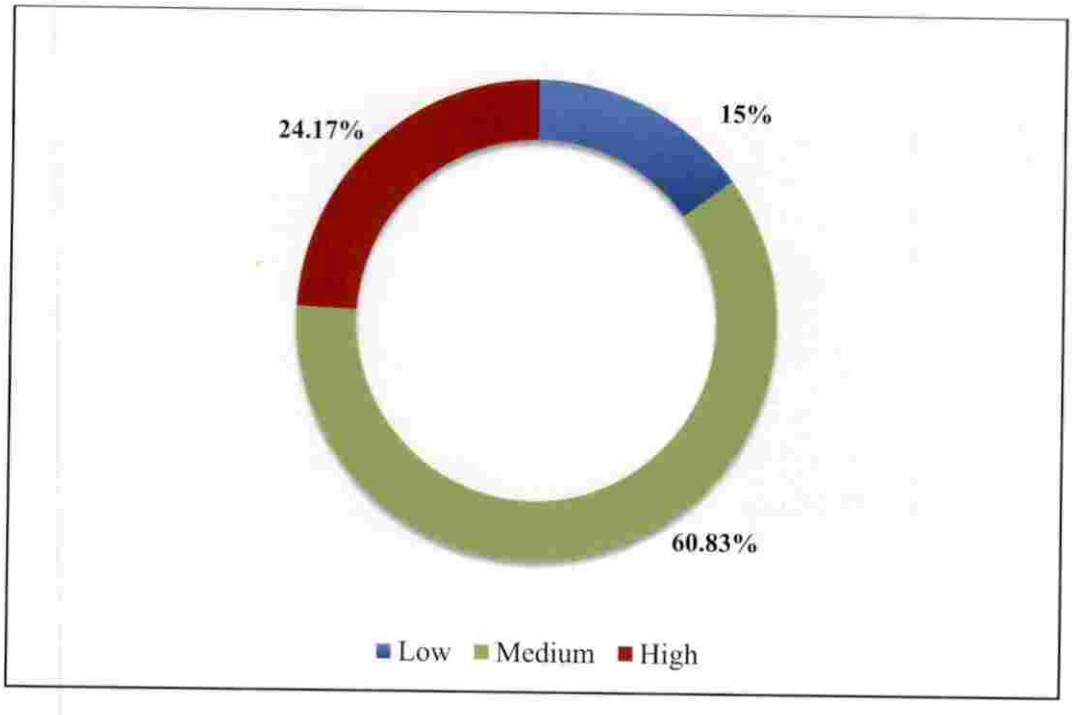


Fig 8: Distribution of farmers based on information seeking behaviour

and 15 per cent of them belonged to high and low categories respectively. The result is in line with findings of Sligo *et al.* (2005).

The distribution of coconut farmers based on frequency of exposure to various information sources was recorded and are presented in Table 9.

Table 9. Distribution of respondents based on frequency of exposure to various information sources

Category	Regularly		Occasionally		Never	
	F	%	F	%	F	%
Radio	21	17.5	48	40	51	42.5
TV	53	44.17	67	55.83	0	0
Newspaper	69	57.5	51	42.5	0	0
Magazines	19	15.83	50	41.67	51	42.5
Ag. literature	30	25	60	50	30	25
Information kiosks	0	0	50	41.67	70	58.33
Mobile apps	11	9.17	53	44.17	56	46.67
Krishi bhavan	92	76.67	28	23.33	0	0
Fellow farmers	108	90	12	10	0	0

The information sources sought by the respondents were analysed and from the data it is clear that majority of the respondents regularly sought information from other fellow farmers (90%), krishi bhavan (76.67%) and newspapers (57.5%). Television (55.83%) and agricultural literatures (50%) were used occasionally by the respondents as major sources of information. More than half of the respondents (58.33%) never used information kiosks for seeking information. The reason for this might be low accessibility of mobile advisory services and kiosks or reluctant nature of the farmers to depend the same. The result was in agreement with findings of Jacob (2015).

The information seeking behaviour of the farmers substantially depends on their extent of contact with the available information sources and those who are having more networks in the social system utilizes the sources more productively. Also, farmers rely up on innovators and early adopters for getting information regarding various farming practices. This was in line with the findings of Oluvasuzi (2014).

4.1.9 Decision making ability

Decision making ability was operationally defined as the ability of the farmer to take decision on crop production from the available alternatives. The distribution of coconut farmers based on frequency of exposure to various information sources were recorded and are presented in Table 10.

Table 10. Distribution of respondents based on decision making ability

Category	Frequency	Percentage
Low (<15)	12	10.00
Medium (15-21)	87	72.50
High (>21)	21	17.50
Total	120	100
Mean=18.54; S.D=2.95; SE=0.27		

From the table 10 it was clear that 90 per cent of the respondents had fairly good decision making ability as the mean value is 18.54. Majority of the farmers (72.5%) had medium level of decision making ability. This might be due to the fact that majority of them took decision in consultation with other fellow farmers. About 17 per cent of the respondents had high level of decision making ability and only 10 per cent of them had low level of decision making ability.

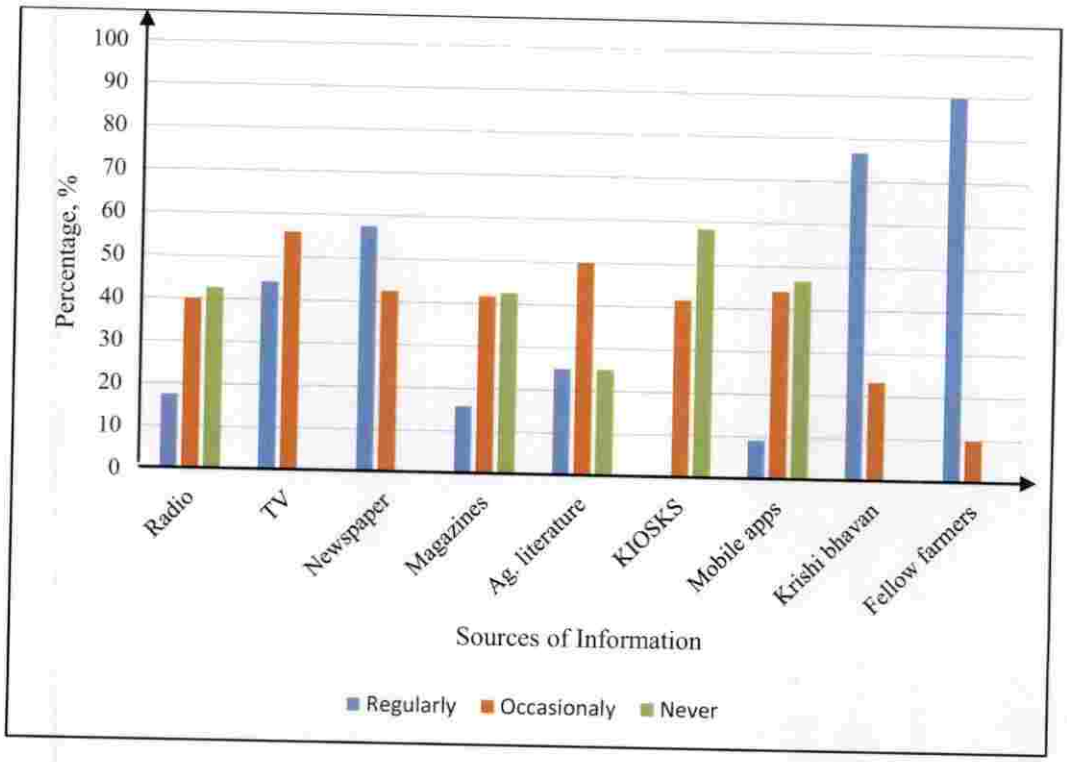


Fig 9: Distribution of farmers based on frequency of exposure to various information sources

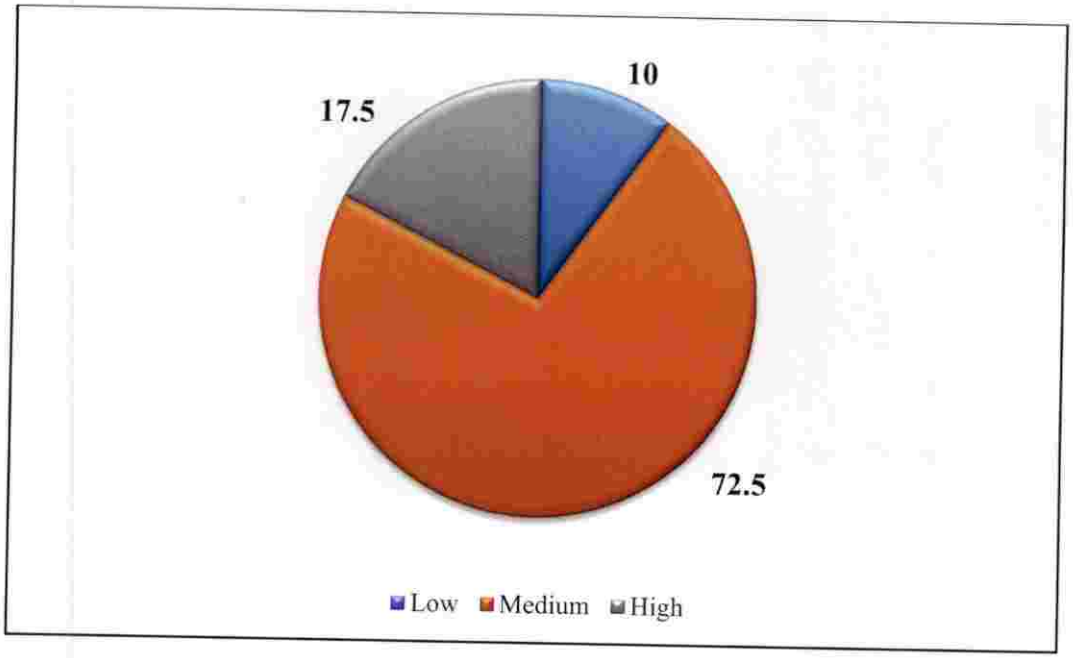


Fig 10: Distribution of farmers based on decision making ability

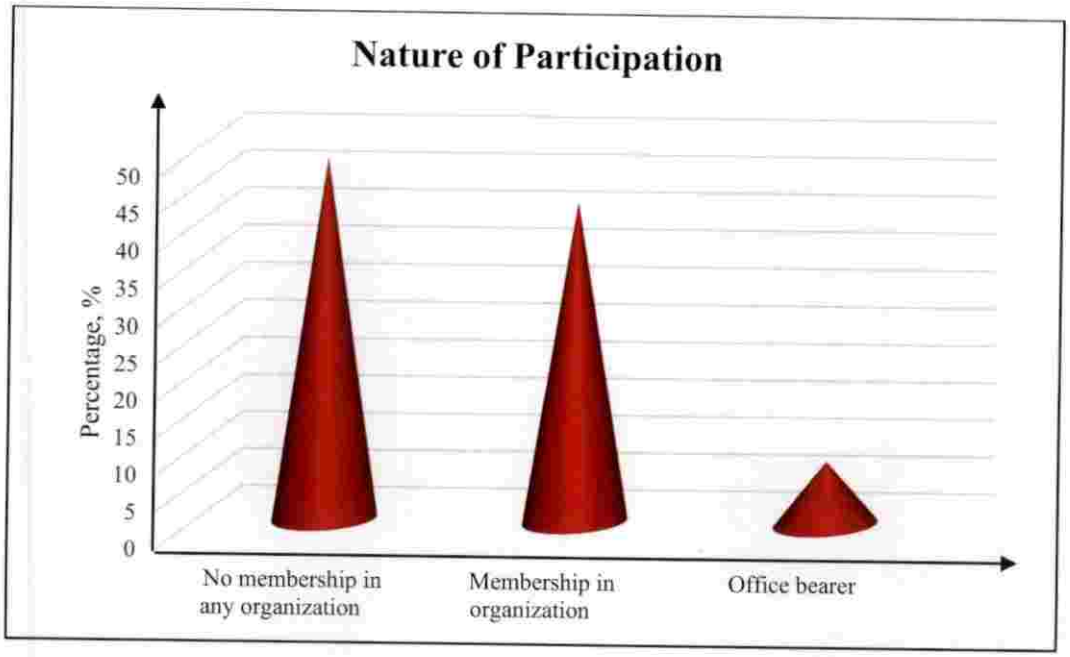
4.1.10 Social participation.

Social participation was operationally defined as the degree of involvement and participation of farmers in various formal and informal organisations. Nature and frequency of participation of the respondents in social organisations were found out. The distribution of coconut farmers based on their social participation were recorded and are presented in Table 11.

Table 11. Distribution of respondents based on social participation

Category	Percentage
a) Nature of participation	
No membership in any organization	48.5
Membership in organization	43
Office bearer	8.5
b) Frequency of participation	
Never attending any meetings	37.83
Occasionally attending meetings	57
Regularly attending meetings	5.17

About half of the respondents (48.5%) were not members of any organisation. Less number of respondents (43%) have membership in other organisations and only 8.5 per cent were office bearers of these organisations. In case of frequency of participation more than half of the respondents (57%) occasionally attended the meetings and 37.83 per cent never participated in the meetings. Percentage of respondents regularly attending any meetings was low (5.17%). An overall low level of social participation was exhibited by respondents. The reason for high occasional participation may be due to the negative association between social participation and extent of involvement in farm activities as suggested by Govind (1984).



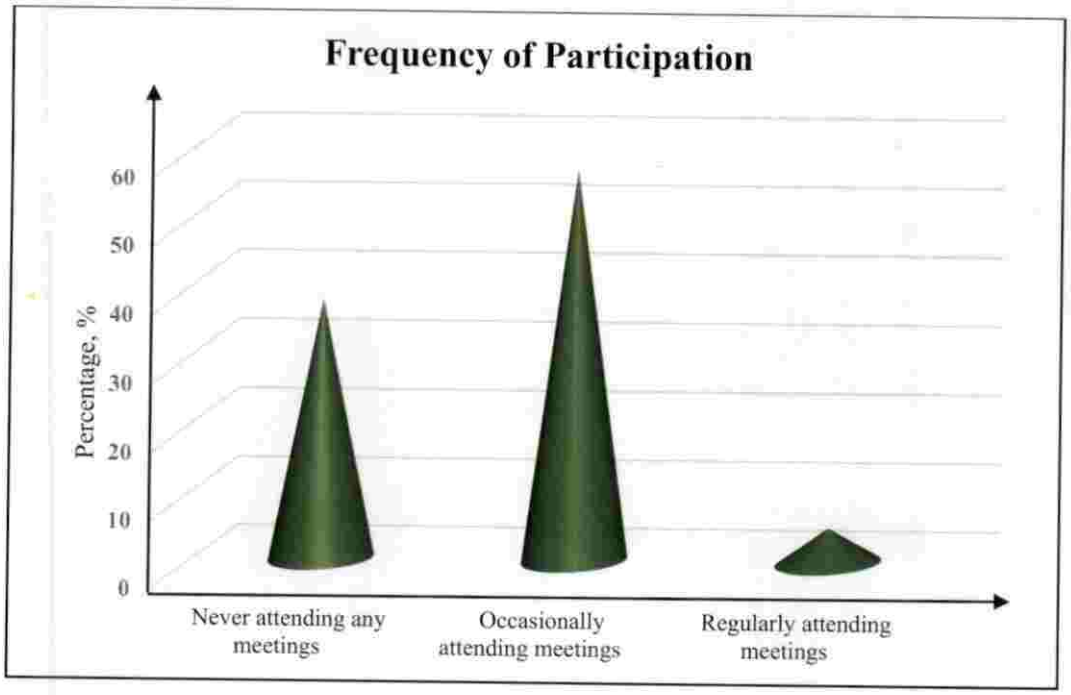


Fig 11 & 12: Distribution of farmers based on social participation

4.1.11 Scientific orientation

Scientific orientation was operationally defined as the degree to which a farmer was oriented to the use of scientific methods in cultivation of coconut. The distribution of coconut farmers based on their scientific orientation were recorded and are presented in Table 12.

Table.12 Distribution of respondents based on scientific orientation

Category	Frequency	Percentage
Low (<16)	14	11.68
Medium (16-22)	92	76.64
High (>22)	14	11.68
Mean=18.82; S.D=3.11; SE=0.28		

From the table 12 it was clear the mean value was 18.82. Majority of the respondents (88.32%) belonged to medium to high category of scientific orientation. Hence, majority were having good scientific orientation. Only 11.68 per cent belonged to low category.

Trainings imparted with special reference to use of new generation plant production and protection measures naturally enhances the scientific orientation of farmers. The result was in line with the findings of Kumar (2004).

4.1.12 Risk orientation

Risk orientation was operationally defined as the degree to which the farmer is oriented towards encountering risks and uncertainity in adopting new ideas. The distribution of coconut farmers based on their risk orientation were recorded and are presented in Table 13.

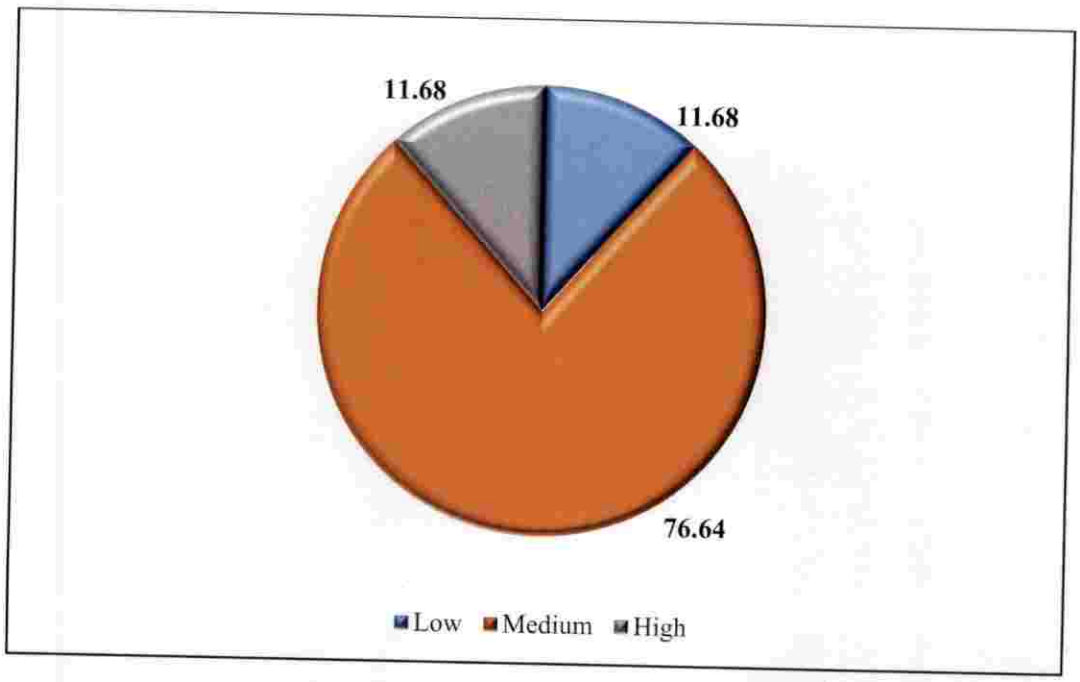


Fig 13: Distribution of farmers based on scientific orientation

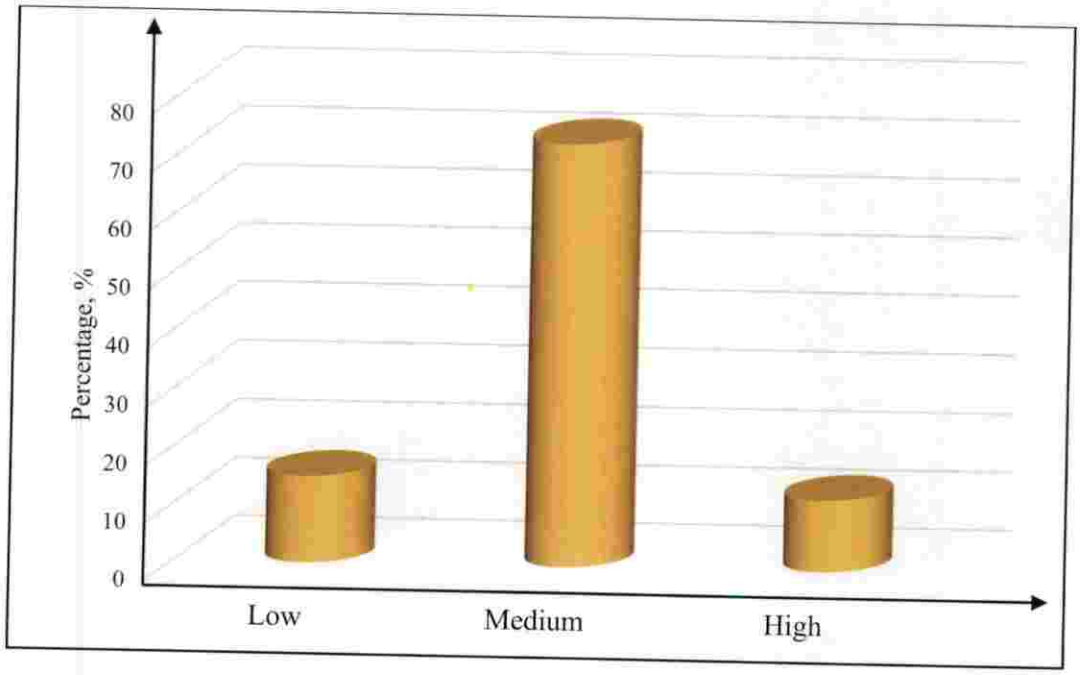


Fig 14: Distribution of farmers based on risk orientation

Table.13 Distribution of respondents based on risk orientation

Category	Frequency	Percentage
Low (<14)	18	15.00
Medium (14-20)	87	72.50
High (>20)	15	12.50
Total	120	100
Mean=16.84; S.D=2.98; SE=0.27		

From the table 13 it was evident that the 85 per cent of the respondents had medium to high level of risk orientation. Knowledge about the recommended practices in coconut helps the farmers to become aware about the positive and negative aspects of the technologies thereby helping them to overcome the risks associated with coconut farming. Similar result was reported by Neelaveni (2005).

4.1.13 Extension agency contact

Extension agency contact was operationally defined as the degree to which the respondents meet the extension agents for information related to various aspects of cultivation. The distribution of coconut farmers based on their extension agency contact was recorded and are presented in Table 14.

Table.14 Distribution of respondents based on extension agency contact

Category	Frequency	Percentage
Low (<9)	14	11.67
Medium (9-13)	75	62.50
High (>13)	31	25.83
Total	120	100
Mean=11.65; S.D=1.94; SE=0.18		

Majority of respondents had medium level of extension agency contact (62.5%) and about 25 per cent of them had high level of extension agency contact. This may be due to the fact that the krishi bhavans of the selected panchayats were active.

Also, it was observed that the mean score obtained by the respondents is 11.65 and 74.17 per cent of them belonged to low and medium categories. Hence, it shows that the farmers have low extension agency contact. This was in line with findings of Christen (2005) where he found that, nearly half of the respondents (45.43%) showed low level of extension contact and 24.17 per cent showed medium level contact. He also found that 30 per cent felt high level contact.

4.1.14 Extension participation

Extension participation was operationally defined as participation of farmers in various extension activities or programmes like meetings, seminar, and alike. The distribution of coconut farmers based on their extension participation were recorded and are presented in Table 15.

Table.15 Distribution of respondents based on extension participation

Category	Frequency	Percentage
Low (<8)	28	23.33
Medium (8-10)	72	60.00
High (>10)	20	16.67
Total	120	100
Mean=8.50; S.D=1.32; SE=0.12		

From the table 15 it was clear that, more than half of the respondents (60%) ensured medium participation in extension activities and only a small portion of respondents (16.67%) was found with high participation.

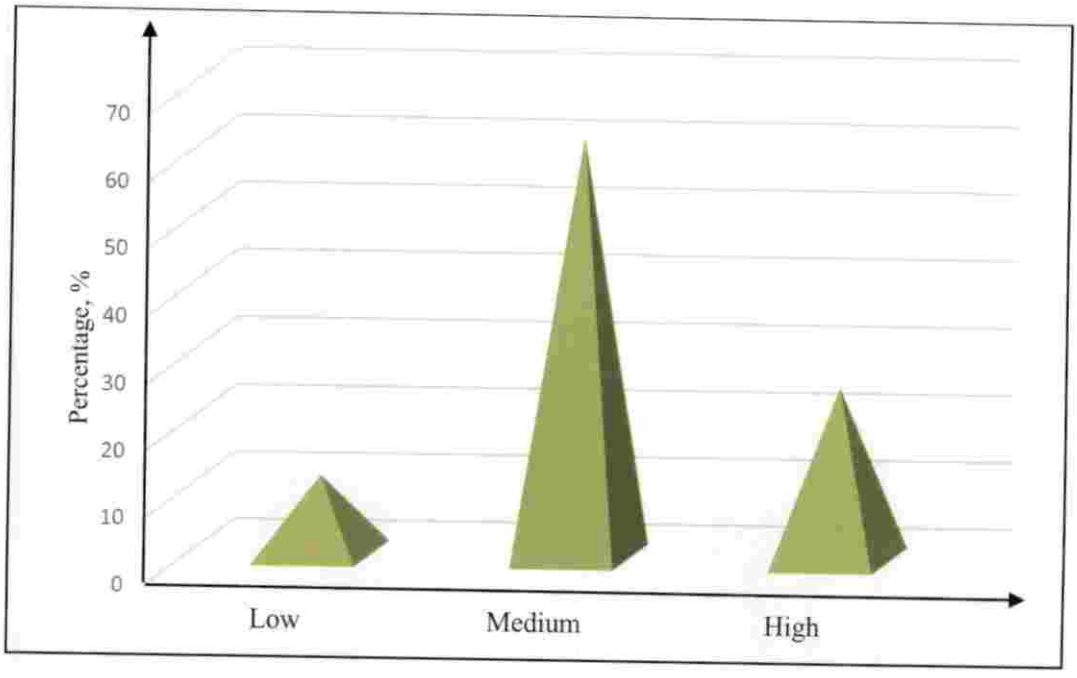


Fig 15: Distribution of farmers based on extension agency contact

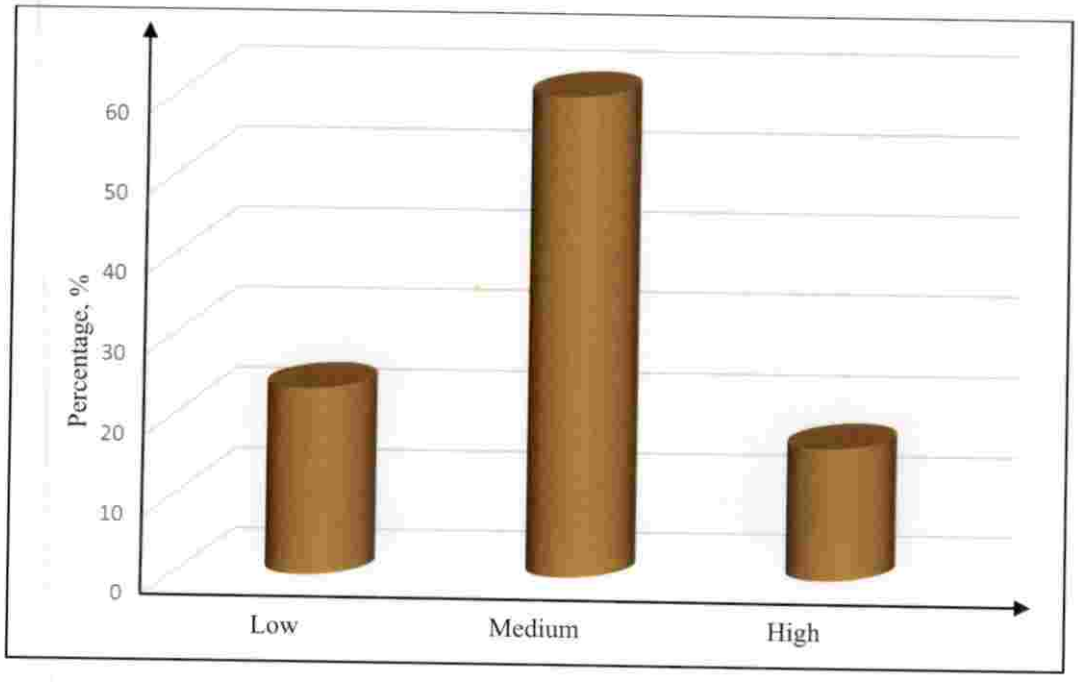


Fig 16: Distribution of farmers based on extension participation

The learning experience through participation in extension activities asserted that technology package supported with appropriate extension mechanisms based on socio-economic situations and technical parameters might result in wide spread awareness and adoption of technology. The result is in line with findings of Anithakumari *et al.* (2015).

4.2 DISTRIBUTION OF COCONUT FARMERS BASED ON DEPENDENT VARIABLES

4.2.1 Extent of knowledge

The distribution of coconut farmers based on their extent of knowledge was recorded and are presented in Table 16.

Table.16 Distribution of respondents based on extent of knowledge

Knowledge score	Frequency	Percentage
Low (<13)	15	12.50
Medium (13-15)	68	56.67
High (>15)	37	30.83
Total	30	100
Mean=14.85; S.D=1.49; SE=0.14		

From the data presented in table 16, it was clear that the mean value (14.85) was high indicating that majority of the respondents (about 85%) had clear knowledge on the cultivation practices in coconut. More than half of the farmers (56.67%) possessed medium level of knowledge about the recommended coconut farming practices. Similar result was reported by Jacob (2015). Only a small fraction of farmers (12.5%) were yet to gain an equally better knowledge about the practices. This may be attributed to their low extension agency contact. This is in line with the findings of Jnanadevan (1993).

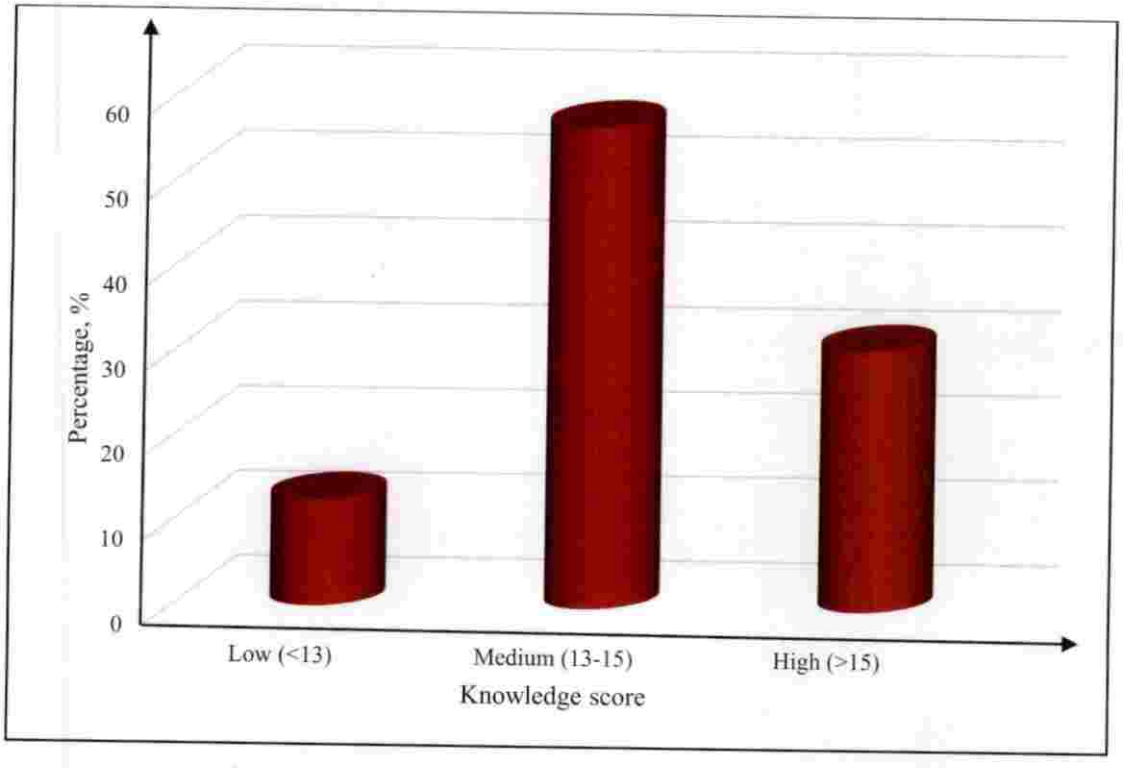


Fig 17: Distribution of farmers based on extent of knowledge

4.2.2 Correlation between extent of knowledge and profile characteristics of the coconut farmers

Correlation analysis was done to determine whether any relationship exists between the dependent variable and independent variables.

Table.17 Correlation between extent of knowledge and profile characteristics of the coconut farmers

Variables	Correlation
Age	0.067
Means of livelihood	-0.036
Area	-0.041
Educational status	-0.025
Experience	0.063
Annual Income	0.019
Innovation proneness	0.279**
Information seeking ability	0.237**
Decision making ability	0.505**
Social participation	0.349**
Scientific orientation	0.394**
Risk orientation	0.307**
Extension agency contact	0.349**
Extension participation	0.266**
If N = 120, r_{table} = 0.179 (5%) & r_{table} = 0.234 (1%)	

(** significant at 1% significant level; * significant at 5% significant level)

Table 17 revealed that out of 14 independent variables eight independent variables viz., innovation proneness, information seeking ability, decision making

ability, social participation, scientific orientation, risk orientation, extension agency contact and extension participation had significant and positive correlation at 1 per cent level with 'extent of knowledge'.

There was a significant and positive correlation between 'extent of knowledge' and innovation proneness of the farmers. The farmers may adopt any new idea or innovation only after they acquire enough knowledge on it. This may not happen until they see a large number of farmers taking up such innovation for utilization, effectively well over time. Therefore it is essential that policy makers focus on innovation dissemination by the enforcing agencies for ensured participation of the coconut farmers and encouraging people's participation at multiple levels taking into account the mass media utilization pattern and favourable attitude of the target groups, which invariably has an influence on the knowledge level of farmers.

A significant and positive correlation was found between 'extent of knowledge' and information seeking ability of the farmers. The farmers seek and find information so as to have a clear knowledge in the recommended practices in coconut and may get equipped themselves to manage any hardships rendered during the farming process. Similar result was observed by Nayabhai (2011).

There was a significant and positive correlation between 'extent of knowledge' and decision making ability of the farmers. A person takes a decision on something only once he/she has a clear knowledge about it. In agriculture, especially with perennial crop like coconut thrives in uncertain situations. Many agricultural decision-making activities are often vague or based on intuition and this becomes the uncertainty that is compounded as a result of different problems. Here decision making becomes difficult and knowledge imparting becomes essential to reduce the randomness that results from the increasing complexities. Hence, positive correlation between 'extent of knowledge' and decision making ability of the farmers can be substantiated. The results are in agreement to the findings of Passam *et al.* (2003).

A significant and positive correlation was found between 'extent of knowledge' and social participation of the farmers. It is natural that when farmers participate more in social programmes related to agriculture their knowledge base widens. Also, it is possible that members of farm organizations have more access to farm information and training which equips them with the necessary skills and knowledge to perform more farm roles. The result is in line with findings of Kumar (2004) and Thippeswamy (2007).

There was a significant and positive correlation between 'extent of knowledge' and scientific orientation of the farmers. There are a lot of efforts by the authorities and agencies to help coconut farmers by offering innovation support which are quite scientific. Trainings imparted with special reference to use of new generation plant production and protection measures naturally enhances the scientific orientation of farmers. The respondents who are scientifically oriented will generally have a high knowledge level on the recommended practices in coconut.

A significant and positive correlation was found between 'extent of knowledge' and risk orientation of the farmers. Knowledge about the recommended practices in coconut helps the farmers to become aware about the positive and negative aspects of the technologies thereby helping them to overcome the risks associated with coconut farming. Similar result was reported by Kumar (2004).

There was a significant and positive correlation between 'extent of knowledge' and extension agency contact of the farmers. This may be attributed to fact that the krishi bhavans of the panchayats were active and farmers seek information from the agricultural officers and assistants regularly, which validates our finding. Similar result were reported by Anithakumari *et al.* (2015). Also, A significant and positive correlation was found between 'extent of knowledge' and extension participation of the farmers. The knowledge level and skills of the farmers might increase if they are willing to participate in seminars, field demonstrations,

exhibitions and alike and see the outcomes. The result is in line with findings of Thippeswamy (2007).

4.2.3 Adoption of technologies

The distribution respondents based on their adoption index is shown in table 18.

Table.18 Distribution of respondents based on adoption index

Adoption Index	Frequency	Percentage
Low (<54)	31	25.83
Medium (54-78)	72	60
High (>78)	17	14.17
Total	120	100
Mean=66.03; S.D=11.87; SE=1.08		

From the table 18, it was clear that more than half of the farmers (60%) were medium adopters of the recommended cultivation practices in coconut. About 25 per cent of the farmers were in low category and only 14.17 per cent belonged to the high category. This result may be attributed to the fact that majority of the respondents possessed medium level of knowledge about the recommended coconut farming practices. This was in line with the findings of Jnanadevan (1993).

Table.19 Adoption Index of the selected practices in coconut

Sl. No.	Practices	Adoption Quotient
1.	Varieties: WCT, Keraganga, Kerasankara, Kerasree, Lakshaganga, Kalpamithra, Kalparaksha, Kerachandra, Chandrakalpa, Chandrasankara, T*D	84.72
2.	Size of the pit: 1.2m*1.2m*1.2m	70.27
3.	Spacing: 7.6m*7.6m	70.83

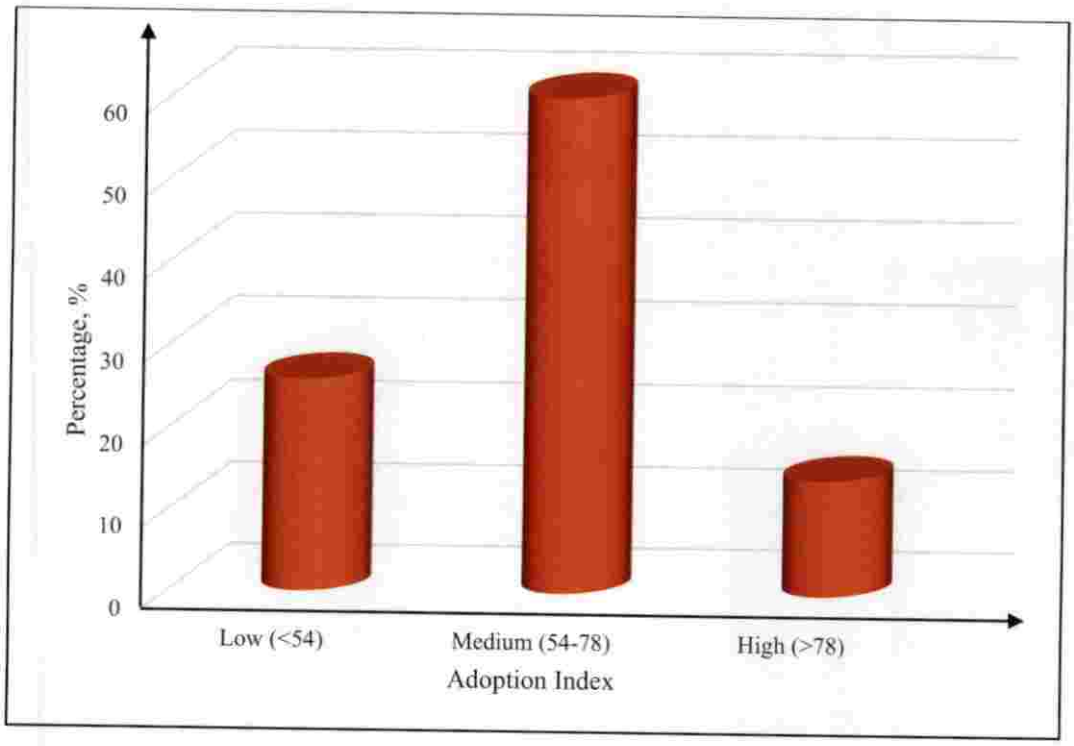


Fig 18: Distribution of farmers based on adoption of technologies

4.	Fertilizer application: 0.5:0.32:1.2 kg/palm/annum	65.28
5.	Under rainfed conditions, apply fertilizers in 2 splits, 1/3 in April-June and 2/3 in Sept-Oct	52.78
6.	Under irrigated conditions, fertilizers can be applied in 3-4 equal split doses.	54.62
7.	Apply Fertilizers and manures in circular basins at a radius of 2m from the base of the palm and 10cm deep	58.89
8.	Irrigation: For first 2 yrs from planting, irrigate@ 45l of water per seedling, once in 4 days, during dry summer months	67.78
9.	To minimize the sun scorch on the trunk, application of lime solution on the trunk upto a height of 2-3m is recommended	55
10.	Burial of 2 layers of husks in the pits is useful for moisture conservation	55
11.	Mulching is an effective method for moisture conservation	52.5
12.	For moisture conservation, lowermost 3-5 leaves may be cut and removed	62.78
13.	Hook out beetles	84.17
14.	Leaf axil filling	67.78
15.	Coconut log trap	61.67
16.	Cut and removal of leaves for management of bud rot	77.78
17.	Roguing/ cut and removal of palms	85.83
Mean = 68.06		

From table 19, it was clear that the adoption index was maximum for variety selection in production practices and roguing or cut and removal of infected and diseased palms in protection practices. This may be due to the fact that these

practices were being promoted by the krishi bhavans and farmers were likely to adopt them more.

4.2.4 Correlation between 'adoption of technologies' and profile characteristics of the coconut farmers

Table.20 Correlation between 'adoption of technologies' and profile characteristics of the coconut farmers

Variables	Correlation
Age	0.057
Education	-0.036
Means of livelihood	-0.018
Experience	0.013
Area	0.072
Annual income	0.266**
Innovation proneness	0.208*
Information seeking ability	0.499**
Decision making ability	0.246**
Social participation	0.060
Scientific orientation	0.157
Risk orientation	0.004
Extension agency contact	0.239**
Extension participation	0.016
If N = 120, r_{table} = 0.179 (5%) & r_{table} = 0.234 (1%)	

(** significant at 1% significant level; * significant at 5% significant level)

The result in table 20 showed that annual income, information seeking ability, decision making ability and extension agency contact were positively and

significantly correlated with 'adoption of technologies' at 1 per cent and innovation proneness was positively and significantly correlated to 'adoption of technologies' at 5 per cent level.

A significant and positive correlation was found between 'adoption of technologies' and annual income of the farmers. The farm income will increase to those farmers who adopt the recommended practices in coconut cultivation because adoption of these practices may lead to reduction in the cost of cultivation and increase in the production and productivity of crops and thereby an increase in income from farming. Similar result was observed by Thippeswamy (2007).

There was a significant and positive correlation between 'adoption of technologies' and information seeking behaviour of the farmers. The farmers who seeks information on the modern technologies and recommended practices are more likely to adopt them. This also attributes to the fact that majority of the farmers seeks information from other fellow farmers and hence, may adopt these on seeing the success of others. Also, authentic information from reliable sources might have facilitated higher level of adoption. Similar result was observed by Sherief *et al.* (2008) and Jacob (2015).

A significant and positive correlation was found between 'adoption of technologies' and decision making ability of the farmers. The socio-demographic background of the farmers such as education levels, the social category they belong to, income level, and landholding size also play a significant role in impacting decision-making aptitudes which might be particularly prominent in production planning and post-harvest and marketing related decisions. This in turn may affect the adoption behaviour of the farmers (Ali and Kumar, 2011).

There was a significant and positive correlation between 'adoption of technologies' and extension agency contact of the farmers. The farmers who can access more technical information through their contact with extension workers might naturally be more influenced by the extension agencies in adoption of innovations and technologies. The learning experience through extension agency

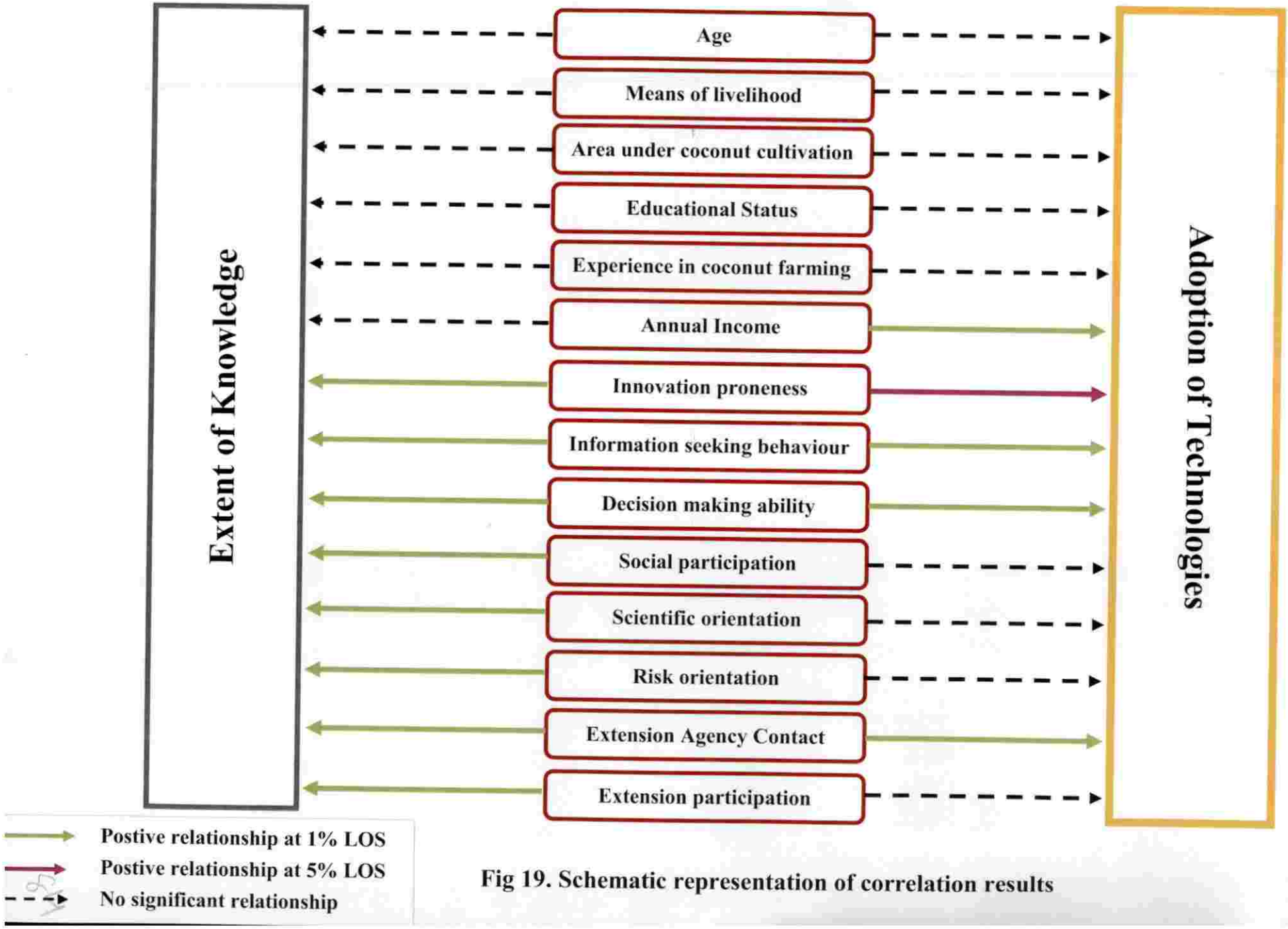


Fig 19. Schematic representation of correlation results

contact asserted that technology package supported with appropriate extension mechanisms based on socio-economic situations and technical parameters might result in wide spread awareness and adoption of technology. The result is in line with findings of Kumar (2004) and Anithakumari *et al.* (2015).

A significant and positive correlation was found between 'adoption of technologies' and innovation proneness of the farmers. Innovative farmers are progressive in outlook and are always keen in updating their farming practices. Hence they tend to seek changes in their farming practices (Sherief *et al.,* 2008). The farmers who may not take up risks of innovation on time due to their more cautious and skeptic nature will have low level of adoption. Similar results were obtained by Oluwasuzi (2014).

4.3 INVENTORISATION OF DIFFERENT EXTENSION APPROACHES

Nine extension approaches in coconut were inventorised after discussion with agricultural officers. The approaches were as following:

4.3.1 Production and distribution of planting material

The objective of the programme was to enhance the production and supply of good quality planting materials through krishi bhavans.

4.3.2 Expansion of area under coconut

The programme was intended to bring in more area under coconut in the potential belts thereby increasing the production potential in the country. For this, the small and marginal farmers were given incentive assistance for undertaking new planting of coconut and its further maintenance. The area under coconut has increased to the extent of 21.71 per cent during the period 1985-96 due to impact of the scheme (Syamlal, 1997).

4.3.3 Technology mission on coconut

Traditionally, coconut was grown for edible oil. It served as an ingredient for various industrial applications too. The changed food habits and availability of other cheaper edible oils both in the edible and industrial sectors, however, have brought out a drastic decline in the use of coconut oil in these areas. During the last few years, the price of coconut oil has been depressed despite the large-scale price support operations undertaken. The Price Support Scheme could not make much impact in pushing up the price level and was not beneficial to the farmers as expected. In this context, it was realized that diversification of coconut derived products and value addition could only help the coconut growers in getting remunerative prices and thus the programme was launched.

4.3.4 Integrated farming for productivity improvement

The programme facilitates the adoption of appropriate coconut based farming systems and promote farm level processing for value addition on a community basis. The scheme was implemented by the Coconut Development Board on cluster basis in a contiguous area of appropriate size of 25-50 ha irrespective of the individual size of the holdings. The selection of the cluster is based on criteria such as demonstration value, easy accessibility, and availability of minimum infrastructure facilities for the adoption of average management practices, cohesiveness of the group and most importantly the readiness of the farmers in the cluster to assume responsibility and implement the programme in a farmer participatory mode as per the Board's guidelines.

4.3.5 Technology demonstrations - INM, IPM, IDM and post-harvest technologies

This scheme was implemented for the maintenance of quality control laboratories, for conducting techno-economic studies on product diversification and by product utilization, for consultancy service on production, processing and marketing and for conducting training programmes on coconut based convenience foods.

4.3.6 Scheme for market promotion

The scheme was being implemented to provide financial assistance for establishment of procurement centres by Farmer Producer Organisations (FPOs).

4.3.7 Coconut palm insurance scheme

Coconut palms are perennial crops, but palm trees were characterized by periodic system of crop setting and outcomes and hence resemble seasonal annual crops and should, accordingly, eligible for insurance cover. Since coconut was cultivated under rain-fed management and was susceptible to biotic and a-biotic stresses, it was necessary to minimize risk faced by coconut farmers, predominantly small and marginal, by covering coconut palms with an insurance scheme. The objectives of the scheme were to assist coconut growers in insuring coconut palms, against natural and other perils, to provide timely relief to farmers, who suffer income loss due to sudden death of palms and to minimize risk and encourage replanting and rejuvenation to make coconut farming remunerative.

4.3.8 Keragramam

The coconut development programme was implemented in continuous areas called Keragramam covering a minimum area of 250 ha. The objective was to increase production and productivity through the activities such as replanting, integrated pests and disease management, integrated nutrient management, promotion of inter cultivation, improving irrigation facilities, promotion of value addition, ensuring availability of quality planting materials and employment generation.

During 2018-19, an amount of Rs.5000.00 lakh was provided for undertaking activities like cultural operations including Integrated Nutrient Management & Integrated Pest Management (INM & IPM), application of organic manure, distribution of climbing device, establishment of coconut nurseries, irrigation units and alike (GOK, 2017).

4.3.9 Institutional on or off campus training programmes

Institutional on or off campus training programmes on various aspects of production, protection and processing of coconut were organized at the headquarters, regional stations and research centres of the Central Plantation Crops Research Institute (CPCRI) to benefit farmers and extension personnel. Besides, training programmes were also being conducted on selected topics on request from individuals and organizations for which training fee would be charged. The farmers of the district were send to attend the training programmes on behalf of their respective krishi bhavans.

4.4 IMPACT OF DIFFERENT EXTENSION APPROACHES

The impact of the delineated extension approaches in coconut are shown in table 21.

Table.21 Impact of the delineated extension approaches

Sl. No.	Extension Approaches	Social Impact	Technological Impact	Economic Impact
1.	Production and distribution of planting material	808	557	718
2.	Expansion of area under coconut	845	459	786
3.	Technology mission on coconut	711	643	651
4.	Integrated farming for productivity improvement	865	628	834
5.	Technology demonstrations - INM, IPM, IDM and post-harvest technologies	697	657	641
6.	Scheme for market promotion	653	409	631
7.	Coconut palm insurance scheme	745	177	673
8.	Keragramam	958	786	891
9.	Institutional on or off campus training programmes	672	606	644

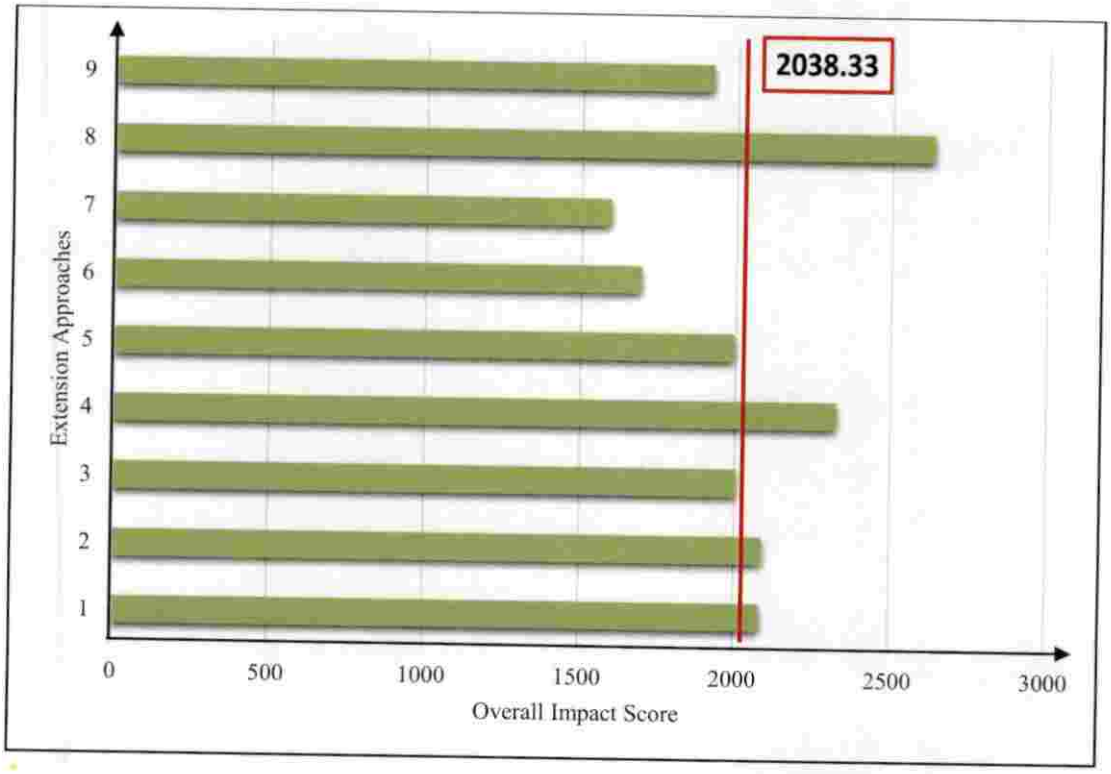


Fig 20: Overall impact of extension approaches

From table 21, it was clearly evident that 'Keragramam' had the maximum social, technological and economic impact. The Keragramam programme was implemented through krishi bhavans and an area of 250 ha was selected for this. This area is a cluster of several individual coconut farmers. The formation of such clusters may lead to pooling of resources which in turn reduce cost of cultivation and thus making an economic impact. Also, machines for value addition and product diversification may be pooled together so as to make them accessible to individual farmers as well as FPOs. This may attribute to the technological impact. All these factors lead to improvement in the livelihood of the farmers and thus making a social impact. Hence, Keragramam programme was found to be the resilient extension approach as it made maximum social, technological and economic impact under the perception of the coconut farmers.

4.4.1 Analysis of variance of the impact of the delineated extension approaches

Table 22. Analysis of variance of the impact of the delineated extension approaches

ANOVA						
Source of variation	SS	df	MS	F	P-value	F crit
Between approaches	258775.3	8	32346.92	3.425557	0.017253*	2.591096
Between impacts	250276.2	2	125138.1	13.2522	0.000403**	3.633723
Error	151085.1	16	9442.819			
Total	660136.7	26				

(** significant at 1% significant level; * significant at 5% significant level)

From table 22, it was clear that there was significant difference between the approaches at 5 per cent level as well as between the social, technological and economic impacts at 1 per cent level. However, the difference was more prominent between the impacts. This may be due to the fact that the farmers were more influenced by the profits made through the different approaches.

4.5 CONSTRAINTS FACED BY THE FARMERS AND STRATEGIES TO OVERCOME THEM

Constraints faced by coconut farmers are shown in table 23.

Table 23. Constraints faced by coconut farmers

Sl. No.	Constraints	Weighted mean	Rank
1.	High labour cost	7.29	1
2.	Non availability of labourers in time	6.77	2
3.	Lack of adequate finance	6.60	3
4.	Inadequate and untimely supply of coconut seedlings	5.36	4
5.	High cost of inputs	5.20	5
6.	Lack of awareness about the different extension approaches	4.43	6
7.	Lack of proper support from extension agents	3.97	7
8.	Low knowledge on plant protection practices	3.06	8
9.	Non availability of sufficient water for irrigation, during summer months	2.40	9

From table 23, it was clear that high cost of labour and non-availability of labourers on time were the major constraints faced by the farmers. Similar results were observed by Kumar (2004) and Singh and Varshney (2016). Major suggestion to overcome these constraints as perceived by the farmers were to explore policy initiatives to mainly reduce the labour cost through mechanisation and low cost production and protection technologies.

Another major constraint observed was lack of adequate finance to undertake the cultivation practices. This can be overcome by formation of farmer producer organizations (FPOs) which in turn can help in pooling of resources so as to make them accessible to every farmers and thus reducing the cost of cultivation.

Inadequate and untimely supply of coconut seedlings, high cost of inputs, lack of awareness about the different extension approaches, lack of proper support from extension agents, low knowledge on plant protection practices, and non-availability of sufficient water for irrigation during summer months were the other constraints faced by the coconut farmers.

The most important suggestions offered by majority of the coconut plantation growers were creating awareness about damaged and deteriorated quality of coconut caused by pests and diseases, establishment of market facilities at local level, fixing reasonable price of pesticides and fertilizers, providing subsidy for chemical fertilizer by government and conducting short term training programme on use of herbicide and plant protection measures. It is necessary to intensify the extension efforts to increase the knowledge level and adoption of recommended coconut technologies, which would help in increasing the production and productivity of coconut at farm level.

Diversification of coconut based farming system can be improved through implementation of community based organizations and thus in turn lead to income generation and sustainable productivity (Krishnakumar *et al.,* 2013). New project interventions that focus on community level awareness and actions, convergence of group efforts, linkage with extension agencies, decentralized production of inputs, participatory monitoring and federating women farmers groups for improved technology access are to be put forth.

4.6 VALIDATION OF HYPOTHESIS

A research hypothesis is a statement created by the researcher when they speculate upon the outcome of the experiment. It must be testable and realistic. In this study the hypothesis set and established were:

1. **There exist no significant difference between profile characteristics of the respondents and extent of knowledge.**

The results from table 17 revealed that out of 14 independent variables eight independent variables viz., innovation proneness, information seeking ability, decision making ability, social participation, scientific orientation, risk orientation, extension agency contact and extension participation were significant at 1 per cent level when correlated with 'extent of knowledge'. This proves that eight profile characteristics of the farmers have significant relationship when correlated with the extent of knowledge of the farmers. Thus, the hypothesis was falsified.

2. **There exist no significant difference between profile characteristics of the respondents and adoption of technologies.**

The results from table 20 revealed that out of 14 independent variables four independent variables viz., annual income, information seeking ability, decision making ability and extension agency contact were significant at 1 per cent level and the variable, innovation proneness was significant at 1 per cent level when correlated with 'adoption of technologies'. This proves that five profile characteristics of the farmers have significant relationship when correlated with the adoption of technologies of the farmers. Thus, the hypothesis was falsified.

3. **There exist no difference between the impacts of delineated extension approaches.**

The results from table 22 revealed that there was significant difference between the impacts made by the extension approaches at 5 per cent level. This proves that each of the delineated extension approach influences the farmers differently. This may be attributed to the fact that each approach had been focused on specific objectives and this can vary between different approaches. Thus, the hypothesis was falsified.

4. There exist no difference between the social, technological and economic impact made by the different approaches

The results from table 22 revealed that there was significant difference between the social, technological and economic impacts of each extension approach at 1 per cent level. This proves that each of the delineated extension approach made social, technological and economic impact on the farmers differently. This may be attributed to the fact that the farmers may be more inclined towards the economic benefits that they receive from the approach in order to ensure sustainability of their livelihood. Thus, the hypothesis was falsified.

Summary

5. SUMMARY

Coconut is considered as 'Kalpavriksha'- an all giving tree in the Indian classics. It is the most popular crop to the people of Kerala and plays an important role in the socio-economic development of the state. Kerala's share in area and production of coconut in the country has declined over time. While Kerala accounted for 69.58 per cent of the area and 69.52 per cent of the production in the country in 1960-61, the corresponding shares declined to 40.2 per cent and 42.12 per cent respectively in 2011-12 (GOK, 2016). Shift in cultivation to other remunerative crops like rubber, high cost of cultivation and low returns from coconut, prevalence of pests and diseases like root wilt, bud rot and alike could be the reasons for the negative growth rate in area and production yield. To overcome these constraints and boost up the production and productivity of the crop, a number of development activities have been introduced and implemented in the State by the State Department of Agriculture, Coconut Development Board and CPCRI.

Hence there was a need to analyse the impact of different extension approaches in coconut farmers, find the resilient one, identify the constraints faced by them and put forward suggestions to augment their livelihood. In this context the present study was conducted during 2018-19 with the following objectives:

- To study the extent of knowledge and adoption of technologies among the coconut farmers
- To study the impact of the different extension approaches being used by different extension agencies in coconut farming and identify the resilient one
- To identify the constraints faced by the coconut farmers and to suggest methods to augment the livelihood of coconut farmers.

The study was undertaken among the coconut farmers of Kozhikode district. The sample of the study comprised of 120 farmers i.e., 15 coconut

farmers from eight panchayats. Research was conducted using the design ex post facto research design.

A pre tested interview schedule was used to collect relevant data from these respondents. After collection, the data was analysed using statistical techniques for obtaining valid interpretations.

Fourteen independent variables for were selected and the correlation of independent variables with extent of knowledge and adoption of technologies were analysed.

5.1 Salient Features of the study

1. Majority of the respondents (75%) belonged to the age group of 'middle' that range between 42 to 57 years of age.
2. More than half of the respondents (54.17%) had farming as their sole means of livelihood and 45.83 per cent of the farmers did farming along with other activities.
3. Majority of the respondents (67.5%) have an area between 51 to 111 cents under coconut cultivation.
4. Sixty per cent of the respondents had an educational qualification up to high school or higher secondary, followed by respondents with qualification up to middle school (20%).
5. All the respondents had more than ten years of experience in coconut farming. More than half of the respondents (57.5%) had 16 to 25 years of experience.
6. About 50 per cent of the respondents belonged to medium category of annual income (Rs.38,250- Rs.55,840).
7. Majority of the respondents (74.17%) fall under medium category based on their innovation proneness.
8. More than half of the respondents (60.83%) belonged to medium category based on their information seeking behaviour. 24.17 and 15 per cent of them belonged to high and low categories respectively.

9. Majority of the respondents regularly sought information from other fellow farmers (90%), krishi bhavan (76.67%) and newspapers (57.5%). Television (55.83%) and agricultural literatures (50%) were used occasionally by the respondents as major sources of information. More than half of the respondents (58.33%) never used information kiosks for seeking information.
10. Majority of the farmers (72.5%) had medium level of decision making ability. About 17 per cent of the respondents had high level of decision making ability and only 10 per cent of them had low level of decision making ability.
11. About half of the respondents (48.5%) were not members of any organisation. Less number of respondents (43%) have membership in other organisations and only 8.5 per cent were office bearers of these organisations.
12. In case of frequency of participation in social organizations, more than half of the respondents (57%) occasionally attended the meetings and 37.83 per cent never participated in the meetings. Percentage of respondents regularly attending any meetings was low (5.17%).
13. Majority of the respondents (76.67%) were under medium category of scientific orientation. This was followed by respondents with high (11.33%) and low (11.33%) scientific orientation.
14. 72.5 per cent of the respondents had medium level of risk orientation.
15. Majority of respondents had medium level of extension agency contact (62.5%) and about 25 per cent of them had high level of extension agency contact.
16. More than half of the respondents (60%) ensured medium participation in extension activities and only a small portion of respondents (16.67%) was found with high participation. Also, 23.33 per cent of the respondents could ensure low participation.
17. More than half of the farmers (56.67%) possessed medium level of knowledge about the recommended coconut farming practices. Only a

small fraction of farmers (12.5%) were yet to gain an equally better knowledge about the practices.

18. More than half of the farmers (60%) were medium adopters of the recommended cultivation practices in coconut. About 25 per cent of the farmers were in low category and only 14.17 per cent belonged to the high category.
19. The adoption index was maximum for variety selection in production practices and roguing or cut and removal of infected and diseased palms in protection practices.
20. 'Extent of knowledge' was positively and significantly correlated with innovation proneness, information seeking ability, decision making ability, social participation, scientific orientation, risk orientation, extension agency contact and extension participation had at 1 per cent level.
21. 'Adoption of technologies' was postively and significantly correlated with annual income, information seeking ability, decision making ability and extension agency contact at 1 per cent and innovation proneness was positively and significantly correlated to 'adoption of technologies' at 5 per cent level.
22. Nine extension approaches in coconut were inventorised and they were:
    - Production and distribution of planting material
    - Expansion of area under coconut
    - Technology mission on coconut
    - Integrated farming for productivity improvement
    - Technology demonstrations - INM, IPM, IDM and post-harvest technologies
    - Scheme for market promotion
    - Coconut palm insurance scheme
    - Keragramam
    - Institutional on or off campus training programmes
23. 'Keragramam' had the maximum social, technological and economic impact and hence, it was found to be the resilient extension approach.

24. There was significant difference between the approaches at 5 per cent level as well as between the social, technological and economic impacts at 1 per cent level.
25. High cost of labour and non-availability of labourers on time were the major constraints faced by the farmers.
26. Major suggestion to overcome these constraints as perceived by the farmers were to explore policy initiatives to mainly reduce the labour cost through mechanisation and low cost production and protection technologies.
27. Another major constraint observed was lack of adequate finance to undertake the cultivation practices. This can be overcome by formation of farmer producer organizations (FPOs) which in turn can help in pooling of resources so as to make them accessible to every farmers and thus reducing the cost of cultivation.

5.2 Future Line of Work

1. Similar studies can be done in other districts and AEUs of Kerala.
2. Critical analysis on the effectiveness of the extension approaches can be studied using appropriate mechanisms in order for policy improvement coconut farming.
3. Diversification of coconut based farming system should be promoted through implementation of community based organizations.
4. Comprehensive approach should be taken to form cluster groups of farmers in order to facilitate polling of resources.

Plate 1. Collecting data from the farmer

Plate 2. A typical coconut farm located at Kayakkody panchayat

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Appendices

APPENDIX I

KERALA AGRICULTURAL UNIVERSITY
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Dr. Allan Thomas
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Date:

Sir/Madam,

Ms. Greeshma Susan Mathew (Ad. No. 2017-11-058), the post graduate student in the Department of Agricultural Extension, College of Agriculture, Vellayani is undertaking a research study entitled "Augmenting the Livelihood of Coconut Farmers through Resilient Extension Approach." 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

(Allan Thomas)

OBJECTIVES OF THE STUDY

To study the extent of knowledge and adoption of technologies among the coconut farmers, to study the impact of the different extension approaches being used by different extension agencies in coconut farming and identify the resilient one, to identify the constraints faced by the coconut farmers and to suggest methods to augment the livelihood of coconut farmers.

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.	**Age**	Refers to the number of years completed by the respondent at the time of interview					
2.	**Education**	The academic qualification obtained by the individual through formal and informal education that helps that person to understand information and interpret it is the educational status of the individual					
3.	**Occupation**	Work done by a farmer to sustain his livelihood is termed as the occupation of that individual					
4.	**Family size**	Refers to the number of family members in each respondent's household.					
5.	**Family type**	Refers to the type of the family to which the respondent belongs to.					
6.	**Annual income**	Refers to the earnings of respondent per annum.					
7.	**Total land holding**	The extent of land an individual possessed and cultivated is termed as land holding.					
8.	**Experience in farming**	Refers to the total number of chronological years the respondent has been engaged in farming					

9.	**Institutional interventions**	Refers to the support received by the organisation from formal and non-formal institutions in terms of finance, training, technology and information.					
10.	**Innovativeness**	Refers to the degree to which an individual is relatively earlier in adopting new ideas than other members of the social system.					
11.	**Innovation proneness**	Refers to the keenness of the respondent in accepting new ideas and seeking changes in farming techniques and to introduce such changes into their farm operations when practical and feasible.					
12.	**Market intelligence**	The market related information received by farmers from the organisation and its extent of usefulness is measured by this variable.					
13.	**Market orientation**	Refers to the means or opportunity to get the inputs for coconut cultivation as well as to sell the outputs.					
14.	**Training**	Refers to the number of trainings undergone by the respondent in various activities related to coconut production by different agricultural institutions.					
15.	**Experience in coconut cultivation**	Refers to the number of years the respondent has been engaged in coconut production.					
16.	**Extension agency contact**	Refers to degree to which the respondent meets the extension agents for information related to various aspects of coconut cultivation.					
17.	**Extension participation**	Refers to participation of farmers in activities or programmes like meetings, seminar etc. organized by various agencies.					
18.	**Cosmopoliteness**	Refers to the extent of contact with outside of his social system such as nearest farmer's					

		cooperatives, padashekhara samities, farmer's clubs etc.					
19.	**Economic motivation**	Refers to the extent to which respondent is oriented to obtain profit and the relative value placed on economic ends so that it influences further adoption or its sustenance related to agriculture.					
20.	**Information seeking behaviour**	Refers to the sources or channels from which the respondents get technological information regarding agriculture and related area.					
21.	**Attitude**	Refers to the degree of positive and negative approach of respondent towards the adoption of technology.					
22.	**Risk orientation**	Refers to the degree to which the farmer is oriented towards encountering risks and uncertainity in adopting new ideas related to coconut cultivation.					
23.	**Social participation**	Refers to the degree of involvement and participation of the respondents in various formal and informal organizations either as member or as office bearer.					
24.	**Decision making ability**	It is operationally defined as the ability of the respondents to select the most efficient means from among the available alternatives without depending on others.					
25.	**Scientific orientation**	Refers to the degree to which a farmer is oriented to the use of scientific methods in decision making and in farming.					
26.	**Knowledge about coconut production practices**	Refers to the extent of information possessed by the coconut growers on recommended practices.					
27.	**Level of satisfaction**	Refers to the degree to which the respondents feel satisfied with the technology					

28.	**Technology optimism**	Refers to the belief of the respondent that technological growth or advance will get more output per unit input.					
29.	**Technology proficiency**	Refers to the capability of the respondent to utilise the technology in the field level in order to achieve the expected outputs.					
30.	**If any other, specify**						

Place:

Date:

Name and Designation

APPENDIX II

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI, TRIVANDRUM
DEPARTMENT OF AGRICULTURAL EXTENSION

INTERVIEW SCHEDULE

"Augmenting the Livelihood of Coconut Farmers through Resilient Extension Approach."

No. Date:

Name of Block:

Name of Panchayat:

Name and address of respondent:

1. **Age:**
2. **Area:**
3. **Educational status**: (please tick (✓) wherever applicable)

   Illiterate ☐ Can read and write ☐ Primary school ☐ Middle school ☐

   High school ☐ Diploma ☐ Degree ☐

4. **Occupational status: (please** tick (✓) wherever applicable)

   Farming as a sole profession ☐

   Farming + other ☐

5. **Annual Income:**
6. **Experience in coconut farming (in yrs):**
7. **Innovation proneness:** (please tick (✓) wherever applicable)

Sl. No.	Statements	SA	S	UD	DA	SDA

1	You would feel restless unless, you tryout an innovative method which you have come across					
2	You are cautious about trying out new practices					
3	You like to keep up to date information about the subjects of your interest					
4	You would prefer to 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					

8. Information Seeking behaviour (please tick (✓) wherever applicable)

Sl. No.	Category	Frequently (3)	Rarely (2)	Never (1)
1	Radio			
2	Television			
3	Newspaper			
4	Magazines			
5	Agrl. Literatures			
6	KIOSKs			
7	Mobile phone applications			
8	Krishi Bhavan			
9	Fellow growers			

9. Decision making ability (please tick (✓) wherever applicable)

Sl no	Statements	SA	A	UD	DA	SDA
1	I interpret problems by examining the pros and cons and make decisions					
2	I will not take a decision without conferring others					
3	In general, I prolong my choices					
4	Once I take a decision, I will stick on it					
5	I need more time to take a decision					
6	I can take firm decision and initiate action when there are more					

	alternatives					

10. Social Participation: (please tick (✓) wherever applicable)

Organization	Nature of Participation			Frequency of Particpation		
	Not a member (1)	Member (2)	Office bearer (3)	Never (1)	Sometimes (2)	Regularly (3)
Panchayat						
Co-op Society						
Farmers Club						
Youth Club						
Socio-Cultural Organization						

11. Scientific orientation (please tick (✓) wherever applicable)

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 fathers is still the best way to farm today					
3	Even a farmer with a lot of experience should use new methods in farming					
4	A good farmer experiments with new ideas in farming					
5	Though it takes time for 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					

12. Risk orientation (please tick (✓) wherever applicable)

Sl no	Statements	SA	A	UD	DA	SDA
1	A farmer should grow intercrops to avoid risks involved in growing coconut alone					
2	A farmer should take more chance in making a big profit than to be content with smaller but less risky profit					
3	A farmer who is willing to take greater risk than the average farmer usually is rich					
4	It is good for a farmer to take risk when he knows his chance of success is fairly high					
5	It is better for a farmer not to follow commercial coconut cultivation practices unless most of the farmers in the locality have used it with success					
6	Trying an innovative coconut farming technique is beneficial even though an element of failure is involved in it					

13. Extension agency contact: (please tick (✓) wherever applicable)

14. Extension participation: (please tick (✓) wherever applicable)

Extension personnel	Frequency of Exposure		
	Regularly(3)	Occasionally(2)	Never
Agricultural Scientist			
Agricultural Officer			
Agricultural Assistant			
KVK			
ATMA			

Activities	Frequency of Participation

	Regularly(3)	Occasionally(2)	Never(1)
Seminars			
Exhibitions			
Demonstrations			
Exposure visit			

15. Extent of knowledge: (Knowledge test)

Sl. No.	Questions	Score
1	What is the best time for planting the coconut seedlings?	
2	What is the spacing recommended by KAU in planting coconut seedlings?	
3	Do you know that there should be 6-8 leaves in 10-12 month old seedlings that are selected for planting?	
4	What is the pit size for planting coconut seedlings	
5	Whether the pits are filled by top soil while planting?	
6	What is the height below the ground level to be filled with top soil?	
7	Do you know that the seedlings are to be removed from nursery by lifting with spade and cutting the roots?	
8	What should be the frequency of irrigation for young palms upto 2 years age, during dry summer months?	
9	How many split doses of fertilizers are applied under rainfed conditions?	
10	How many split doses of fertilizers are applied under irrigated conditions?	
11	Do you know the approximate quantity of fertilizers required for the following fertilizers for a bearing palm under good management conditions?	
12	Do you know about the beneficial effects of burial of husk in coconut gardens?	
13	Do you know that the husk is to be buried in layers with concave surface facing upwards?	
14	How many years the effect of husk burial will last in retaining moisture in coconut gardens?	
15	What should be applied on the trunk to minimize the sun scorch?	
16	Name the intercrops that are recommended in young	

	coconut plantation upto 3-4 years?	
17	Do you know about the method of leaf axil filling in coconut which acts as a prophylactic measure?	

16. Adoption of Technologies:

Sl. No.	Practices	Adopt (3)	Partially Adopt (2)	Not Adopt (1)
1	Varieties: WCT, Keraganga, Kerasankara, Kerasree, Lakshaganga, Kalpamithra, Kalparaksha, Kerachandra, Chandrakalpa			
2	Size of the pit: 1.2m*1.2m*1.2m			
3	Spacing: 7.6m*7.6m			
4	Fertilizer application: 0.5:0.32:1.2 kg/palm/annum			
5	Under rainfed conditions, apply fertilizers in 2 splits, 1/3 in April-June and 2/3 in Sept-Oct			
6	Under irrigated conditions, fertilizers can be applied in 3-4 equal split doses.			
7	Apply Fertilizers and manures in circular basins at a radius of 2m from the base of the palm and 10cm deep			
8	Irrigation: For first 2 yrs from planting, irrigate@ 45l of water per seedling, once in 4 days, during dry summer months			
9	To minimize the sun scorch on the trunk, application of lime solution on the trunk upto a height of 2-3m is recommended			
10	Burial of 2 layers of husks in the pits is useful for moisture conservation			
11	Mulching is an effective method for moisture conservation			
12	For moisture conservation, lowermost 3-5 leaves may be cut and removed			
13	Hook out beetles			
14	Leaf axil filling			

15	Coconut log trap			
16	Cut and removal of leaves for management of bud rot			
17	Roguing/ cut and removal of palms			

17. Impact of different extension approaches

Sl. No.	Extension Approaches	Social Impact	Technological Impact	Economic Impact
1.	Production and distribution of planting material	808	557	718
2.	Expansion of area under coconut	845	459	786
3.	Technology mission on coconut	711	643	651
4.	Integrated farming for productivity improvement	865	628	834
5.	Technology demonstrations - INM, IPM, IDM and post-harvest technologies	697	657	641
6.	Scheme for market promotion	653	409	631
7.	Coconut palm insurance scheme	745	177	673
8.	Keragramam	958	786	891
9.	Institutional on or off campus training programmes	672	606	644

18. Constraints faced by the farmers:

Sl. No.	Constraints	Rank
1	High labour cost	
2	Non availability of labourers in time	

3	Inadequate and untimely supply of coconut seedlings	
4	Non availability of climbers for carrying out plant protection and harvesting	
5	Lack of adequate finance	
6	High cost of inputs	
7	Non availability of sufficient water for irrigation, during summer months	
8	Lack of proper support from extension agents	
9	Non availability of plant protection equipments	
10	Lack of awareness about the different extension approaches	

19. Suggestions for improvement:

AUGMENTING THE LIVELIHOOD OF COCONUT FARMERS THROUGH RESILIENT EXTENSION APPROACH

by

GREESHMA SUSAN MATHEW

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ABSTRACT

The study entitled "Augmenting the Livelihood of Coconut Farmers through Resilient Extension Approach" was undertaken in the year 2017-19. The objectives were to study the extent of knowledge and adoption of technologies among the coconut farmers, to study the impact of the different extension approaches being used by different extension agencies in coconut farming and identify the resilient one, to identify the constraints faced by the coconut farmers and to suggest methods to augment the livelihood of coconut farmers. A total of 120 respondents were selected from Kozhikode district for the study.

The results of the study on socio-economic profile of coconut farmers revealed that 75 per cent of the respondents were middle aged (42-57 years). 54.17 per cent of the respondents had only farming as the sole occupation wherein 67.5 per cent of the respondents possessed an area ranging from 51-111 cents under coconut. Majority (80% and 85%) of the respondents had more than high school level of education and fifteen years of experience in coconut cultivation. The mean annual income of the coconut farmers was Rs. 52125.

Innovation proneness was high (mean=14.36) for the coconut farmers and 74.17% of respondents belonged to medium category. Majority of the respondents (72.5%) had medium level of decision making ability and 90 per cent of the respondents seeks information from other fellow farmers regularly. The respondents (50%) had low level of social participation. Majority of the respondents (76% and 72.5%) had medium level of scientific orientation and risk orientation respectively. More than 60 per cent of the respondents participated in different extension activities like seminars, exhibitions, demonstrations, etc.

The dependent variables of the study were 'extent of knowledge' and 'adoption of technologies'. About 56.67 per cent of the respondents had medium level of knowledge on coconut cultivation. Correlation of extent of knowledge with the 14 independent variables revealed that eight variables had positive and significant relationship at 1% level of significance.

The adoption quotients were worked out for 12 selected practices under plant production and five practices under plant protection. Selection of recommended varieties (84.72) and roguing/ cut and removal of diseased and infected palms (85.73) were the practices with maximum adoption quotient. Correlation of adoption of technologies with the 14 independent variables revealed that five variables had positive and significant relationship. Among these, four variables, viz., annual income, information seeking ability, decision making ability and extension agency contact were significant at 1% level of significance.

The extension approaches inventorised were, production and distribution of planting material, expansion of area under coconut, technology mission on coconut, integrated farming for productivity improvement, technology demonstrations - INM, IPM, IDM and post-harvest technologies, schemes for market promotion, coconut palm insurance scheme, Keragramam and institutional on or off campus training programmes. The impact of different extension approaches in coconut farming were studied on the basis of social impact, technological impact and economic impact. It revealed that there was significant difference between the selected extension approaches (5% level of significance) and between the impacts (1% level of significance). Keragramam had the maximum social, technological and economic impacts and hence, this approach was found to be the resilient extension approach.

Finally, the study explored the constraints faced by the respondents. High cost of labour (7.29) was one of the major constraints. Non availability of labourers in time (6.77) and lack of adequate finance (6.60) were the important constraints. Inadequate and untimely supply of coconut seedlings, high cost of inputs, lack of awareness about the different extension approaches, lack of proper support from extension agents, low knowledge on plant protection practices, and non-availability of sufficient water for irrigation during summer months were the other constraints faced by the coconut farmers.

Major suggestions to overcome the constraints as perceived by the farmers was to explore policy initiatives to mainly reduce the labour cost through mechanisation and low cost production and protection technologies, creating awareness about damaged and deteriorated quality of coconut caused by pests and diseases, establishment of market facilities at local level, fixing reasonable price of pesticides and fertilizers, providing subsidy for chemical fertilizer by government and conducting short term training programme on use of herbicide and plant protection measures. It is necessary to intensify the extension efforts to increase the knowledge level and adoption of recommended coconut technologies, which would help in increasing the production and productivity of coconut at farm level.