TECHNOLOGY UTILISATION OF ORGANIC PLANT PROTECTION PRACTICES OF KAU

by

APARNA. K.V
(2015-11-076)

THESIS

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DECLARATION

I, hereby declare that this thesis entitled **"TECHNOLOGY UTILISATION OF ORGANIC PLANT PROTECTION PRACTICES OF KAU"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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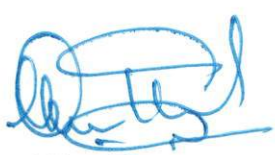
Certified that this thesis entitled **"TECHNOLOGY UTILISATION OF ORGANIC PLANT PROTECTION PRACTICES OF KAU"** is a record of research work done independently by Mrs. Aparna K.V. under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her.



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Aparna. K. V

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LIST OF ABBREVIATIONS AND SYMBOLS USED

%	Per cent
@	At
DoA	Directorate of Agriculture
et al.	And co-workers
F	Frequency
FGD	Focus Group Discussion
Fig.	Figure
FYM	Farm Yard Manure
KAU	Kerala Agricultural University
KB	Krishi Bhavan
KVK	Krishi Vigyan Kendra
NGO	Non Governmental Organisation
No.	Number
OVF	Organic Vegetable Farming
PARC	Pakistan Agricultural research foundation
Q	Quartiles
R&D	Research and Development
SD	Standard deviation
SE	Standard Error
TOT	Transfer Of Technology

Introduction

CHAPTER 1

INTRODUCTION

"Among more than 150 cotton farmers in the districts of Adilabad, Karimnagar, and Warangal in the Telengana region who have committed suicide since 1997, the first five of them in the first five days of January 1998 consumed the same pesticide they used 40 times a year to get rid of Spodoptera, supposedly an 'insignificant' agricultural pest. The pest is not dying, but the farmers are."

(Richard, 1998)

Oelhaf (1978) quoted "The side-effects of the modern agricultural chemicals and machines raise serious questions about the overall benefits of the new technology. Chemical fertilisers and pesticides pollute our air and water. Agricultural chemicals, including hormones and antibiotics leave residue in food that may cause cancer or genetic damage. Soil and energy resources are being depleted.

The un-sustainability of modern agricultural practices through its unscrupulous use have led farming communities the world over to look for alternatives. The majority of these alternatives call for a back to nature policy, a return to traditional, eco-friendly practices. Organic farming is one among them. Organic farming over the last few decades has proved to be successful; but the differences in culture, ecology and geographical factors necessitate adoption of situation-specific principles and techniques.

Perhaps the most revealing statement put forward in the late 1990's on the agricultural situation in Kerala through the Kerala State Resource based Perspective Plan 2020 AD (Kerala State Land Use Board, 1997) gives a bird's eye-view of agriculture in Kerala where in it strongly recommends the adoption of sustainable agriculture through organic production cum protection practices at the earliest. It is one of the most precise indictments on the state's sorry state of

agricultural affairs. Irrespective of crops, noteworthy among the observations are those on decreasing use of organic manures in the fields and the negative impacts of chemical pesticides. The KSLUB Report recommends popularisation of biofertilisers and green manures; to initiate a 'Green manure perennial planting Programme'; mechanical plants for manufacture of compost in Corporations and Municipalities, minimisation of use of insecticides; and to take up biological and mechanical control of rodents (Nair, 1981).

The ultimate goal of farmers in sustainable agriculture are to (1) maintain or improve the natural resource base, (2) protect the environment, (3) ensure profitability, (4) conserve energy, (5)increase productivity, (6) improve food quality and safety, and (7) create more viable socio-economic infrastructure for farms and rural communities. But the key to any forms of sustainability is the component of profitability. To be economically viable, farmers should be able to produce enough for self-sufficiency and income and ensure sufficient returns to meet the costs.

The yield as well as resource conservation and minimal risks should the measure of the sustainable farm, but should not be at the cost of farmer's life as profit determines the continuance of farming in agriculture. Therefore a change to organic farming cannot mean a return to the traditional way of life. A few non-conforming individuals may opt for it, but not the majority who want to improve their living standards. Esoteric aesthetics, principles and values may appeal to them, but not to the vast majority whose principal objective is to get richer and improve in terms of socio-economic constructs of their life. Hence, a practical blend of scientific and organic practices was an option proposed in different studies. The view for such a thought process is to minimize the use of chemicals with alternative safe organic plant protection practices.

The farmers of Kerala are in the process of evolution and yet some have failed but new options are being tested out. In this study, the focus was to look into the adoption of organic practices for plant protection with more focus on

vegetable crops. The observations made could serve as guidelines to take a realistic view for those who plan to switch over to eco-friendly agricultural practices.

Government of Kerala in Kerala State Organic Farming Policy: Strategy and action plan reported on the role of Kerala Agricultural University Under the main head 'strategy 21' mainly focussing on reorienting research, education and extension system to support the laid in Organic farming Policy of the state. (GOK, 2008).

Agricultural practices, world over, have been undergoing changes over a period of time. The intensification of land use with increased dependence on agro-chemicals resulted in stagnation of crop yield in many situations, which necessitated a change to a sustainable farming system approach having inbuilt features of equilibrium between farming and nature. This type of farming system, later on, came to be known as organic farming (KAU, 2009).

With a view to promote organic practices Kerala Agricultural University has developed standard organic Plant Protection practices and has been given the mandate of further exploration of organic plant protection practices by the Government of Kerala. Hence, it becomes essential to study the extent of adoption of such practices and factors affecting the rate of adoption. The study by Balachandran (2004) reported the non-availability of organic plant protection formulations and adequate quality organic manure which forced farmers to choose the chemical option, much to their dislike. Therefore constraints faced by the farmers using organic plant protection practices needs to be identified and solutions to overcome the constraints as perceived by the farmers needs to be probed. With all the aforesaid facts in mind the objectives of the study was framed.

Objectives of the study

- ✓ Adoption of standard organic plant protection practices.
- ✓ Factors affecting rate of adoption of organic plant protection practices.
- ✓ Constraints in the process of adoption, if any with suggestions for refinement.

Scope of the study

The results of this study may help to streamline strategies to overcome the problems faced by the farmers using organic plant protection practices. The youth can be attracted towards organic farming by highlighting the prospects. This study becomes important since it is aimed at assessing the level of adoption and the different factors contributing to the adoption of selected practices of organic plant protection. Large amount of agricultural activities takes place through homegardens as it is believed that there are 66 lakhs of homegardens. It amounts to 60-70 per cent of the land area. Hence, farm and farmer friendly practices needs to be developed, disseminated and scaled up. This study will therefore help in assessing the technology needs and factors therein for the system sustainability of agricultural technologies especially with reference to organic plant protection practices. Hence, its impact assessment in terms of adoption study assumes significance.

Limitations of the study

The research was part of post graduate programme. It was done in short period of time and with limitations in finance and other sources. The study was limited to 3 blocks of Thiruvananthapuram district and hence there are inherent difficulties in generalizing the results. The data were gathered by personal interview with the farmer respondents and most of the response from farmers was recall memory. It was not based on written records. Hence the chances of bias do exist. In spite of these limitations the researcher took every effort to make the research objective and systematic.

Organisation of thesis

The entire thesis presented in five chapters:

Introduction is the first chapter, in which importance of topic; objectives, scope and limitation of research are presented. In the second chapter was the review of literature. It deals with previous works and findings in relation with objectives. The third chapter methodology which explains research design, study area, measurements of dependent and independent variables, tools for data collection and statistical tools used are illustrated. The fourth chapter describes results and discussion and the last chapter explains summary of research. At the end references, abstract and appendices are given.

Review of Literature

CHAPTER-11

REVIEW OF LITERATURE

A review of literature is an evaluative report ought to portray, condense, assess and illuminate the literature that gave a theoretical orientation about the research and aid us to determine the nature of research. The review of literature goes past the output for information and consolidates the recognizing verification and clarification of associations between the written work and the field of research. Review of literature is mainly used for secondary data collection. It is not an original experimental work and it does not report a new one. The new facts are compared with earliest studies for gathering evidence. In this chapter discussion takes place on the study entitled on 'Technology utilization of organic plant protection practices of KAU'. This chapter mainly deals with dependent variables, independent variables, relation with extent of adoption and independent variables and constraints cum suggestions for refinement. Review of literature is presented under the following headings.

1. Personal and social characteristics of farmers.
2. Awareness and knowledge of farmers
3. Preferences, perceived usefulness and effectiveness
4. Level of adoption
5. Extent of adoption and independent variables
6. Technology need/gaps
7. Farmers practices.
8. Reasons for non-adoption
9. Constraints experienced by the farmer with suggestions for refinement

1. PERSONAL AND SOCIAL CHARACTERISTICS OF FARMERS

Adoption of any agricultural activities relies upon the socio-pshychological characteristics of farmers (Sherief, 2002). Farmers' adoption of enhanced innovations can be impacted by different elements. The socio-

individual elements are among such components that assume a prime part in the person's choice to embrace an innovation or not. A few writing are available referring to such components impacting adoption of innovations by farmers.

1.1 ***Age***

Chronological age is basically an estimation of time, not an impression of age-related changes and advancement. (Schwall, 2012)

Ogunyemi (2005) reported that in organic farming some labour intensive programmes are involved. But older farmers may not have enough energy to do that. So that age is a slackening factor for organic farming. Also he opined that adoption can vary inversely with age because of this, adoption of any innovation on organic farming may not be as high as expected.

Jayawardhana (2007) in a study entitled on 'organic agricultural practices in coconut based homesteads in Thiruvananthapuram' deduced that majority of the coconut based homestead farmers (84%) comes under the old age category.

Solomon (2008) deduced that 51 years was the mean age of oil palm growers; younger people were less interested in organic farming than the older ones.

Chouichom and Yamao (2010) opined that 48 years was the average age of organic rice farmers and it was higher than of non organic farmers.

Khaledi *et al.* (2011) reported that well educated and young age farmers use small area from their cultivated land to organic practice and those with old age farmers use large area.

Oyesola *et al.* (2011) inferred that 40 and 70 years were the ages of majority (90%) respondents, with the mean age of 53.8 years and only 10% youth were there.

Anupama (2014) in a study on 'content development for agricultural expert system on organic vegetable cultivation' deduced that more than 50% of the organic farmers (58%) are included in the old age category and 42% is included in the middle age category.

Mondal *et al.* (2014) reported that majority (70%) of the organic vegetable growers belongs to above 50 years of age in North Eastern Thailand and young farmers are not accepting agricultural jobs.

Sasidharan (2015) opined that among the farmers of vegetable and banana crops, more than 50% of the farmers belonged to middle aged category. 37 % and 30% belonged to old age category in vegetable and banana crops respectively.

Singh *et al.* (2015) inferred that older farmers are reluctant to change and thus has a tendency to not adopt organic farming.

1.2. Education

Education is production of desirable changes in human behavior *i.e.* change in knowledge, change in attitude and change in skill. (Sharma, 2012)

Rathinasabapathi (1987) in a study on 'knowledge and extent of adoption of integrated pest management for cotton' opined that education had positive and non-significant association with adoption of improved paddy cultivation practices.

Quazi and Iqbal (1991) reported that education was an important determinant of innovation adoption.

Kamalakkannan (2003) deduced that majority of vegetable growers (70%) studied up to medium level education.

Jaganathan (2004) in a study entitled 'analysis of organic farming practices in vegetable cultivation in Thiruvananthapuram district' inferred that majority of respondents (52%) had secondary level education.

According to Lapar and Ehui (2004) the relatively well educated and resourceful persons are expected to adopt innovations more than the less-educated ones.

Jayawardhana (2007) in study on 'organic agricultural practices in coconut based homesteads' inferred that most of the coconut based homestead farmers (42%) studied upto primary school education.

Patel (2008) in a study on production and marketing management behavior of organic vegetable growers deduced that moderate number (38.57%) of respondents had high school level education followed by middle school education.

Solomon (2008) reported that majority of present day farmers had some formal education.

Oyesola *et al.* (2011) in a study of organic farming stated that majority (80.6%) of the respondents had formal education and rest of them had no formal education.

Sasidharan (2015) stated that 48% of the vegetable farmers and 52% of the banana growers had high school level education and another 47% and 33% studied upto primary school education respectively. .

Shaban (2015) opined that farmers had higher education level and better attitudes towards organic farming are more likely to convert.

1.3 Occupation

Occupation is characterized as the fundamental employment and other extra livelihoods that the respondents were having at the time of interview. A couple of writing identified with this is furnished beneath.

Rathinasapabathi (1987) reported that there is a non-significant relationship of occupation with extent of adoption of integrated pest management practices in cotton.

Kamalakkannan (2001) in a study on 'content analysis of selected mass media in dissemination of farm technology' revealed that majority (60%) of the respondents were having farming as their primary occupation.

Kafle (2011) observed that occupation have no impact on organic vegetable production.

Basheer (2016) opined that majority of farmers had agriculture as the only job (84.44%) while 15.56% of farmers had other jobs along with agriculture.

1.4 Farm size

Farm size is characterized as the aggregate cultivating land possessed by the farmer for agricultural exercises and is expressed in acres. A few studies related to this are presented below.

Fayas (2003) observed that in vegetable cultivation majority of farmers (84.4%) had medium level of area.

Priya (2003) deduced that in vegetable cultivation 85% of the vegetable growers had medium level of area.

Suthan (2003) opined that 37.33% of the respondents' had 0.25 acres of vegetable cultivation.

Balachandran (2004) inferred that about 53% of small and marginal farmers had land holdings up to 2 acres, as compared to 44% with land holdings above 2 acres up to 25 acres.

Khaledi *et al.* (2011) opined that when farm area increases farmers are not adopting organic practices because of labour demand.

According to Singh and George (2012) the farmers carried out organic farming in a relatively smaller proportion of their land holding.

Sasidharan (2015) observed that 52% of the respondents were having less than 0.10 ha of organic vegetable cultivating area and 43% of the respondents were having up to0.10 to 0 .40 ha area.

1.5 Farming experience

Farming experience is defined as the number of completed years in farming. Some studies connected with this are presented underneath.

Fayas (2003) revealed that 75% of the respondents had more than 20 years of experience in vegetable cultivation.

Suthan (2003) stated that 40% of the farmers had 6-10 years of farming experience in vegetable cultivation.

Jaganathan (2004) reported in a study on 'analysis of organic farming practices in vegetable cultivation in Thiruvananthapuram district' that 47% of farmers were having medium level of experience in vegetable cultivation

Elaikka (2007) observed that the farmers (43%) possess high level of farming experience followed by low (34%) and medium (23%) level of experience.

Jayawardhana (2007) in study entitled 'organic agricultural practices in coconut homesteads in Thiruvananthapuram' inferred that 38% of the farmer respondents in homestead were having more than 25 years of experience in coconut cultivation.

The study on production and marketing management behavior of organic vegetable growers conducted by Patel (2008) deduced that around fifty percent of respondents had less than 3 years of experience in organic farming whereas one fourth of the farmers had (23%) the experience in organic farming for more than 6 years.

Sidram (2008) revealed that majority of farmers (82%) had low experience ; while only 17% of the farmers had high experience in organic pigeon pea cultivation.

Adesope *et al.* (2011) reported that those who have very long farming experience are usually old; they are less educated and thus are more reluctant to change to organic farming.

Anupama (2014) deduced in a study on 'content development for agricultural expert system on organic vegetable cultivation' that majority of the vegetable growers (54%) were having more than 25 years of farming experience.

Sasidharan (2015) stated that 95% of farmers had experience in organic farming. 42% of the vegetable growers and 52% of the banana growers had less than 3 years of experience in organic farming.

1.6 Economic motivation

Economic motivation is defined as the occupational motives of farmers practicing organic measures intended for profit maximization and relative value the farmer places on monetary gain.

Ananthamanikandan (2003) in study entitled on 'content analysis and audience research on farm and home programmes ' revealed that majority of the respondents of audience of dooradarshan had medium level of economic motivation.

Fayas (2003) in his work, opined that more than half (86%) of the respondents had medium level of economic motivation.

Priya (2003) in her study on vegetable growers stated that majority of vegetable growers (92%) had medium level of economic motivation.

Suthan (2003) opined that more than half of the vegetable growers (57.33%) had high level of economic motivation.

As per Sheeder and Lynne (2009) economic concerns are the fundamental factor of adoption of organic farming.

Jaganathan *et al.* (2012) inferred that economic motivation among farmers was due to reduction in cost of production which may increase their profits.

Sujitha (2015) opined that more than half of respondents had low level of economic motivation.

Anupama (2014) in a study entitled 'content development for agricultural expert system on organic vegetable cultivation' stated that majority (78%) of the organic farmers were highly economically motivated.

1.7 Market perception

It is operationalized as the organization wide generation of market intelligence pertaining to current and future customer needs, dissemination of intelligence across departments and organization wise responsiveness to it.

Foster and Lampkin (2000) inferred that in major markets like Europe, North America, and Japan, the market for organic products is growing, likewise many other countries, including developing countries.

The major markets for organic products are developed countries (FAO, 2001).

Fayas (2003) inferred that 89% of the vegetable farmers had high level of market perception.

According to Panyakul & Sukjirattikarn (2003) the prices of conventional vegetables in the supermarkets of the capital city of Bangkok could be 2-3 times less than the prices of organic vegetables.

Suthan (2003) observed that majority of the respondents (54.67%) had high market perception.

Jaganathan (2004) observed that more than 50% of the respondents had medium level of market perception and respondents' attitude and awareness towards the organic farming practices had a positive and significant relationship with market perception.

Elaikka (2007) revealed that majority (60%) of the farmers had medium level of market perception, followed by high level (22%) and low level (17%).

Sidram (2008) found that majority of the farmers sold their produce at prevailing price (72.67%), in regulated market (90.00%) through commission agents (77.50%) in organic pigeon pea cultivation.

The study conducted by Chandrashekar (2010) stated that market value of conventional products were 25per cent less than the organic products because of the perceived health benefits of organic food.

Sasidharan (2015) found that with respect to organic products, majority (82%) of the organic vegetable growers had low market perception, while high market perception was observed in 18% of the farmers.

1.8 Environmental concern

It refers to the farmers concern for the environment that has prompted them for embracing organic farming practices in their farm.

Logananadhan (2002) stated that 54% of the farmers shifted to organic farming mainly due to environmental care or awareness about environmental safety and ill effects of hazardous practices followed in organic farming.

Organic farming is an environmentally sustainable farming hence it reduces use of pesticides and fertilisers. (Vogeler *et al.* 2006; Wood *et al.* 2006).

According to Jaganathan (2009) the organic farmers were treating their farms as a living organism and they were mostly using locally available inputs in their farming which did not harm the environment.

Best (2010) inferred that adoption of organic farming had direct and indirect effect of environmental orientation.

Mondal *et al.* (2014) opined that 47% of the respondents convinced that chemical pesticide can be used at a critical stage for organic vegetable cultivation. Another 37% of farmers did not know that chemical pesticide should not be used in organic vegetable cultivation.

Sasidharan (2015) reported more than 50% of vegetable growers (75%) had high environmental orientation, whereas one fourth (25%) of the farmers had low environmental orientation.

Ullah *et al.* (2015) reported that by adopting organic farming the farmer income can be increased and protect environment from pollution by avoiding the toxic chemicals and fertilisers.

1.9. Rational orientation

Rational orientation is defined as the extent of rationality and scientific belief of farmer practicing organic practices.

Rajendran (1992) in a study entitled on feasibility and utilization of agricultural technologies among scheduled caste farmers stated that there was

positive and significant relationship between rational orientations of scheduled caste farming families to the extent of adoption.

Thomas (2004) in a study on 'problems and prospects of medicinal plant cultivation in Thiruvananthapurm' reported that there was no relation between rational orientation of homegarden farmers to extent of adoption.

According to Krishnan (2013) more than half of the sampled farmers had belief on science and religion rather than belief on religion or science alone.

Jacob (2015) reported that about 93 per cent of farmers had medium to high level of rational orientation.

1.10. Risk orientation

Risk orientation refers to degree to which an organic farmer is situated towards hazard and vulnerability in embracing organic plant protection practices.

Majjusha (2000) found that there is equal percentage (50%) of cowpea growers who had high and low risk orientation.

Sreedaya (2000) stated that majority of vegetable growers (66%) had low risk orientation followed by equal percentage of respondents (17%) with medium and high risk orientation.

Fayas (2003) deduced that more than half (90%) of the vegetable growers had medium level of risk orientation.

Suthan (2003) reported that 58.67% of the farmers had medium level of risk orientation.

Jaganathan (2004) observed that nearly three fourth of the respondents had medium level of risk orientation.

1.11 Attitude towards organic plant protection practices

Thrustone (1935) defined attitude as the degree of positive or negative feeling associated with some psychological objects.

According to Suthan (2003) in a study on analysis of farmers participation in the participatory technology development process vis- a-vis plant protection in vegetable at Kunnathukal panchayat deduced that more than half of the farmers (60%) had low attitude towards scientific agricultural practices.

Zutinic and Tratnik (2009) reported that the attitude of vegetable farmers towards the organic farming is positive, more than that of other farmers.

According to Sadati *et al.* (2010) participation in extension classes, availability of extension communication channels, education level and farm size were the effective factors of farmers attitude towards organic farming.

Nayakarathna *et al.* (2013) inferred that the attitudes of farmers are positive towards organic paddy farming with extended benefits and health impacts.

Mohan and Helen (2014) inferred that majority of organic and conventional farmers had positive attitude towards organic farming.

According to Oluwasusi (2014) most of the farmers had positive attitude towards organic farming practices.

1.12 Extension orientation

Extension orientation is the perspective wherein the farmers look for help and support for innovation know how and is measured as far as both extension participation and extension contact commitment by various organizations/specialists occupied with the field of agriculture. Some studies connected with this are presented below.

Manoj (2000) deduced that 48.57% of the farmers had high level of extension orientation.

Arunkumar (2002) in his study revealed that 48.50% of the respondents had regular contact with extension agencies.

According to Smith (2002) there are many extension agencies like non-governmental organizations trying to promote organic farming.

Reddy (2003) opined that majority (60%) of the respondents were having medium level of extension contact followed by low (24.67%) and high (15.33%) levels of extension contact respectively.

Suthan (2003) opined that majority of the vegetable growers (60%) had high level of extension orientation.

The study conducted by Kratdemiryrek *et al.* (2012) reported that by conducting better extension services and farmers' training activities relating to organic agriculture focusing on raising the educational level of growers, facilitating growers with greater access to credit to increase farm land and to enhance farm assets are factors that may accelerate the process of conversion to organic hazelnut production.

Baiyegunhi (2013) stated that the higher the degree of connectedness of a community the more easily people would able to transfer information and the more people this information is likely to reach.

Floyd *et al.* (2013) inferred that the level of adoption technologies in the western hills of Nepal was consistently and significantly affected by the level of extension contact.

Yadav *et al.* (2013) opined that for spreading organic farming practices agricultural extension workers have a role.

Anupama (2014) deduced in a study on 'content development for agricultural expert system on organic vegetable cultivation' that majority (67%) of vegetable farmers respondents had medium extension orientation, followed by low (19%) and high (11%) levels of extension orientation.

1.13 Information source utilization

Information source utilization is characterized as the distinctive sources through which information on organic plant protection practices are acquired by farmer.

Kuttan (2005) in a study entitled 'credibility of the news media' deduced that old aged respondents use TV as their source of information.

Government of India (2011) revealed that in Kerala urban households of 32.2% and rural households of 27.7% are using radio as their source of information.

As per Oyesola *et al.* (2011) farmers ought to enlighten on various organic methods of controlling weeds, pest and diseases, through the information sources.

Approximately 60 percent of organic rice farmers have information from extension agents (government and NGOs operators), from the group meeting. About18 per cent of organic farmers have got information from their neighboring farmers (relatives and companions), followed by broad communications (TV and radio) 14 percent (Pornpratansombat, 2011).

Sobha (2013) in a study entitled 'farm telecast in Kerala' stated that 22.22% of respondents having high level of mass media exposure where as more than half of the respondents (67.78%) were having medium level of mass media exposure.

Jacob (2015) inferred that most beautiful mass media was television followed by newspaper and magazines.

2 AWARENESS AND KNOWLEDGE OF FARMERS

2.1 Knowledge

Knowledge is the insight or acknowledgment, ability to act, and understanding that dwells or is contained within the mind or in the brain. (Liew, 2007)

Both in organic and inorganic farmers had very low and high levels of knowledge observed by Jeyaraj (1997).

The study conducted by Bernice (2000) stated that injudicious use of insecticides causes well documented side effects and hence it is desirable to evaluate another method for the pest management practices.

Sharma (2006) deduced that knowledge of plant protection measures had positive and significant relationship with their adoption.

Elakkia (2007) reported that major proportion of the farmers had high level of knowledge about organic farming.

Tippeswamy (2007) observed that majority of the coconut growers (61.88%) had medium knowledge about plant protection measures, while 28.75% had high knowledge. More than 40% of the farmers had the knowledge of Bordeaux paste to control the bud rot disease.

According Sidram (2008) more than half (63%) of the respondents had medium level of knowledge about organic pigeon pea farming practices. When individual organic farming practices were taken, majority of the respondents had knowledge about recommended seed rate (81%), recommended sowing time (98%), application of FYM (100%), vermicompost (100%) and jeevamruth

(98%), summer ploughing (100%), crop rotation (96%), pheromone traps (98%) and NSKE (100%)

Assis and Ismail (2011) opined that the knowledge on organic farming concepts such as the use of chemical insecticides, herbicides and fertilisers of farmers is still need to be improved.

Jaganathan *et al.* (2012) opined that Organic farmers had better knowledge than inorganic farmers

Kumar *et al.* (2014) stated that majority of farmers in Harda district of Madhyapradesh (68.87%) had medium category of knowledge.

According to Istrate *et al.* (2014) 47% of farmers had knowledge about organic farming from media followed by 37% from the school.

Mondal *et al.* (2014) reported that less than half of the respondents had a medium level of knowledge. But there were no organic vegetable growers who had high level of knowledge.

Sujitha (2015) found that more than half of the respondents were having high level of knowledge on plant protection practices.

2.2 Awareness on organic plant protection practices

As per word reference of behavioral sciences awareness is being conscious of something seeing and assessing some occasion, event and experience or protest.

Krishnamurthy *et al.* (1997) stated that majority (65%) of the respondents had awareness about the application of chemical fertilisers while 61.66% had awareness about plant protection measures.

Jaganathan (2004) observed that 80 to 90% farmers had well awareness about organic farming practices like summer ploughing, in situ incorporation of crop residues, raising green manure crops and incorporation, selection of good seeds, application of FYM, application of poultry manure, timely irrigation, crop rotation, intercropping systems, mulching, hand/mechanical weeding and destruction of plants affected with pests and diseases.

The farmers were aware that pests could be controlled by locally made bio-pesticides, many farmers have been using bio-pesticides made from locally available ingredients such as molasses, neem leaves and citronella grass. (Gopal and Kanokporn , 2011)

Sasidaran (2015) noticed that major proportion (67%) of vegetable growers had medium level of awareness about organic farming technologies while an equal percentage of farmers belong to the low (18%) and high (15%) category.

According to Jaganathan (2016) most of the farmers do not have awareness on advanced organic farming practices such as, application of bio pesticides and bio fertilisers.

3. PREFERENCES, PERCEIVED USEFULNESS AND EFFECTIVENESS

The study conducted by Gopal and Kanokporn (2011) inferred that many farmers would be interested to practice OVF only if they get required amount of organic fertiliser and locally made bio-pesticides.

De Graaff *et al.* (2008) deduced that if a farmer would be willing to adopt any new technology only after finding out that such technology is compatible with the local conditions.

According to Jacob (2015) guaranteed market and cost effectiveness were the two most important reasons for preferring perennial crops such as coconut and pepper in homegardens.

As per Basheer (2016) market preference was the vital motive for preferring bittergourd cultivation.

4. LEVEL OF ADOPTION

Adoption

As indicated by Rogers (1962) adoption process does the mental procedure through which an individual goes from first know how about an innovation to its final adoption.

Both Thiagarajan and Ramachandran (2001) inferred that more than two fifth (43.33%) of the respondents had low level of adoption regarding bio-fertiliser practices in paddy, followed by 31.67% and 25% of them had high and medium level of adoption respectively.

The innovation Theory (Rogers, 2003) stated that adoption of an innovation depends on the attributes of the innovation, social norms and communication channels which are used as information sources to reduce uncertainty about the innovation.

According to Noorjehan (2004) adoption of organic farming practices in sugarcane observed that, cent per cent adoption was found in the application of farm yard manure, green manure, bio fertilisers and bio pesticides.

Tippeswamy (2007) in the study of plant protection measures of coconut cultivation noticed that over one- fourth (28%) of the farmers fully adopted the application of Bordeaux paste to control bud rot and more than 51 percent did not adopt the application of Bordeaux paste.

According to Sivakumar (2011) none of the farmers adopted the recommended dose of pesticides or fertilisers. The study found that the farmers

had a tendency towards the adoption of chemical pesticides for the pest management in vegetables.

According to Kumar (2012) nearly three fourth of the respondents (72.67%) adopted recommended dose of chemical fertilisers, followed by 63.33% of the respondent who had adopted the correct concentration of pesticides in Cole crop cultivation.

Ram *et al.* (2012) in the study entitled 'Adoption Level of IPM Practices in Cabbage and Cauliflower growers of Manipur' reported that most of the respondents had medium level of adoption of IPM practices while equal percent of respondents (20%) had high and low level of adoption, respectively.

Sujitha (2015) in her study on adoption of KAU plant protection practices reported that majority of respondents (70%) had medium level of adoption.

5. EXTENT OF ADOPTION AND RELATION WITH INDEPENDENT VARIABLES.

Social and individual qualities of farmer respondents are the central point impacting adoption of improved technologies.

Rathinasabapathi (1987) in a study entitled 'knowledge and extent of adoption of integrated pest management for cotton' opined that education had positive and non-significant association with adoption of improved paddy cultivation practices.

According to Bourdillon *et al.* (2002) the extent of adoption of organic farming practices was significantly influenced by knowledge, environmental orientation and awareness of vegetable growers.

Loganadhan and Singh (2003) stated that adoption behaviour of farmers is affected by their socio-economic characteristics such as education, farm size, social interest and communication skills.

The study conducted by Jaganathan (2004) reported that the extent of adoption of organic farming activities was greatly affected by knowledge, environmental orientation and awareness of vegetable farmers.

According to Rousan (2007) attitude towards change, education, farm income, farmers' exposure, and income level are the most important socio-economic components affecting adoption of farm innovation.

Chanu *et al.* (2014) inferred that socio- economic characters like education, land holding, annual income, attitude towards present day agricultural technology, mass media exposure, extension contact, information sources utilized, value added product management show the positive and significant relation with adoption level of pineapple cultivators.

Sasidaran (2015) reported that age, farming experience and farm size had non significant relationship with extent of adoption. Also he opined that education had significant and positive relationship with extent of adoption.

Sujitha (2015) stated that age, information source utilization and extension contribution had significant positive relationship with the adoption of selected plant protection practices of KAU.

6. TECHNOLOGY NEED/GAPS

Farmers utilize better technology for their prosperity. So technology is most essential in their field of activity. Basic evaluation of the past work done in this field is given below:

Technology needs

Technology is the orderly information of activity, typically modern procedures however relevant to any intermittent action. (Mc Graw, 1982)

As per Rogers (1995), the level of trial-ability impacts the extent of adoption of any technologies.

The study conducted by Cornejo and McBride (2002) and Erenstein (2006) in organic coffee farming stated that adoption can be encouraged if the technology is labour-saving.

Farmers favour the technology with low input but high benefit and ensure high productivity conducted by Truong and Ryuichi (2002)

Kelly *et al.* (2003) suggested that research and extension systems that have derisory information flows, adverse (example, top down and non participatory) incentive structures and exceedingly intricate organizational structures can prevent the effective design and execution of even technically sound interventions

Farmers would receive any new technology simply subsequent to discovering that such technology is perfect with the local conditions (De Graaff *et al.* 2008).

In the context of technologies for adaptation in agriculture, it may involve identification and assessment of agricultural practices and technologies that enhance productivity, food security and resilience in specific agro-ecological zones and farming systems (UNFCCC, 2014a)

7. FARMERS PRACTICES

It is characterized as the agrarian practices done by the farmer all alone in his farm through his own intuition and experience.

According to Manoj (2000) the practice of using poultry manure instead of FYM was rated as the most efficient farmer practice in rice cultivation

8. REASONS FOR NON-ADOPTION

Non adoption of enhanced technologies can be ascribed to many reasons. Many authors have referred to differed explanations behind not embracing an imaginative routine with regards to which couple of important ones are exhibited underneath.

The study conducted by Thippeswmy *et al.* (2008) reported that Non availability of plant protection inputs and lack of technical knowledge regarding plant protection measures are the important reasons for non adoption of plant protection measures

Oinam and Sudhakar (2014) observed that the reason of non adoption of recommended pest and disease management techniques in paddy were unawareness about pest and disease management techniques, non availability of labour and high cost of chemicals.

According to Kabir (2015) lack of knowledge about IPM practice which also included the use of pheromone traps that is most applicable to cucurbits is one of the most important reason or barrier to adoption

9. CONSTRAINTS EXPERIENCED BY THE FARMERS WITH SUGGESTIONS FOR REFINEMENT

The issues and challenges confronted by the farmers throughout the period of cultivation are incorporated as constraints for the review.

9.1 Constraints in adoption

Sriram (1997) in his study stated that a vast majority of the respondents (92.50%) had labour scarcity as the first and foremost constraint while following

ecofriendly agricultural practices, followed by lack of assured irrigation (87.50%) and the lack of technical guidance on the use and application of bio-control agents(56.56%).

Ongunsumi *et al.* (2002) inferred that non-availability of inputs, transportation and finance and lack of market information were the major constraints in cowpea cultivation.

Balachandran (2004) in a study entitled on 'the status of organic farming in Kerala' deduced that lack of awareness and knowledge about organic farming as important constraint in adoption of organic practices.

Singh (2004) noticed that rainfall, drought, lack of knowledge on improved dry land practices, lack of finance and low produce were most important constraints.

Patel (2008) showed that the major constraint identified by all the organic vegetable growers were non-availability of labour and lack of research support for providing rationality of traditional organic practices.

Verma *et al.* (2012) suggested that the constraints in adoption of organic farming observed are low income and low yield in terms of non adoption of recommended organic farming practices while 98.33 per cent respondents were lacking in training facility regarding organic farming.

9.2 Suggestion for refinement of technology

Gangadharan (1993) in his study revealed that development of low cost technologies for the control of pest and diseases was a solution suggested by 56% of farmers. 49% of the farmers suggested production and distribution of good quality planting materials.

Materials and Methods

CHAPTER 111

METHODOLOGY

This chapter deals with the brief discussion of methods and procedures that were followed for meeting the objectives set forth in this study. The materials and methods followed in this study are presented under the following headings.

3.1 Research design

3.2 Location of study

3.3 Selection of respondents

3.4 Selection of recommended practices

3.5 Operationalisation and measurement of variables

3.5.1. Measurement of independent variables

3.5.2. Measurement of dependent variable

3.6 Preferences, perceived usefulness and effectiveness of selected organic plant protection practices of KAU

3.7. Technology need/gaps for the selected practices

3.8. Farmers practices

3.9. Reasons for non-adoption of the recommended practices

3.10. Constraints experienced by the farmers

3.11. Suggestions for refinement

3.12. Data collection procedure

3.13. Statistical tools used

3.1 Research design

Research design ensures the evidence obtained to effectively address the research problem, logically, coherently and unambiguously as possible. According to Burns and Grove (2003) research design is "a framework for conducting a study with maximum control over factors that may interfere with the faithfulness of the findings". In this study 'Ex-post-facto' research design was used. This research design had little chance to control over the independent variable. Hence no manipulation is possible because the variables are inherently not changeable. (Kerlinger, 1983)

Fig 1. Location map of study area

3.2 Location of study

Marginal and small scale farmers of Thiruvananthapuram district were purposively selected for the study (Technology utilisation of organic plant protection practices of KAU).

The respondent groups comprised of organic farmers of Thiruvananthapuram district. Marginal and small scale farmers were selected for this study. There were 11 blocks in Thiruvananthapuram district. From 11 blocks total 3 blocks with maximum vegetable growers were selected in consultation with Assistant Director Office. From each block one panchayat each was selected in consultation with Assistant Director Office namely Nedumangad, Kunnathukal and Chenkal.

3.3 Selection of respondents

From each panchayt 30 marginal or small scale farmers were randomly selected in consultation with agricultural officers of respective panchayat. Thus a total of 90 organic vegetable farmer respondents were selected for the study.

3.4 Selection of recommended practices

A list of 15 plant protection practices were delineated from the organic Package of Practices of KAU (2011) in discussion with subject matter specialist.

3.5 opertionalisation and measurement of variables

3.5.1. Measurement of independent variables

A list of 36 independent variables was selected based on personal characteristics of respondents for meeting the objectives of study. (Appendix 1) These were collected by the processes such as review of literature and discussion with subject matter specialists. Then the variables list was sent to 25 judges for rating. The rating was done on 5 point continuum *ie*, most relevant, more relevant, relevant, less relevant and least relevant. The scoring pattern is given below.

Category	Code
Most relevant	5
More relevant	4
Relevant	3
Less relevant	2
Least relevant	1

Out of 25 judges 20 responded. Finally 14 independent variables were selected for the study based on the criterion of mean relevancy score. (Appendix 2) Mean relevancy score was obtained by summing up the weightages obtained by each variable and dividing it by the total number of judges that responded. Those variables which had scores more than mean score were selected for the study.

The final variables selected for the study were age, education, occupation, farming experience, farm size, information source utilization, extension orientation, economic motivation, rational orientation, risk orientation, market perception, environmental concern, attitude towards organic plant protection practices and awareness on organic plant protection practices.

Independent variables and their measurement are given below in Table 1.

Table 1. Independent variables and measurement

Sl no	Independent Variable	Measurement
1	Age	Actual chronological age and classification based on census report, 2011.
2	Education	Categorized by Thomas (2004) with slight modifications.
3	Occupation	Vocation of the farmer respondent at the time of interview.
4	Farm size	Actual area in acres.
5	Farming experience	Experience of the farmer in organic cultivation expressed in terms of number of years.
6	Economic motivation	Fayas (2003) with slight modification.
7	Market perception	Method used by Hanjabam (2013) with slight modification.
8	Environmental concern	Method used by Sreevalsan (1995) with slight modification.
9	Rational orientation	Method used by Jacob (2015) with slight modification.
10	Risk orientation	Method used by Thomas (2004) with slight modification.
11	Attitude towards organic plant protection practices	Method used by Sasidharan (2015) with slight modification.
12	Extension orientation	Method used by Bhaskaran (1979) with slight modification.

13	Information source utilization	Scoring procedure developed for the study.
14	Awareness on organic plant protection practices.	Awareness index by Mathilagan and Senthil kumar (2002) with slight modification.

3.5.1.1. Age

In this study age is defined as the number of calendar years completed by the respondent at the time of interview. This was measured as the total number of years completed by the respondent at the time of interview and was categorized based on census report, 2011.

Age category	Years
Young	<35 years
Middle aged	35-55 years
Old aged	>55 years

The respondents were categorized into three groups *viz*, young, middle and old aged and the results were expressed in terms of frequency and percentage.

3.5.1.2. Education

In this study education refers to highest academic qualification possessed by the farmer at the time of data enumeration. The scoring procedure adopted by Thomas (2004) with slight modification was used for the study. One score was added to every successful completion of formal schooling and the respondent farmers were categorized based on their level of education.

category	Code
Illiterate	0
Primary	1-4
Middle	5-7
High school	8-12
Collegiate	>13

The results were then expressed as frequency and percent

3.5.1.3. Occupation

In this study occupation is defined as the main vocation and other additional vocations that the respondents were possessing at the time of interview. The scoring pattern followed for the study was as depicted below.

Category	Score
Primary (agriculture alone)	2
Secondary (Others+Agriculture)	1

The respondents were further classified based on their vocation and expressed as frequency and percentage.

3.5.1.4. Farm size

In this study farm size is defined as the total farming land owned by the farmer for agricultural activities and is expressed in acres. The respondents were categorized into different categories and presented as frequency and percentage.

Category	Code
<1 acre	1
1-2 acre	2
>2 acre	3

3.5.1.5. Farming experience

In this study farming experience is defined as the number of completed years in farming. Based on this, the farmers were categorized into four categories as given below.

Category	Code
<1 year	1
1-<3 years	2
3-5 years	3
Above 5 year	4

3.5.1.9. Rational orientation

Rational orientation is defined as the extent of rationality and scientific belief of farmer practicing organic practices. The measurement used by Jacob (2015) is followed for this study.

Category	score
Belief in stars alone	1
Belief in stars and scientific recommendation	2
Belief only in scientific recommendations	3

3.5.1.6. Economic motivation

Economic motivation is defined as the occupational motives of farmers practicing organic measures intended for profit maximization and relative value the farmer places on monetary gain. The measurement adopted by Fayas (2003) was used in this study. The scale consists of 4 statements as given below of which 3 were positive statements and 1 was negative statement.

Sl no	Statements	Economic motivation		
		SA	A	DA
1	Organic farming gives more profit than conventional farming			
2	Supermarkets/ retailers want more organic fruit and vegetables.			
3	Consumers are ready to pay premium price for organic products.			
4	It is difficult for the farmer children to make good start unless he provides them with economic assistance.			

The maximum score obtainable was 12 and minimum score was 4 for individual respondent. According to the quartiles, farmers were categorized as high, medium and low levels of economic motivation.

3.5.1.7. Market perception

It was operationalized as the organizations wide generation of market intelligence pertaining to current and future customer needs, dissemination of intelligence across departments and organization wide responsiveness to it. The scale developed by Hanjabam (2013) was used with slight modification. Method consisted of scoring of responses obtained to selective questions presented to the respondents to elicit their perception of the market of produce. The statements and its scoring are mentioned below.

1. Organic commodities are expensive by nature; therefore, not all the consumers can afford to buy them, is it so?
   a. Yes (1) b. No (0)
2. Do you find it difficult to sell the produce in local market?
   a. Very difficult(1) b. Difficult(2) c. Easy(3) d. Very easy(4)
3. How much price the organic produce will fetch compared to those produced under conventional methods?
   a. Low (1) b. Same (2) c. High (3)

The total score obtained by individual farmers will be computed. The maximum score obtainable was 24 and minimum score was 6. According to the quartiles, the farmer respondents were categorized as high, medium and low.

3.5.1.8. Environmental concern

It refers to the farmers concern for the environment that has prompted them for embracing organic farming practices in their farm. The scale followed by Sreevalsan (1995) was used for the study with slight modification. The scale comprised of eight statements with responses agrees or disagree. For agree the score was one and for disagree the score was zero. The statements in the scale are presented below.

Sl. No.	Statement	Agree	Disagree
1	Excessive and exploitative uses of pesticides pose threat to earth and human kind.		
2	Soil pollution, air pollution and water pollution are the major environmental issues concerned by humans.		
3	Do you agree that older method of farming were safer than the present ones by the statement that present trend reduce the use of chemical measures?		
4	Tastier and healthier agricultural products are obtained by the use of organic plant protection measures.		

5	Agro chemicals can be used during emergency situations		
6	Recommended dose of agro chemicals in correct quantity shall be used		
7	Man is destroying the earth too much.		
8	Organic plant protection measures cannot harm surroundings.		

The maximum score attainable was 16 and minimum score was 8. Based on the quartiles, the farmer respondents were categorized into high, medium and low.

3.5.1.10. Risk orientation

Risk orientation refers to degree to which a farmer who practices organic measures is oriented towards risk and uncertainty in adopting organic plant protection practices. In this study risk orientation was measured by asking the respondents five questions in a 3 point continuum. A score value of 3 was assumed for high risk, 2 for moderate risk and one for low risk. The total score obtained by a respondent was then worked out. The maximum score attainable was 15 and minimum was 5. The respondents were grouped as belonging to high, medium and low risk categories based on quartiles.

Category	Score
High	>Q1
Medium	Between Q1 and Q3
Low	<Q1

3.5.1.11. Attitude towards organic plant protection practices

Attitude was defined as Positive or negative feeling of the farmer towards organic plant protection practices. Ten statements were used for measuring attitude. The scoring pattern is given below.

Category	Code
Agree	3
Undecided	2
Disagree	1

The maximum score achievable was 30 and minimum score was 10 for the individual respondent. Based on the quartiles farmer respondents were grouped into high, medium and low.

3.5.1.12. Extension orientation

Extension orientation was defined as the point of reference wherein the farmers seek help and supports for technology know how. In this study it was measured in terms of both extension participation of farmers and extension contribution by different agencies /agents engaged in the field of agriculture. Extension orientation was measured using the scoring procedure developed by Bhaskaran (1979).

Extension participation: in this study extension participation means the level of involvement of farmers in different extension programmes viz, study tour, seminar, mela, meeting and demonstration. By adding up the score values of different extension programmes, obtained by the respondents the total score was calculated. The scoring pattern is given below.

Extension participation

Response	Score
Whenever conducted	3
Sometimes	2
Never	1

Likewise extension contact was measured in this study as to the dependency of farmers with different support systems or individual rendering extension advice services, namely, KAU, KB, KVK, friends and neighbours and NGO. The scoring pattern is as follows.

Extension contact

Response	Score
Regularly	3
Often	2
Not often	1

By adding up of the values of various extension agencies, the total score was obtained. Extension orientation was total score obtained by adding up the

score obtained for both extension contact and extension participation. The maximum score attainable was 30 and minimum score was 10. Based on the quartiles the farmer respondents were grouped into high, medium and low.

3.5.1.13. Information source utilization

In this study information source utilization was defined as the different sources through which information on organic plant protection practices were obtained by farmer. Information sources like newspaper, television, magazine, mobile advisory services, kiosk, radio and friends or relatives were classified and scored as not often, often and regularly. The information source utilization was measured in terms of the frequency of use of information source the respondents rely on and the relative usefulness of the information source. In case of frequency of use of the information source, the measurement was done as given below.

Category	Score
Not often	1
Often	2
Regularly	3

In case of extent of usefulness of the information source, the measurement was done as given below.

Category	Score
Not useful	1
Useful	2
Very useful	3

By summing up the scores obtained from 'frequency of use of information source' and 'extent of usefulness of information source', value for information source utilization is arrived at. The cumulative maximum score achievable was 42 and minimum was 14, considering the scores obtained from both 'frequency of use of information source' and 'extent of usefulness of information source'. According to quartiles obtained from the summing up of frequencies the farmer respondents were grouped into high, medium and low.

3.5.1.14. Awareness

Awareness in this study is defined as the extent to which the respondents were familiar with organic plant protection practices. The awareness of farmers

on organic plant protection practices were measured using the awareness index developed by Mathialagan and Senthilkumar (2012) with slight modifications.

Ten recommended plant protection practices from organic Package Of Practices of KAU, 2011 were included in the study after conducting focus group discussion with subject matter experts. Awareness was measured by using two point continuums, aware or not aware with score 1 and 0 respectively. The maximum score that could be obtained was 10 and the minimum score was 0. The total score for awareness was measured by adding the scores obtained by each farmer for each practice. According to the quartiles, the farmer respondents were grouped into high, medium and low.

3.5.2. Measurement of dependent variable

3.5.2.1. Adoption

Adoption in this study was referred to making full use of the recommended organic plant protection practices in vegetable cultivation by the farmers.

Extent of adoption was measured using the formulae mentioned below developed by Chttopadhyay (1963) and modified by Singh and Singh (1967):

$$AQ = \frac{\sum_{i=1}^{n} \frac{e_i}{p_i} X\ 100}{N}$$

Where,

AQ = Adoption quotient

ei = Extent of adoption of each practice

pi = Potentiality of adoption of each practice

N = Total number of practices selected.

After calculating the adoption quotient for each practice the respondents were categorized as high, medium and low adopters. Also based on the total adoption quotient score of each farmer they were further categorized into different adopter categories as put forth by Rogers (2003).

3.5.2.2. Knowledge

Knowledge in this study was defined as the level of understanding of different organic protection practices as stated in the recommended package of practices. Knowledge of farmers on different aspects of organic plant protection practices would be measured using a 'teacher made test'. Fifteen recommended protection practices from organic Package of Practices of KAU (2011) were selected. After judges opinion the protection practices were finalized. A score of one was given for the known practice and zero for the unknown practice. The total score was obtained by adding up the scores for each practice of each respondent. The maximum score that could be attained by a farmer was 15 and minimum was zero. The farmer respondents were then categorized based on quartiles and grouped as high, medium and low.

3.6. Preferences, perceived usefulness and effectiveness of selected organic plant protection practices of KAU

Protection preferences for the selected organic protection practices were identified. Different protection criterions were assigned. The criterions were: cost effectiveness, sustainability, family safe food concept, ease in operation, compatibility with management practice, eco friendliness, local resource utilization, safety in handling, availability of inputs and immediacy of effect.

The selected criterion from the protection practices were ranked in decreasing order of preferences, that is, highest rank was given for the most preferred reason and the lowest rank for the least preferred reason.

Perceived effectiveness and usefulness of KAU protection practices were categorised as 'effective', 'not effective' and 'useful' and 'not useful' as perceived by the farmers who adopt organic plant protection practices. The perceived effectiveness and usefulness were expressed as percentages.

3.7. Technology need/gaps for the selected practices

Technology needs of organic farmer regarding various plant protection practices were worked out after a pilot survey and discussion with experts. The needs assessment was developed by Thomas (2004) and used by Jacob (2015).

Criteria	Score
Technology not available	1
Technology available but not applicable	2
Technology available but not sustainable	3
Technology available applicable and sustainable	4

Technology needs were calculated for different selected parameters such as botanicals, soil solarization, seed treatment, equipments, plant protection chemicals, biocontrol agents, resistant variety, trap crop, natural predators and bio pesticides. The maximum score that could be obtained was 40 and minimum was 10. The total score with low value was considered as most needed technology.

3.8. Farmers practices

In this study farmer practice was defined as the agricultural practices done by the farmer on his own farm. The practices followed by farmers were based on frequency of use and the same was measured as given below.

Category	score
Rarely	1
Moderately	2
Frequently	3

3.9. Reasons for non-adoption of the recommended practices

Various general reasons were collected after review of literature and discussion with subject matter specialist. A list was prepared and given to the respondents for scoring. The reasons were ranked from 5 to 1. The highest score indicates most important reason. For each reason mean of score was found out and ranked from decreasing order. Based on the mean score reasons were ranked from highest to lowest. High mean score indicates that it was the most important reason for non adoption of organic plant protection practices.

3.10. Constraints experienced by the farmers

After discussion with farmers, scientists, experts in agriculture and relevant review of literature some of the constraints faced by farmers were identified. A list (open ended) containing such constraints was prepared and included in the final interview schedule. The response to each constraint was obtained on a four-point continuum namely, most important, important, less important and least important, with the score 'four', 'three', 'two' and 'one' respectively. Based on total score obtained for each constraint, the ranking was done. Maximum score indicated the most important constraint faced by farmers.

3.11. Suggestions for refinement

Through focus group discussion the suggestions for refinement were collected. After screening and discussion with experts major strategies were delineated and documented.

3.12. Data collection procedure

A suitable well-structured pre-tested interview schedule was prepared and administered to the respondent group. (Appendix 3) After preparation of interview schedule a pilot survey was conducted in the non sample population and suitable modification was done in the interview schedule. After that it was directly administered to the respondents at the time of interview. The interview schedule consists of open ended questions, multiple choice questions and questions that had rating scale.

3.13. Statistical tools used

The delineated data were scored, tabulated and analyzed using statistical methods as depicted below.

3.13.1. Mean

The respondents were grouped into categories with reference to means of the selected independent variables. After grouping the respondents into categories, their percentages were worked out.

3.13.2. Percentage analysis

After grouping the farmers into various categories, simple percentage was worked out to find out the percentage distribution of farmer respondents.

3.13.3. Quartile deviation

Quartile deviation was used for finding out the quartiles by dividing the data set into 3 quarters. This was used for categorizing the respondents into high, medium and low category.

3.13.4. Standard deviation

Standard deviation is a measure used to quantify the amount of dispersion of a data set. Standard deviation was used along with mean to group the respondents into high, medium and low in case of extent of adoption.

3.13.5. One way ANOVA

One-way analysis of variance (one-way ANOVA) is a method that can be used to compare means of two or more samples. This technique can be used only for arithmetic response data.

3.13.6. Correlation analysis

Correlation analysis was done to illustrate the relationship between the dependent and independent variables of study. Correlation coefficient is measure of the relation or association between the dependent variable and the different independent variables. The significance of the correlation coefficient was tested for 5 and 1 percent levels of significance.

Results and Discussion

CHAPTER 1V

RESULTS AND DISCUSSION

This section manages the results and discussion based on analysis of data acquired after survey research. The results and discussions are introduced under the following heads.

4.1 Distribution of respondents based on their personal and social characteristics of farmers.

4.2 Awareness and knowledge of farmers about selected organic plant protection practices of KAU and other research and development institutes

4.3 Preferences, perceived usefulness and effectiveness of selected organic plant protection practices.

4.4 Level of adoption of selected organic plant protection practices

4.5 Technology need/gaps for the selected practices as perceived by the farmers

4.6 Farmers practices

4.7 Reasons for non-adoption of the recommended practices

4.8 Constraints experienced by the farmers with suggestions for refinement

4.1 DISTRIBUTION OF RESPONDENTS BASED ON THE PERSONAL AND SOCIAL CHARACTERISTICS OF FARMERS

The distribution of respondents based on the personal and social characteristics of farmers selected through judges rating are presented below.

4.1.1 Age

Age is defined as the number of calendar years completed by the respondent at the time of interview. The result on distribution of respondents based on their age is depicted in the Table 2.

Table 2. Distribution of respondents based on age

N=90

Category (Years)	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
	No.	%	No	%	No	%	No	%
<35	0	0	0	0	0	0	0	0
35-55	16	53.33	14	46.67	12	40.00	42	46.67
>55	14	46.67	16	53.33	18	60.00	48	53.33

It was observed from Table 2 that majority of farmers (53.33%) belonged to old age category, followed by middle aged farmers (46.67%). The most important thing noticed is that no young farmers were involved in farming.

On analyzing the panchayat wise distribution of respondents based on age, in Nedumangad, 53.33 per cent belonged to middle aged category followed by 46.67 per cent in the old age category. In Kunnathukal panchayat more than half of the farmers (53.33%) belonged to old age category followed by middle aged farmers (46.67%). In Chenkal panchayat 60 per cent farmers' belonged to old aged farmers followed by 40 per cent in the middle aged category.

Hence it was concluded that majority of farmers belonged to old aged category followed by middle aged category.

This distribution of farmers is a typical representation of Kerala farming circumstances where dominant part of farmers belongs to middle age or old age category. This is the sympathetic situation among the farming community. By providing adequate support and policy, government can attract youngsters to this field. The results are in agreement with the findings of Anupma (2014), Monadal *et al.* (2014) and Jayawardhana (2007).

4.1.2 Education

Education refers to highest academic qualification possessed by the farmer at the time of data enumeration. The respondent farmers were categorized into

different categories like illiterate, primary, middle, high school and collegiate. The results of the distribution of respondents based on education level are represented in Table 3.

Table 3. Distribution of respondents based on education

N=90

Category	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
	No.	%	No.	%	No.	%	No.	%
Illiterate	1	3.33	1	3.33	3	10.00	5	5.56
Primary	0	0	0	0	3	10.00	3	3.33
Middle	2	6.67	7	23.33	11	36.67	20	22.22
High school	24	80.00	21	70.00	12	40.00	57	63.33
Collegiate	3	10.00	1	3.33	1	3.33	5	5.56

The result of the data furnished in Table 3 deduced that majority (63.33%) of farmers had high school level education followed by middle school education (22.22%). Only low per cent of farmers were illiterate (5.56%) followed by 3.33 per cent with primary education and only 5.56 per cent had collegiate education.

Panchayat wise distribution of respondents on education also reflected this finding where, farmers with high school level education was more. Nedumangad was the panchayat with more number of respondents with high school level education that is 80 per cent compared to the other two panchayats. No respondent in Nedumangad and Kunnthukal had primary level education.

Hence it was concluded that more than half of the farmers (63.33%) had high school level education followed by middle school (22.22%) level education. Since Kerala is a high level literate state it might be an influence in the overall education position of respondents. Similar results were obtained by Patel (2008) and Sasidharan (2015).

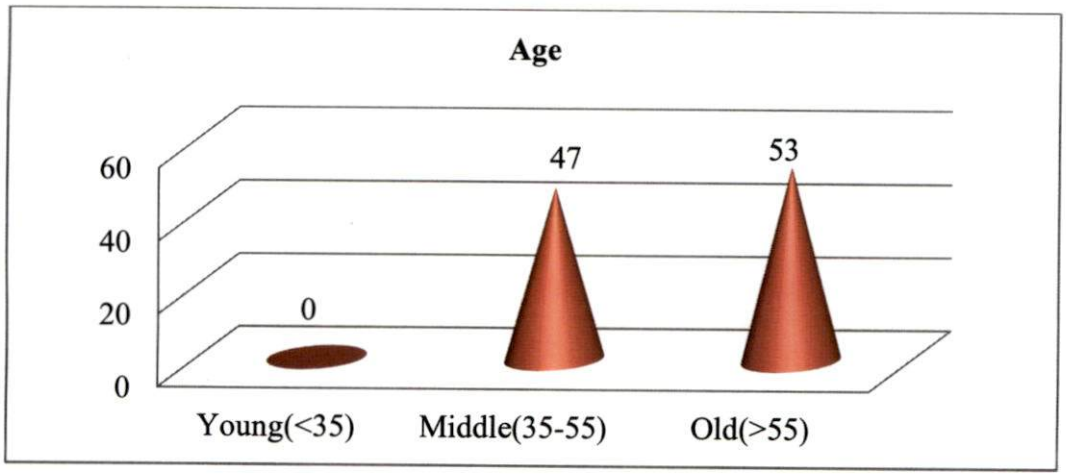

Fig. 2. Distribution of respondents based on age

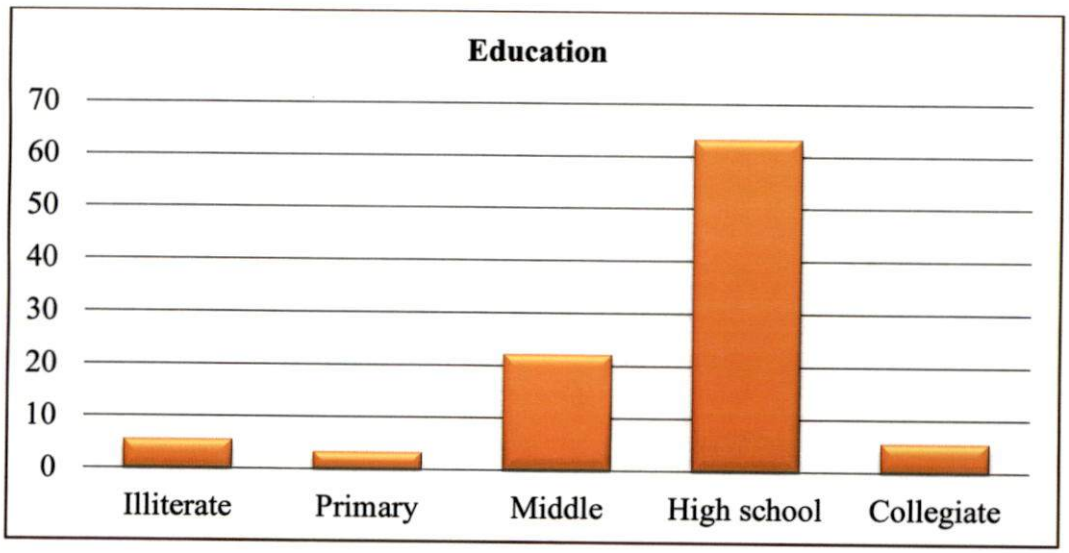

Fig. 3. Distribution of respondents based on education

4.1.3 Occupation

Occupation is defined as the main vocation and other additional vocations that the respondents possessed at the time of interview. The respondents were grouped based on the occupation and the result is presented in Table 4.

Table 4. Distribution of respondents based on occupation

N=90

Category	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
	No.	%	No.	%	No.	%	No.	%
Primary (Agriculture)	24	80.00	25	83.33	27	90.00	76	84.44
Secondary (Others+ agriculture)	6	20.00	5	16.67	3	10.00	14	15.56

On analyzing the Table 4 it was found that more than half of the farmers (84.44%) depended mainly on agriculture as their occupation followed by 15.56 per cent of farmers in the secondary category *ie* they depended on others along with agriculture.

Based on panchayat wise distribution 90 per cent of farmers depended on agriculture in Chenkal followed by Kunnathukal (83.33%) and Nedumangad (80%).

Since most of the farmers (84.44%) depend on agriculture as their livelihood. The similar significant results are observed in the studies conducted by Kamalakkannan (2011) and Basheer (2016). The finding also reflected to the point that majority people depend on agriculture as their primary source of income.

4.1.4 Farm size

Farm size is defined as the total farming land owned by the farmer for agricultural activities and is expressed in acres. The respondents were grouped into different categories represented in the Table 5.

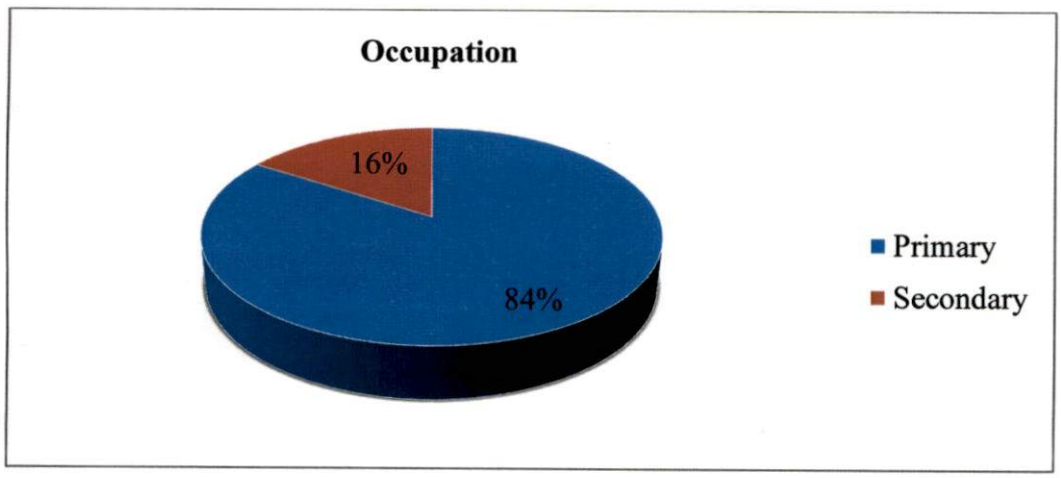

Fig. 4. Distribution of respondents based on occupation.

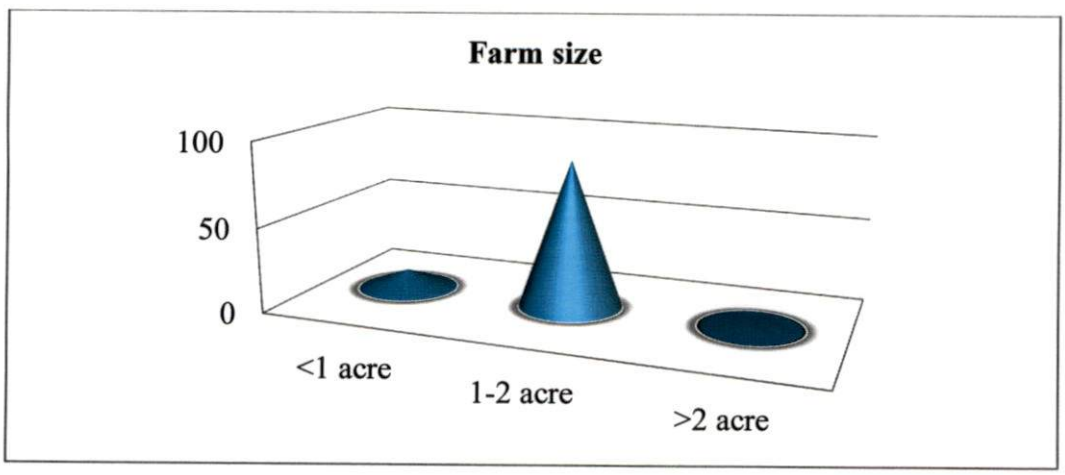

Fig.5. Distribution of respondents based on farm size.

Table 5. Distribution of respondents based on farm size

N=90

Category	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
	No.	%	No.	%	No.	%	No.	%
<1 acre	5	16.67	1	3.33	4	13.33	10	11.11
1-2 acre	25	83.33	29	96.67	25	83.33	79	87.78
>2 acre	0	0.00	0	0.00	1	3.33	1	1.11

It was inferred from Table 5 that 87.78 per cent farmers had farm size between 1 and 2 acres. Only 1.11 per cent of the farmers had more than 2 acre and 11.11 per cent of the farmers had farm size less than 1 acre. The results clearly outline the nature of fragmented lands and hence decrease land for farming.

Based on the panchayat wise distribution 96.67 per cent of farmers in Kunnathukal had farm size of 1-2 acre followed by 83.33 per cent of farmers in Nedumangad and Chenkal panchayat had 1-2 acre of land. However no farmer has more than 2 acres in Nedumangad and Kunnathukal panchayat. Only one farmer had more than 2 acre in Chenkal panchayat.

Hence it was concluded that majority of farmers had farm size between 1 and 2 acre and were marginal farmers. The results are similar to the findings of Fayas (2003), Priya (2003) and Balachandran (2004).

4.1.5 Farming Experience

Farming experience is defined as the number of completed years in farming. The respondents were categorized into different groups and the results are illustrated in the Table 6.

Table 6. Distribution of respondents based on farming experience.

N=90

Category	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
	No.	%	No.	%	No.	%	No.	%
<1 year	0	0	0	0	0	0	0	0
1-<3 years	0	0	0	0	0	0	0	0
3-5 years	11	36.67	6	20.00	7	23.33	24	26.67
Above5 years	19	63.33	24	80.00	23	76.67	66	73.33

From Table 6 it was found that 73.33 per cent of farmers had farming experience above 5 years followed by 26.67 per cent of respondents with 3-5 years of experience and no farmers with less than 3 years of experience.

From the panchayat wise distribution, it was noticed that 80 per cent of farmers of Kunnathukal panchayat had farming experience above 5 years followed by 76.67 per cent in Chenkal panchayat and 63.33 per cent in Nedumangad panchayat who had farming experience above 5 years. In Nedumangad panchayat 36.67 per cent of farmers had experience in between 3 and 5 years followed by 23.33 per cent in Chenkal panchayat. About 20 per cent farmers in Kunnathukal panchayat had farming experience between 3 and 5 years.

Hence it was deduced that majority of farmers had fairly long years of experience. Since they belonged to middle aged and old aged category, it can be inferred that the respondent farmers were having good experience and hence can be assumed that the farmers have excellent intuitive abilities to take decisions on farming practices. The results are similar to the studies of Fayas (2003), Suthan (2003) and Anupama (2014).

4.1.6 Rational orientation

Rational orientation is defined as the extent of rationality and scientific belief of farmer practicing organic practices. The results are distributed based on rational orientation and the results are illustrated under the Table 7.

Table 7. Distribution of respondents based on rational orientation.

N=90

Category	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
	No.	%	No.	%	No.	%	No.	%
Belief in stars alone	0	0.00	3	10	0	0.00	3	3.33
Belief in stars and scientific recommendations	13	43.33	14	46.67	14	46.67	41	45.56
Belief in scientific recommendations only	17	56.67	13	43.33	16	53.33	46	51.11

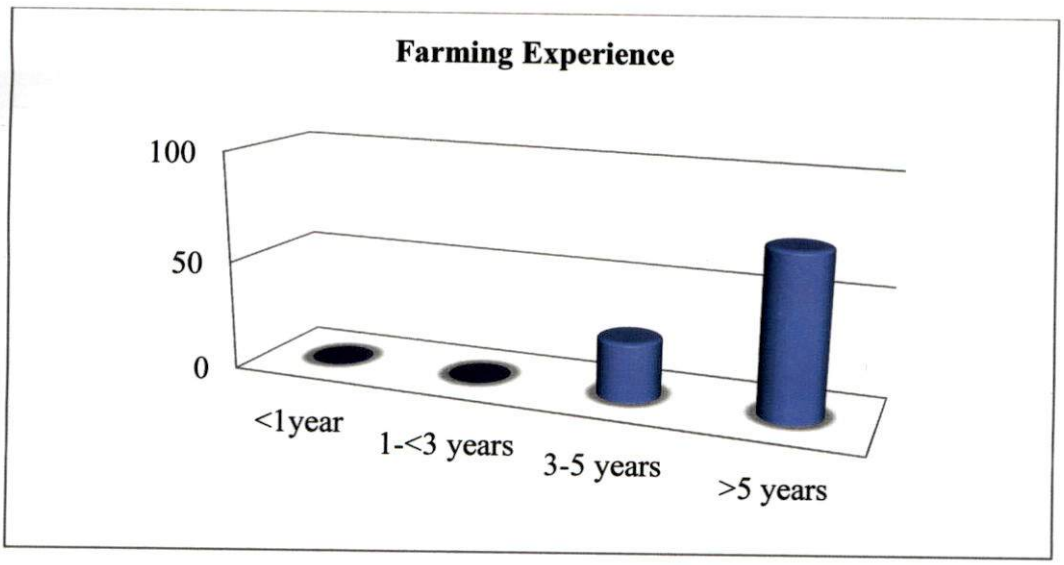

Fig. 6. Distribution of respondents based on farming experience

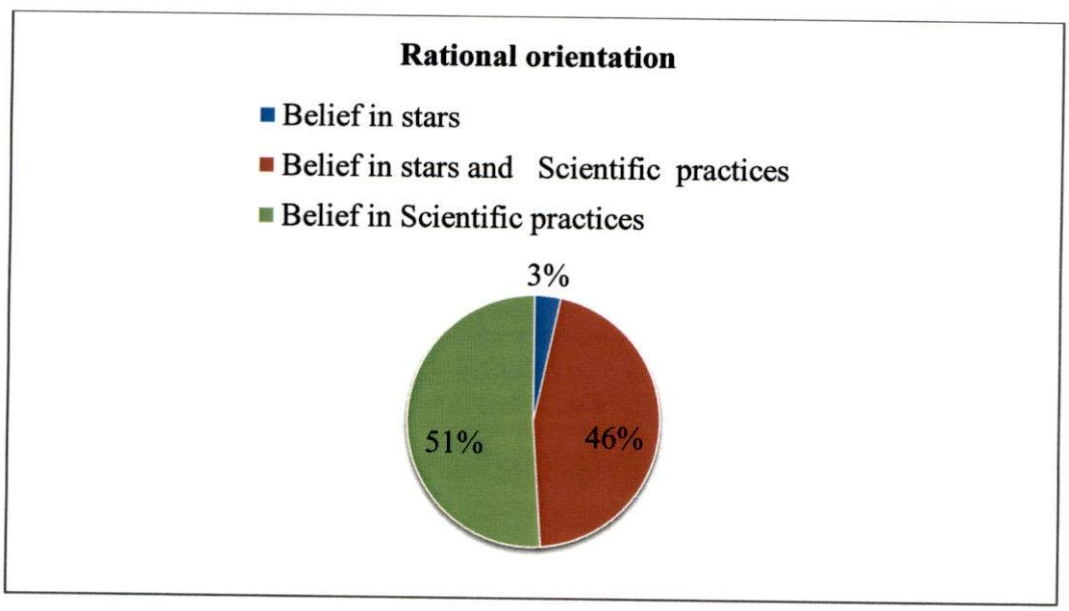

Fig. 7. Distribution of respondents based on rational orientation

From Table 7 it was inferred that 51.11 per cent of farmers believe only in scientific recommendations. About 45.56 per cent of farmers' believe in both stars and scientific recommendations and only 3.33 per cent of farmers' believe in stars.

From the panchayat wise distribution it was noticed that 56.67 per cent of farmers of Nedumangad panchayat believe in scientific recommendations followed by Chenkal panchayat(53.33%) and Kunnathukal panchayat(43.33%). About 46.67 per cent of farmers believe in both stars and scientific recommendations in Chenkal and Kunnathukal panchayat followed by Nedumangad panchayat(43.33%). Only 10 per cent of farmers believe in stars in Kunnathukal panchayat and no farmers in Chenkal and Nedumangad believe in stars only.

4.1.7 Economic Motivation

Economic motivation was defined as the occupational motives of farmers practicing organic measures intended for profit maximization and relative value the farmer places on monetary gain. The farmers were grouped into different categories and results are illustrated under the Table 8.

Table 8. Distribution of respondents based on economic motivation

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>9	0	0.00	0	0.00	0	0.00	0	0.00
Medium	7-9	30	100.00	24	80.00	26	86.67	80	88.89
Low	<7	0	0.00	6	20.00	4	13.33	10	11.11
Q1- 7				Mean- 7.96					Q3- 9
Measured Range: 5- 9								Actual range: 4-12	

From Table 8 it was inferred that majority of farmers (88.89%) belonged to medium category in economic motivation followed by 11.11 per cent of farmers belonged to low category of economic motivation. No farmers belonged to high category of economic motivation.

From the panchayat wise distribution it was found that all the farmers (100%) in Nedumangad panchayat belonged to medium category of economic motivation. In Chenkal panchayat 86.67 per cent of farmers belonged to medium category followed by 80 per cent of farmers in Kunnathukal panchayat. In Nedumangad panchayat no farmers belonged to low category of economic motivation. In Kunnathukal panchayat 20 per cent of farmers belonged to low category followed by 13.33 per cent of farmers in Chenkal panchayat in economic motivation.

Hence it was concluded that most of the farmers (88.89%) farmers belonged to medium category of economic motivation. The results are conformity to the studies of Fayas (2003) and Priya (2003).

4.1.8 Market Perception

Market perception is operationalized in this study as the organization wide generation of market intelligence pertaining to current and future customer needs, dissemination of intelligence across departments and organization wide responsiveness to it. The farmers were categorized into different categories and the results are presented under the Table 9.

Table 9. Distribution of respondents based on Market perception

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>18	7	23.33	2	6.67	8	26.67	17	18.89
Medium	10-18	19	63.33	22	73.33	20	66.67	61	67.78
Low	<10	4	13.33	6	20.00	2	6.67	12	13.33
Q1- 10				Mean- 14.75					Q3- 18

Measured Range: 6-22 Actual range: 6-24

From Table 9 it was found that 67.78 per cent of farmers belonged to medium category of market perception. Less amount of farmers belonged to high (18.89%) and low (13.33%) category.

On analyzing panchayat wise distribution it was noticed that most of the farmers in Kunnathukal panchayat belonged to medium category followed by

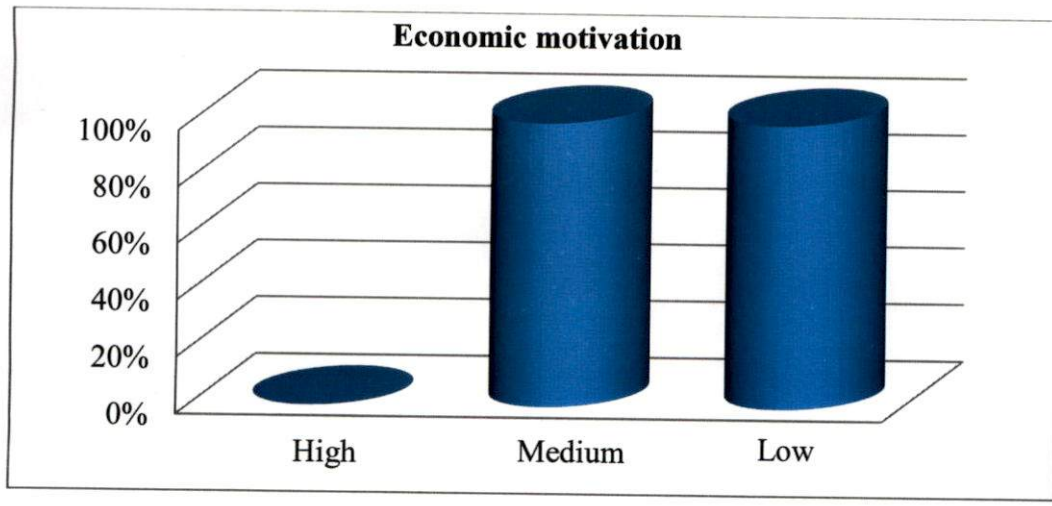

Fig.7. Distribution of respondents based on economic motivation

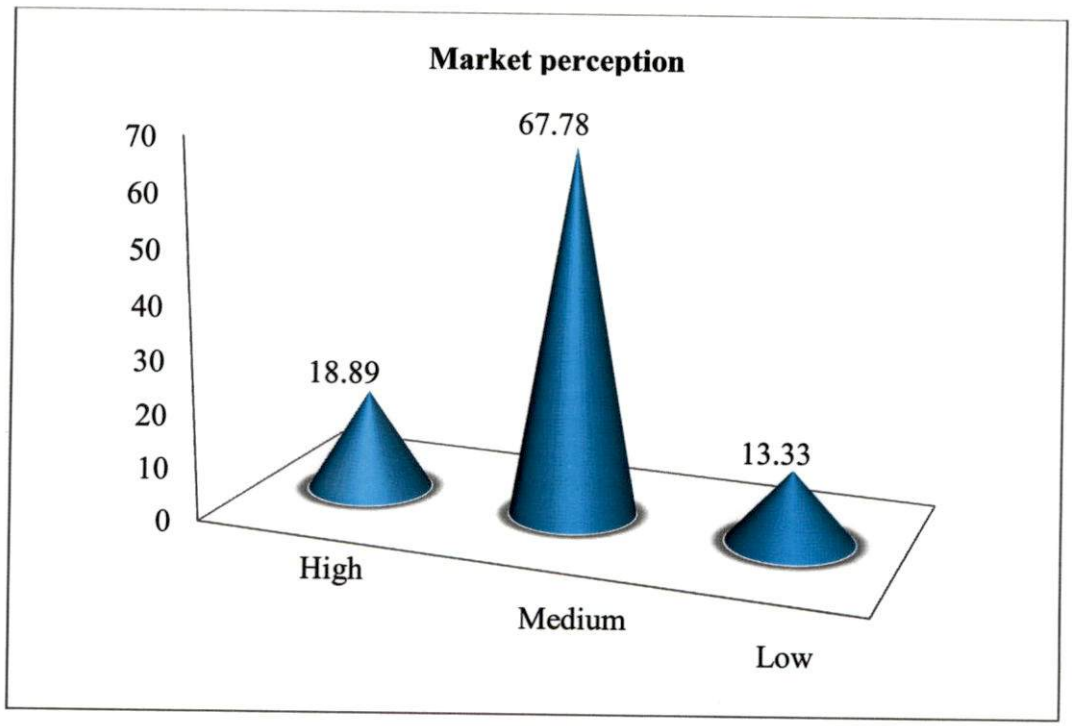

Fig. 8. Distribution of respondents based on market perception

Chenkal panchayat (66.67%) and Nedumangad panchayat (63.33%) in market perception.

Hence it was concluded that majority of farmers (67.78%) belonged to medium category in market perception. The results are in conformity to the studies of Elaikka (2007). The majority of respondent farmers belonging from medium to high category in market perception is an indication that the farmers perceives organic products to fetch premium price thereby helping them to generate more profit or returns.

4.1.9 Environmental concern

It refers to the farmers concern for the environment that has prompted them for embracing organic farming practices in their farm. The results of distribution of respondents based on environmental concern are depicted in the Table 10.

Table 10. Distribution of respondents based on environmental concern

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>14	7	23.33	7	23.33	6	20.00	20	22.22
Medium	13-14	18	60.00	19	63.33	19	63.33	56	62.22
Low	<13	5	16.67	4	13.33	5	16.67	14	15.56
Q1- 13			Mean- 13.21						Q3- 14

Measured Range: 10-15 Actual range: 8-16

From Table 10 it was evident that more than half of the farmer respondent (62.22%) belonged to medium category of environmental concern. About 22.22 per cent of the farmers belonged to high category, only15.56 per cent belonged to low category.

From the panchayat wise distribution it was noticed that 63.33 per cent of farmers of Kunnathukal panchayat and Chenkal panchayat respectively and 60 per cent of farmers of Nedumangad panchayat had medium level of environmental concern.

Hence it was concluded that vast majority of farmers (62.22%) belonged from medium to high category of environmental concern. This could be the essential reason the farmers purposefully resort to organic practices partially or fully in their respective farm. It was interesting to note that majority of farmers knew the ill hazards of indiscriminate use of chemicals and hence the score depicted in table 10 holds good.

4.1.10 Risk orientation

Risk orientation refers to degree to which an organic farmer is oriented towards risk and uncertainty in adopting organic plant protection practices. The results are depicted in the Table 11.

Table 11. Distribution of respondents based on risk orientation.

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>13.5	9	30.00	4	13.33	10	33.33	23	25.56
Medium	8-13.5	21	70.00	26	86.67	20	66.67	67	74.44
Low	<8	0	0.00	0	0.00	0	0.00	0	0.00
Q1- 8			Mean- 10.9						Q3- 13.75
Measured Range: 7-15									Actual range: 5-15

Table 11 deduced that majority of farmers (74.44%) belonged to medium category followed by high category. The most important thing to be pointed out is that no farmers belonged to low category of risk orientation.

From the panchayat wise distribution it was inferred that in Kunnthukal panchayat majority of farmers (86.67%) belonged to medium category followed by Nedumangad (70%) and Chenkal (66.67%) panchayat. Thirty per cent of farmers belonged to high category in Nedumangad panchayat followed by Chenkal (33.33%) and Kunnathukal panchayat (13.33%).

The results are a clear indication that the farmers especially engaged with vegetable cultivation perceived medium to high level of risk when opting for organic practices. Also, it demonstrates the necessities of integrating approaches

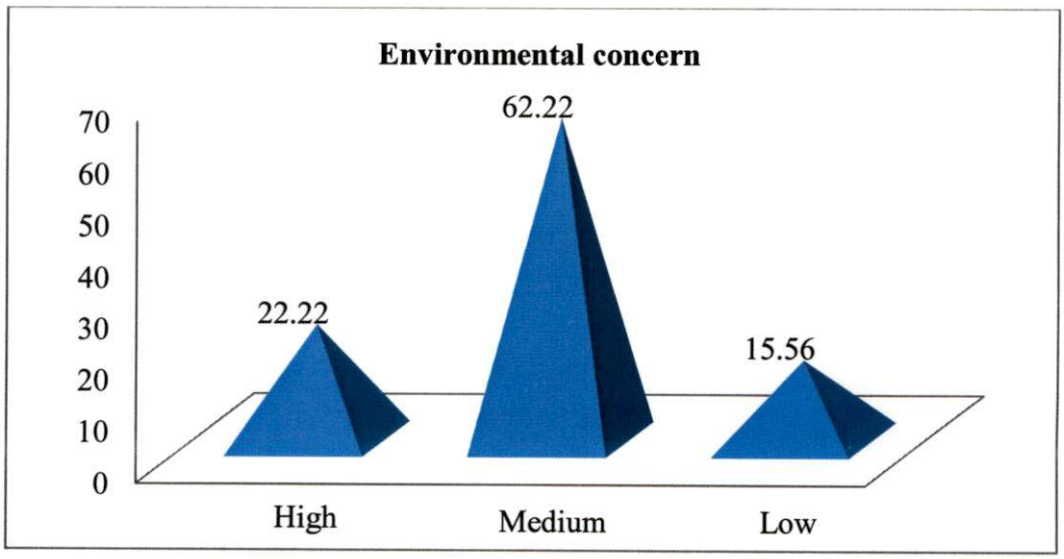

Fig.9. Distribution of respondents based on environmental concern

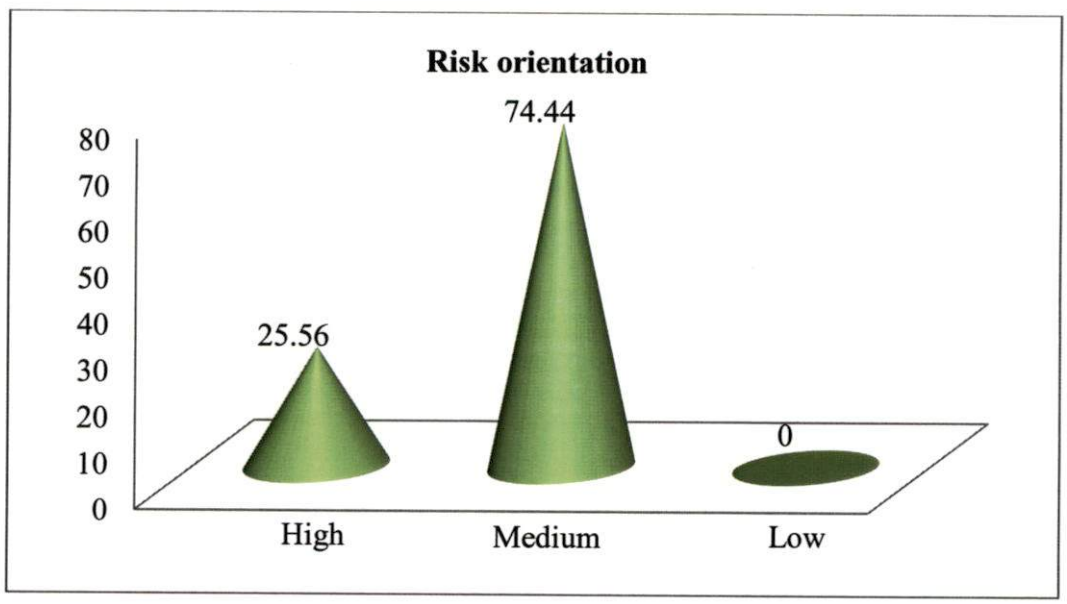

Fig. 11. Distribution of respondents based on risk orientation

to mitigate the risk so as to enable the farmers to continue with safe and remunerative crop production strategies. Hence the conclusion could be that most of the farmers belonged to medium category of risk orientation falls in line with Fayas (2003), Suthan (2003) and Jaganathan (2004).

4.1.11 Attitude towards organic plant protection practices.

Attitude towards organic plant protection practices in this study referred to the positive or negative effect of respondents to organic plant protection practices . The results are depicted in the Table 12.

Table 12. Distribution of respondents based on attitude towards organic plant protection practices

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>24	6	20.00	3	10.00	10	33.33	19	21.11
Medium	15-24	20	66.67	21	70.00	20	66.67	61	67.78
Low	<15	4	13.33	6	20.00	0	0.00	10	11.11
Q1- 15				Mean- 19.64					Q3- 24

Measured Range: 10-30 Actual range: 10-30

From Table 12, it was clearly seen that more than half of the farmers (67.78%) belonged to medium category followed by high (21.11%) category. Less amount of farmers belonged in the category of low (11.11%).

From the panchayat wise distribution it was clear that seventy per cent of farmers belonged to medium category in Kunnathukal panchayat followed by 66.67 per cent of farmers in Nedumangad and Chenkal panchayat. In Chenkal panchayat 33.33 per cent of farmers belonged to high category followed by Nedumangad panchayat (20%) and Kunnathukal panchayat (10%). Twenty per cent of farmers belonged to low category in Kunnathukal panchayat followed by Nedumangad panchayat (13.33%) and no farmers in Chenkal panchayat belonged to low category.

Hence it was concluded that majority of farmers (67.78%) belonged to medium category of organic plant protection practices. The result draws ones

attention to the fact that farmers have a general positive effect towards organic plant protection practices. However, majority of respondents falling under medium category indicates the practical difficulty of just relying on organic practices alone. Resorting to sole use of organic preparations for production and protection of crops can lead to risky situation. Farmers require profit for continued interest in farming and hence the medium to high category of adoption level by majority of respondents may be depicting ones positive attitude to organic plant protection practices but need not be a reflection of adoption of the same.

4.1.12 Extension Orientation

Extension orientation is operationally defined as the point of reference wherein the farmers seek help and support for technology know how. In this study it is measured in terms of extension participation of farmers and extension contact by different agencies /agents engaged in the field of agriculture. The distribution of respondents based on extension contact is presented in Table 13.

i. Extension contact

On analyzing the Table 13, it was deduced that 50 per cent of farmers regularly visited Krishi bhavan followed by 40 per cent of farmers who regularly contacted friends. About 41.11 per cent of farmers often contacted krishi bhavan followed by 34.44 per cent of farmers who often contacted friends. Farmers also reported that they seldom contacted with Krishi Vigyan Kendra (63.33%).

From panchayat wise distribution it was observed that in Nedumangad panchayat 43.33 per cent of farmers regularly visited Krishi bhavan for support and information. Fifty per cent of farmers often contacted Krishi bhavan and Krishi vigyan Kendra. This could be because krishi vigyan Kendra Mithraniketan is situated in Nedumangad. In Kunnathukal panchayat 63.33 per cent of farmers regularly visited Kishi bhavan followed by regular contacts with friends (50%). In Chenkal panchayat 43.33 per cent of farmers regularly visited with Krishi bhavan and regularly contacted friends. Hence it can be concluded that majority of farmers rely on krishibhavan as reliable agency for extension contact.

i. Extension Contact

Table 13. Percentage distribution of respondents based on extension contact

Category	Nedumangad			Kunnathukal			Chenkal			Total		
	R	O	N	R	O	N	R	O	N	R	O	N
Kerala Agriculture University	26.67 (8)	30.00 (9)	43.33 (13)	10.00 (3)	36.67 (11)	53.33 (16)	26.67 (8)	30.00 (9)	43.33 (13)	21.11 (19)	32.22 (29)	46.67 (42)
Krishi Bhavan	43.33 (13)	50.00 (15)	6.67 (2)	63.33 (19)	23.33 (7)	13.33 (4)	43.33 (13)	50.00 (15)	6.67 (2)	50 (45)	41.11 (37)	8.89 (8)
Krishi Vigyan Kendra	23.33 (7)	43.33 (13)	33.33 (10)	6.67 (2)	3.33 (1)	90.00 (27)	26.67 (8)	6.67 (2)	66.67 (2)	18.89 (17)	17.78 (16)	63.33 (57)
Friends	26.67 (8)	33.33 (10)	40.00 (12)	50.00 (15)	26.67 (8)	23.33 (7)	43.33 (13)	43.33 (13)	13.33 (4)	40 (36)	34.44 (31)	25.56 (23)
Non Governmental Orgnization	23.33 (7)	50.00 (15)	26.67 (8)	6.67 (2)	6.67 (2)	86.67 (26)	26.67 (8)	10.00 (3)	63.33 (19)	18.89 (17)	22.22 (20)	58.89 (53)

R- Regularly; O- often; N- Not often

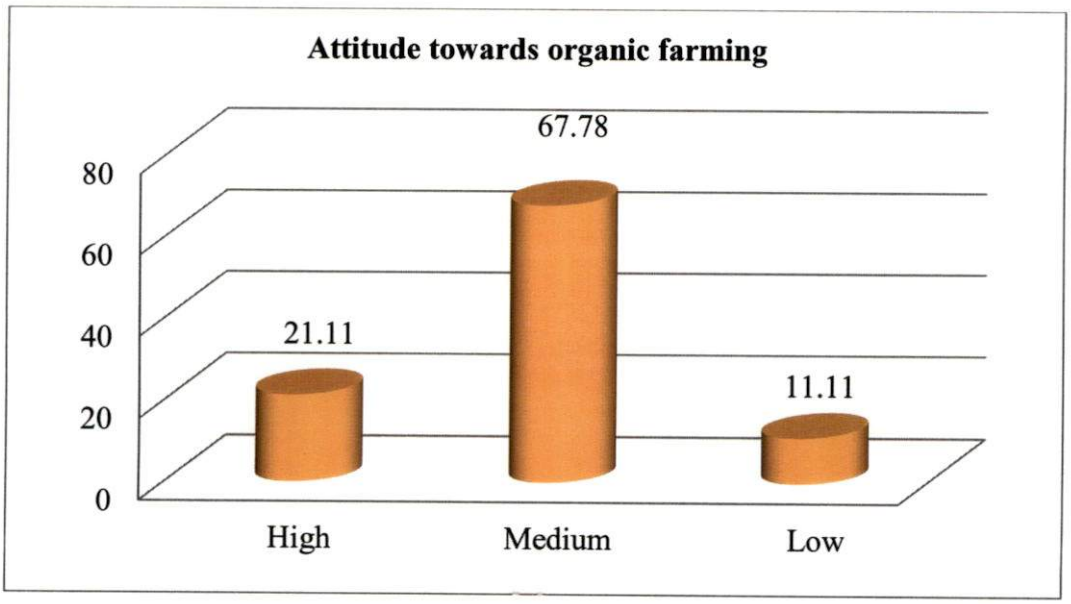

Fig. 12. Distribution of respondents based on attitude towards organic farming

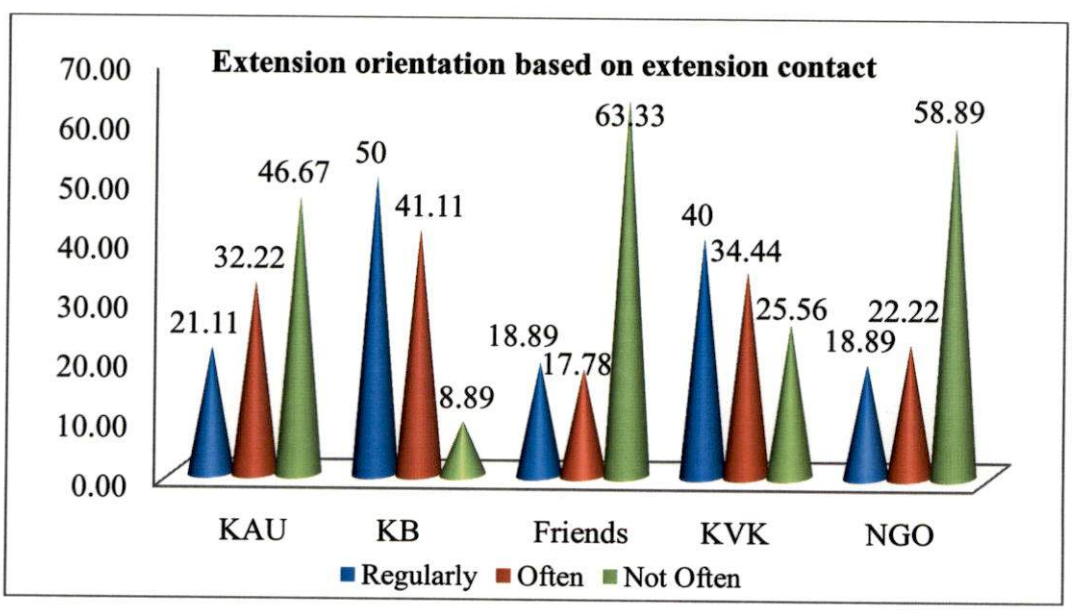

Fig. 13. Percentage distribution of respondents based on extension contact

ii. Extension event participation

The distribution of respondents based on extension event participation is presented in Table 14.

On analyzing the Table 14 it was noticed that 36.67 per cent of farmers participated in seminar whenever it was conducted. About 47.78 per cent of farmers sometimes participated in study tour.

Looking into the panchayat wise distribution it was noticed that thirty per cent of farmers of Nedumangad panchayat participated in mela whenever it was conducted. Fourty per cent of farmers of Kunnathukal panchayat participated in seminar whenever it was conducted. About 43.33 per cent of farmers of Chenkal panchayat participated in seminar whenever it was conducted.

iii. Extension orientation

Extension orientation in this study was worked out by cumulating the total score of both 'extension contact and extension event participation'. The distribution of respondents based on extension orientation is presented in Table 15.

Table 15. Distribution of respondents based on extension orientation

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>20	7	23.33	2	6.67	7	23.33	16	17.78
Medium	16-20	11	36.67	21	70	18	60	50	55.56
Low	<16	12	40	7	23.33	5	16.67	24	26.67
Q1- 20			Mean- 19.43						Q3- 16

Measured Range: 11-30 Actual Range: 10-30

From Table 15 it was found that most of the farmers (55.56%) belonged to medium category followed by low category (26.67%) and 17.78 per cent belonged to high category of extension orientation.

11. Extension event participation

Table 14. Percentage distribution of respondents based on extension event participation

Category	Nedumangad			Kunnathukal			Chenkal			Total		
	WC	S	N	WC	S	N	WC	S	N	WC	S	N
Study tour	20.00 (6)	36.67 (11)	43.33 (13)	16.67 (5)	56.67 (17)	26.67 (8)	40.00 (12)	50.00 (15)	10.00 (3)	25.56 (23)	47.78 (43)	26.67 (24)
Seminar	26.67 (8)	43.33 (13)	30.00 (9)	40.00 (12)	30.00 (9)	30.00 (9)	43.33 (13)	56.67 (17)	0.00 (0)	36.67 (33)	43.33 (49)	20 (18)
Mela	30.00 (9)	40.00 (12)	30.00 (9)	6.67 (2)	50.00 (15)	43.33 (13)	36.67 (11)	43.33 (13)	20.00 (6)	24.44 (22)	44.44 (40)	31.11 (28)
Meeting	23.33 (7)	43.33 (13)	33.33 (10)	36.67 (11)	50.00 (15)	13.33 (4)	33.33 (4)	40.00 (12)	26.67 (8)	31.11 (28)	44.44 (40)	24.44 (22)
Demonstra'n	20.00 (6)	40.00 (12)	40.00 (12)	20.00 (6)	43.33 (13)	36.67 (11)	33.33 (10)	36.67 (11)	30.00 (9)	24.44 (22)	40 (36)	35.56 (32)
	WC- Whenever Conduced; S-Sometimes; N- Never											

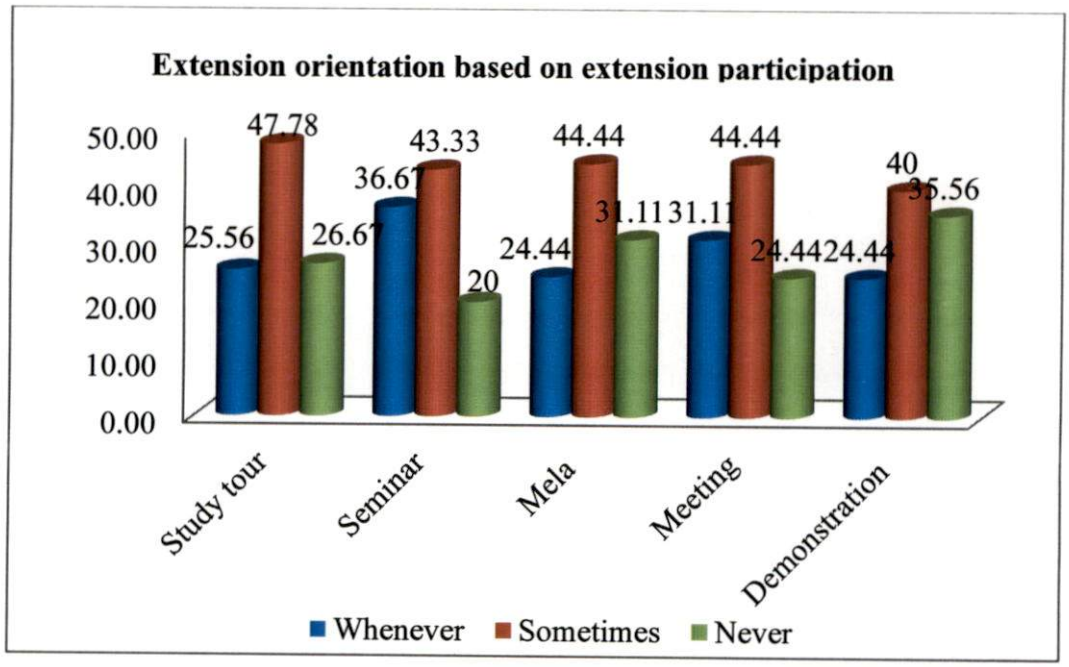

Fig. 14. Percentage distribution of respondents based on extension participation.

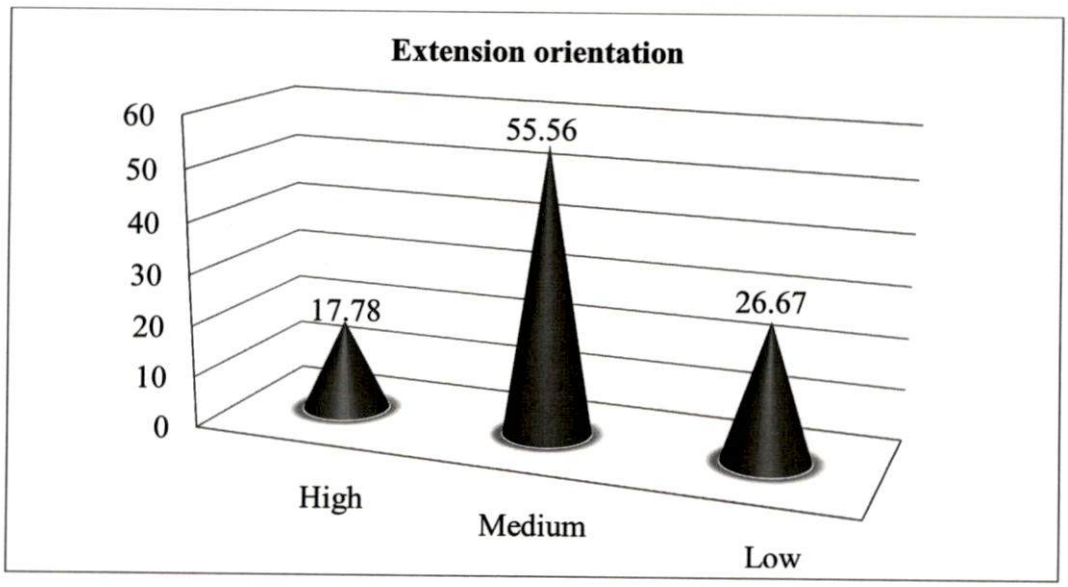

Fig. 15. Distribution of respondents based on extension orientation

From the panchayat wise distribution it was noticed that majority of farmers (40%) in Nedumangad district belonged to low category followed by 70 per cent of farmers in Kunnathukal panchayat belonged to medium category of extension orientation. About 60 per cent of farmers in Chenkal panchayat belonged to medium category of extension orientation.

Hence it was concluded that most of the farmers (55.56%) belonged to medium category of extension orientation. The results are similar to the studies of Anupama (2014) and Basheer (2016).

4.1.13 Information Source Utilization

Information source utilization is defined as the different sources through which information on organic plant protection practices are obtained by farmer. It is the summing up of values obtained by frequency of use of information source and extent of usefulness of information source and the results thus obtained are illustrated in Table 16.

From the Table 16 it was found that 17.78 per cent of farmers regularly use newspaper, television, magazines, friends/ relatives, mobile advisory services and radio as their information source. About 43.33 per cent of farmers often use television as their information source. About 71.11 per cent farmers stated that they seldom use kiosk as a means of information source.

From the panchayat wise distribution it was observed that 20 per cent of farmers regularly use newspaper, television, magazines, friends/ relatives, mobile advisory services and radio in Nedumangad panchayat. Also they stated that they often use television. In Kunnathukal panchayat 6.67 per cent of farmers regularly use all information sources such as newspaper, television, magazines, friends/ relatives, mobile advisory services, kiosk and radio. About 56.67 per cent of farmers often use television as their information source. In Chenkal panchayat 26.67 per cent of farmers regularly use all information sources such as newspaper, television, magazines, friends/ relatives, mobile advisory services, kiosk and radio. Forty per cent of farmers reported that they often use television. The result clearly indicates that television and newspaper are the main source of information. The information sources were evaluated for their extent of usefulness.

Table 16. Percentage distribution of respondents based on frequency of use of information source.

Category	Nedumangad			Kunnathukal			Chenkal			Total		
	R	O	N	R	O	N	R	O	N	R	O	N
Newspaper	20.00	26.67	53.33	6.67	40.00	53.33	26.67	33.33	40.00	17.78	33.33	48.89
Television	21.11	33.33	46.67	5.62	56.67	36.67	25.67	40.00	33.33	18.88	43.33	38.89
Magazines	22.22	23.33	56.67	7.77	53.33	40.00	24.67	36.67	36.67	19.88	37.78	44.44
Friends/ relatives	20.00	20.00	60.00	8.79	46.67	46.67	26.67	33.33	40.00	20.08	33.33	48.89
Mobile advisory services	23.33	20.00	60.00	6.67	23.33	70.00	24.67	6.67	66.67	17.78	16.67	65.56
Kiosk	16.67	16.67	66.67	5.62	13.33	80.00	24.67	6.67	66.67	20.08	12.22	71.11
Radio	20.00	23.33	56.67	7.77	23.33	70.00	26.67	10.00	63.33	18.88	18.89	63.33
R- Regularly; O- Often; N- Not often												

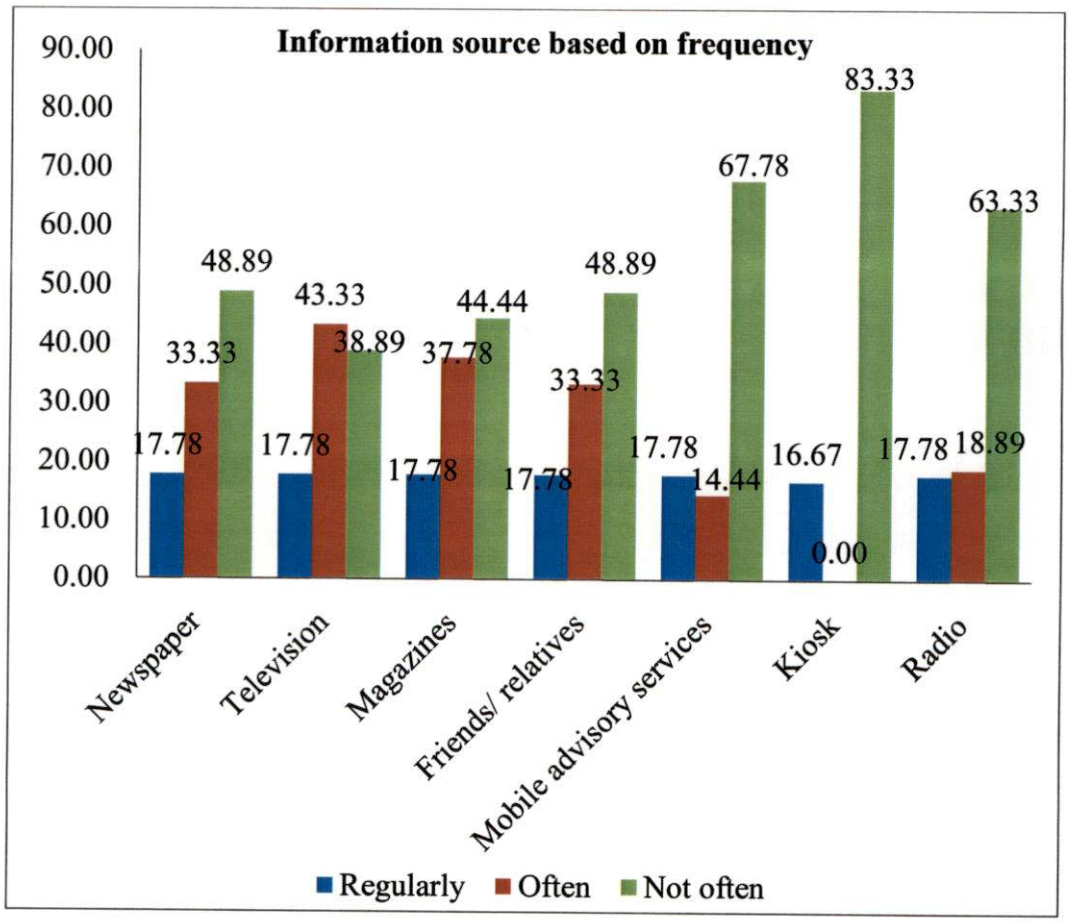

Fig. 16. Percentage distribution of respondents based on frequency of use of information source.

Table 17. Percentage distribution of respondents based on extent of usefulness of information source.

Category	Nedumangad			Kunnathukal			Chenkal			Total		
	VU	U	NU	VU	U	NU	VU	U	NU	VU	U	NU
Newspaper	33.33	23.33	43.33	13.33	36.67	50.00	33.33	33.33	33.33	26.67	31.11	42.22
Television	33.33	23.33	43.33	16.67	43.33	40.00	33.33	40.00	26.67	63.34	21.11	15.56
Magazines	23.33	20.00	56.67	23.33	36.67	40.00	36.67	26.67	36.67	27.78	27.78	44.44
Friends/ relatives	30.00	13.33	56.67	16.67	43.33	40.00	33.33	30.00	36.67	26.67	28.89	44.44
Mobile advisory services	23.33	26.67	50.00	10.00	13.33	76.67	26.67	3.33	70.00	20	14.44	65.56
Kiosk	20.00	6.67	73.33	6.67	3.33	90.00	26.67	6.67	66.67	17.78	5.56	76.67
Radio	26.67	16.67	56.67	10.00	16.67	73.33	26.67	10.00	63.33	21.11	14.44	64.44
VU- Very Useful; U- Useful; NU- Not Useful												

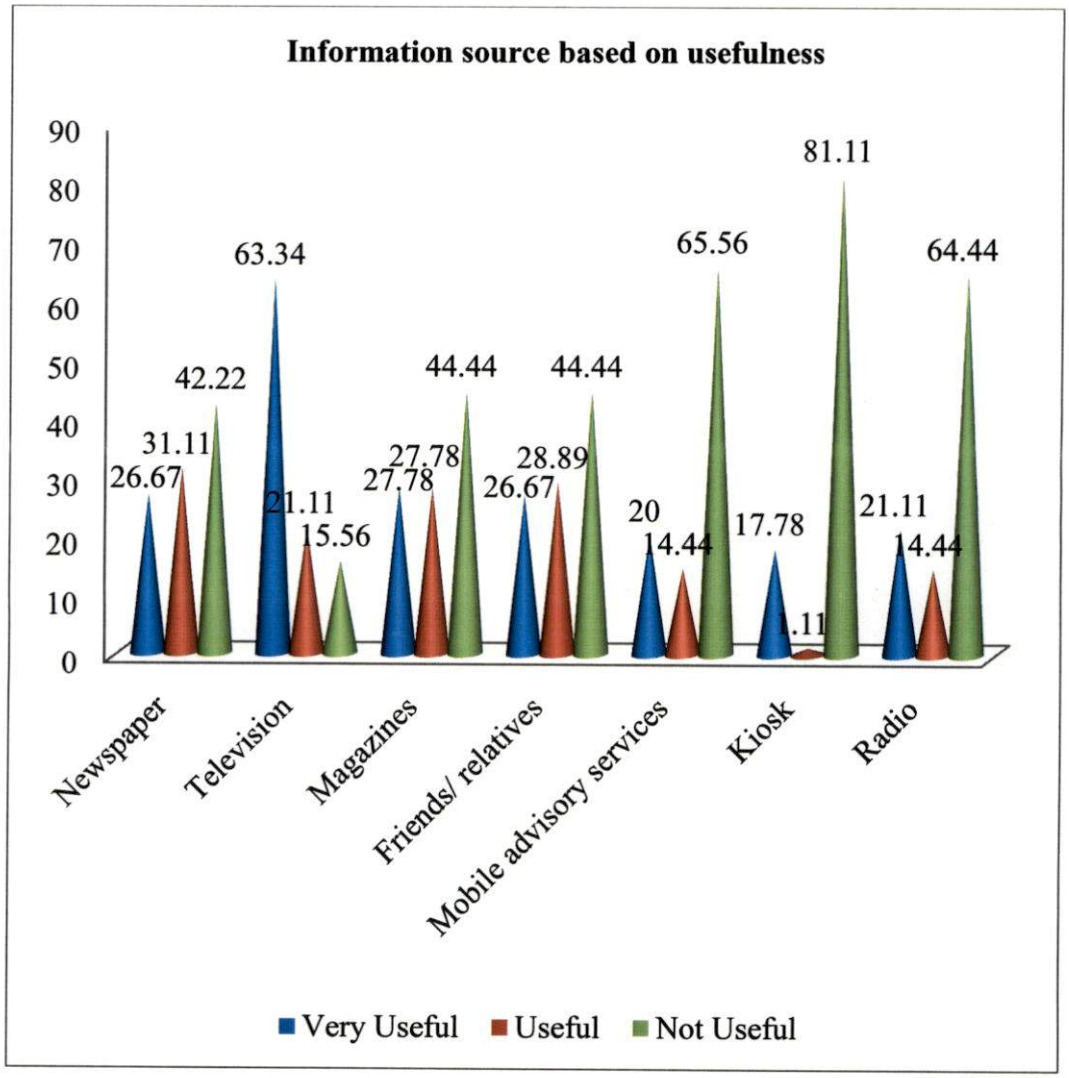

Fig. 17.Percentage distribution of respondents based extent of usefulness of information source

The distribution of respondents based on the extent of usefulness of information is presented in Table 17.

Result from the Table 17 showed that 63.34 per cent of farmers reported that television was very useful for them. About 31.11 per cent of farmers reported that newspaper was useful for them. About 76.67 per cent of farmers reported that kiosk was seldom useful for them.

From the panchayat wise distribution it was inferred that 33.33 per cent of farmers in Nedumangad panchayat reported that newspaper as well as television was very useful for them. About 26.67 per cent of farmers reported that mobile advisory services were useful for them. In Kunnathukal panchayat 23.33 per cent of farmers reported that magazines was very useful for them followed by 43.33 per cent of farmers reported that television and friends/ relatives were useful to them. About 36.67 per cent of farmers in Chenkal panchayat reported that magazines were very useful for them followed by forty per cent of farmers who reported that television was useful for them. From the aforesaid table it can be concluded that television was most useful medium of information.

The result of the distribution of respondents based on information source utilization is given in Table 18.

Table 18. Distribution of respondents based on information source utilization

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>38	6	20.00	2	6.67	8	26.67	16	17.78
Medium	18.25-38	12	40.00	22	73.33	15	50.00	49	54.44
Low	<18.25	12	40.00	6	20.00	7	23.33	25	27.78
Q1- 18.25				Mean- 26.7				Q3- 38	

Measured Range: 15-42 Actual range: 14-42

From Table 18 it was deduced that majority of farmers (54.44%) belonged to medium category of information source utilization. About 27.78 per cent of farmers belonged to low category (27.78%) followed by high category (17.78%) of information source utilization.

From the panchayat wise distribution it was noticed that 40 per cent of farmers belonged to medium and low category respectively in Nedumangad panchayat. About 73.33 per cent of farmers belonged to medium category in Kunnathukal panchayat. In Chenkal panchayat half of the farmers belonged to medium category followed by high (26.67%) and low category (23.33%).

Hence it was concluded that majority of farmers (54.44%) belonged to medium category of 'information source utilisation'. The results are similar with studies of Sobha (2013).

4.2 AWARENESS AND KNOWLEDGE OF FARMERS ABOUT SELECTED ORGANIC PLANT PROTECTION PRACTICES OF KAU AND OTHER R&D INSTITUTES

Awareness showed whether the farmers had any notion on selected organic plant protection practices used for managing crops with special reference to vegetables. Knowledge referred to the in depth comprehension of the farmer respondents on selected organic plant protection practices in crop management.

In this study the extent of awareness and knowledge about selected organic plant protection practices have been worked out and the results are presented in table 19 and table 20 respectively.

4.2.1 Distribution of Farmer Respondents based on their Awareness about selected organic plant protection practices

The farmers were grouped into high, medium and low based on awareness level and its results are illustrated in the Table 19.

Table 19. Distribution of respondents based on their awareness about selected organic plant protection practices.

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>7	9	30.00	3	10.00	8	26.67	20	22.22
Medium	5-7	21	70.00	27	90.00	22	73.33	70	77.78
Low	<5	0	0.00	0	0.00	0	0.00	0	0.00
Q1- 5				Mean- 6.43					Q3- 7

Measured Range: 5-10 Actual range: 0-10

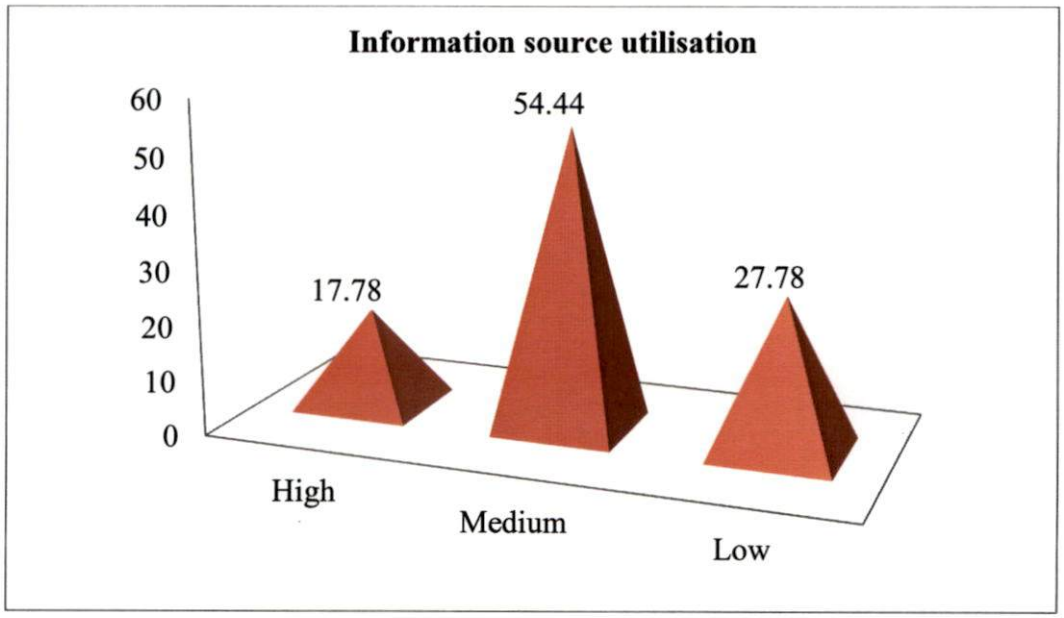

Fig. 18. Distribution of respondents based on information source utilization

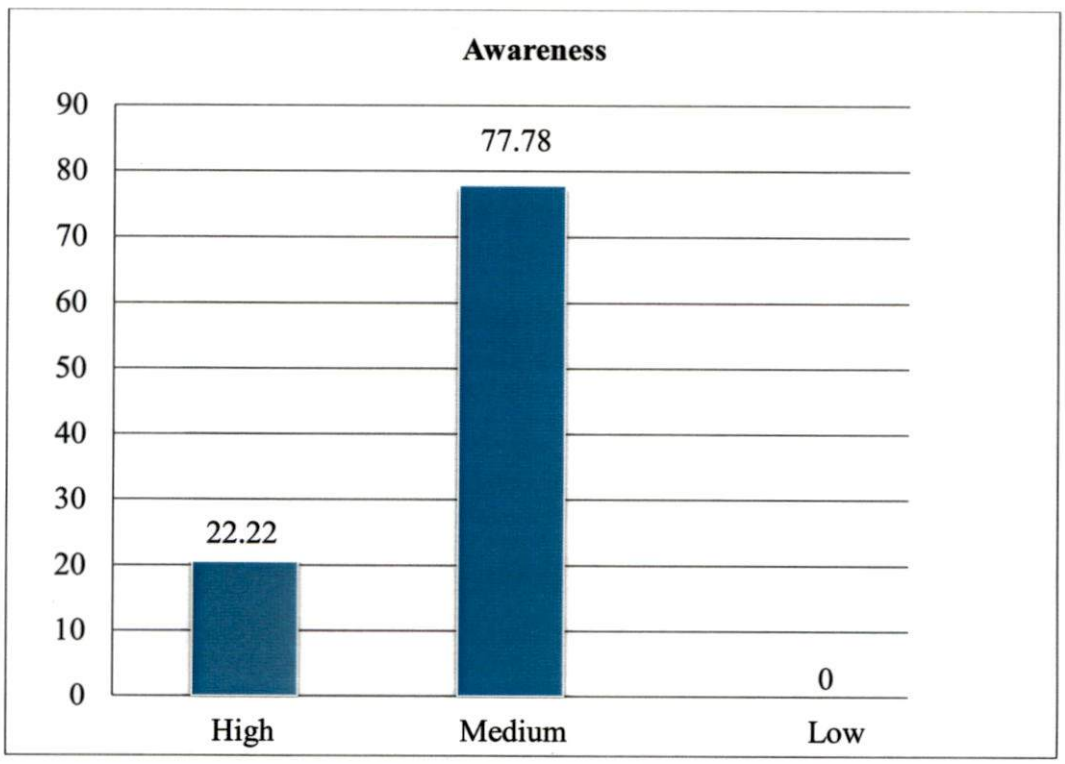

Fig.19. Distribution of respondents based on awareness

From Table 19 it was evident that majority of farmers (77.78%) belonged to medium category of awareness. About 22.22 per cent of farmers belonged to high category. However none of the farmers belonged to low category of awareness.

From the panchayat wise distribution it was noticed that in Nedumangad 70 per cent of farmers belonged to medium category of awareness level. Similar was the case for kunnathukal panchayat (90 %) and Chenkal panchayat (73.33 %) where they belonged to medium category.

Hence it was concluded that more than half of the farmers (77.78%) belonged to medium category of awareness level. The results are similar with studies of Sasidharan (2015). Since Kerala is a literate state and socially sensitized, the farmers would be in the know of things.

Regular information about the organic plant protection practices through information source such as television, radio and newspapers made farmer to be aware of organic plant protection practices. The results were contradictory to the findings of PARC (2012), who reported the low awareness and the need for use of modern technologies to help extension workers reach out to the farmers to spread awareness on different organic plant protection practices.

4.2.2 Level of awareness about selected organic plant protection practices by farmers.

Level of awareness was operationalised as the extent or level to which farmers were aware about the selected plant protection practices in organic farming. Awareness regarding the selected practices was found out on percentage basis of respondents and the results based on the total score are depicted in the Table 20. The detailed result based on panchayath wise distribution is presented in appendix 1V.

Table 20. Percentage of respondents' awareness about selected plant protection practices in farming.

Statements on awareness assessment: Are you aware....?	Total (N=90)	
	Aware	Not Aware
Safe use of pesticides	100.00	0.00
Red and yellow labeled plant protection chemicals were banned.	94.44	5.56
PGPR mix 1 and 11	45.56	54.44
Biocontrol agents and its applications	65.56	34.44
Botanical pesticides	91.11	8.89
Eco shops are functioning for the marketing of produce	53.33	46.67
Animal husbandry is an important component in organic farming.	84.44	15.56
Leaf axial filling with *Bevaria* or neem cake is an important management practice for the control of pseudostem weevil	35.56	64.44
Nanma and Menma products which are extracted from the tapioca leaves for the control of pseudostem weevil	30.00	70.00
Conservation of natural enemies is one of the important practice in organic farming	44.44	55.56

On analyzing the Table 20 it was observed that 100 per cent of farmers had awareness on 'safe use of pesticides' followed by 94.44 per cent farmers on 'Red and yellow labeled plant protection chemicals were banned'. About 91.11 per cent of farmers had awareness about 'botanical pesticides'.

Seventy per cent was not aware about nanma and menma products followed by 64.44 per cent of farmers were not aware about the control measure for pseudostem weevil *ie* leaf axial filling with *Bevaria* or neem cake. About 55.56 per cent of farmers had no awareness about the statement 'conservation of natural enemies is one of the important practices in organic farming'.

From the panchayat wise distribution as given in Appendix 1V, it was noticed that all the farmers in Nedumangad, Kunnathukal and Chenkal panchayat had awareness about the statement 'safe use of pesticides.

All the farmers in Nedumangad panchayaat, 96.67 per cent in Kunnathukal and 86.67 per cent of farmers had awareness about the statement 'Red and yellow labeled plant protection chemicals were banned'. All farmers in Chenkal, 96.67 per cent in Kunnathukal and 76.67 per cent of farmers in Nedumangad had awareness about botanical pesticides. Eighty per cent in Kunnathukal, 70 per cent in Chenkal and 60 per cent in Nedumangad farmers had no awareness about nanma and menma products.

Hence it was concluded that most of the farmers (100%) had awareness about the statement 'Safe use of pesticides' followed by 94.44 per cent of farmers who were aware about the statement 'Red and yellow labeled plant protection chemicals were banned and 91.11 per cent of farmers on botanical pesticides.

The low level of awareness on specific but important organic practices that could be widely used for vegetable cultivation in special should be popularized among the farming community through training, method demonstration or front line demonstrations. Onfarm testing of these technologies in farmer's field can also help farmers improve their level of awareness about organic practices.

4.2.3 Distribution of farmer respondents based on their knowledge about selected organic plant protection practices

Knowledge, in this study was referred to the in depth comprehension of the farmer respondents on selected organic plant protection practices in crop management.

In this study the extent of knowledge about selected organic plant protection practices have been worked out for individual farmers and based on the

total score of the farmers the respondents were categorized as farmers with high, medium and low knowledge and the results are presented in table 21.

Table 21. Distribution of respondents based on their knowledge about selected organic plant protection practices

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No.	%	No.	%
High	>13	7	23.33	6	20	7	23.33	20	22.22
Medium	7-13	18	60	23	76.67	17	56.67	58	64.44
Low	<7	5	16.67	1	3.33	6	20	12	13.33
Q1- 7			Mean- 10.24						Q3- 13

Measured Range: 5-15 Actual range: 0-15

From the Table 21 it was inferred that majority of farmers (64.44%) belonged to medium category in terms of knowledge possession. About 22.22 per cent of farmers' belonged to high category followed by 13.33 per cent in low category.

From the panchayat wise distribution it was observed that 76.67 per cent of farmers in Kunnthukal panchayat belonged to medium category of knowledge level. Similar pattern was observed farmers in Nedumangad panchayat (60%) and Chenkal panchayat (56.67) respectively. Hence it was concluded that more than half of the farmers (64.44% and 22.22%) fell in medium and high category of knowledge level. This result can be acknowledged because of the high literacy rate and comparably better education level of the farmers of the state. However, the results also signifies the scope of bringing more farmers to the category of higher level of knowledge as only 22.22% farmers belonged to the category of higher knowledge level. The results are similar with the studies of Sidram (2008) and Kumar *et al.*, (2014).

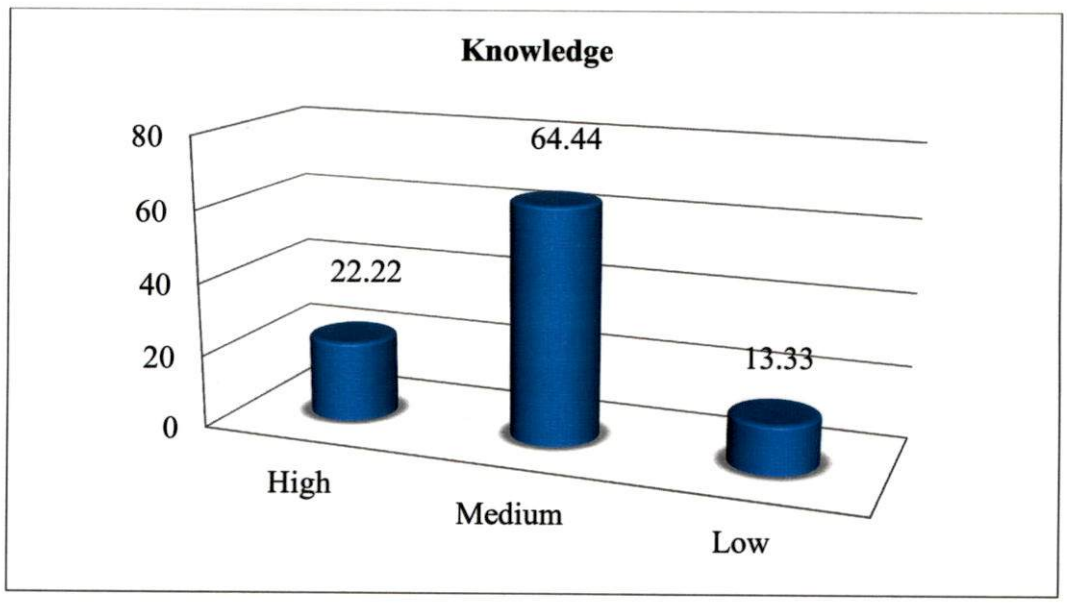

Fig. 20. Distribution of respondents based on knowledge

4.2.4 Knowledge of selected organic plant protection practices by the respondents in percentage

The respondents were tested for their knowledge on the selected recommended organic practices and the results of the same in terms of total score irrespective of panchayath wise distribution was mentioned in table 22. The panchayath wise distribution is presented in appendix V.

Table 22. Percentage of respondents' knowledge about selected organic plant protection practices in farming.

Statements for knowledge assessment	Total (N=90)	
	No.	%
Name any two green label pesticides/fungicides available in markets for vegetables	46	51.11
Pheromone traps can be used in organic vegetable cultivation? Y/N	80	88.89
Name any two botanicals used in vegetables.	82	91.11
Name two biological control agents to control pests in vegetables	52	57.78
Name any disease resistant variety of amaranthus	53	58.89
what are the ingredients used for preparation of panchagavya?	64	71.11
Name the pest and diseases in banana	57	63.33
How many hours you will soak tobacco waste in water and what proportion you will dilute it before application in vegetables?	60	66.67
What is the crop rotation pattern followed in vegetables in a year to decrease the incidence of pest and diseases?	47	52.22
What are the control measures for preventing the incidence of rhinoceros beetle?	55	61.11
Name any two 2 neem based insecticide	65	72.22
Name any resistant plant varieties of bitter gourd to reduce pest/disease attack in plants	42	46.67
Name any trap crops used as a method to control pests and diseases in vegetables.	55	61.11
What is the proportion of mixing $CuSO_4$ and milk of lime in Bordeaux mixture?	63	70.00
Name any 2 natural predators.	40	44.44

From Table 22, it was found that out of 12 statements administered to the 90 respondents to assess their knowledge level, 91.11 per cent of farmers could name two botanicals correctly used in vegetable cultivation, followed by 88.89 per cent of farmers who knew that pheromone traps can be used for controlling pest of crops. The result also proves that when 72.22 per cent of farmers knew on two neem based organic insecticides, 71.11 per cent of farmers knew about the different ingredients used for preparing panchagavya. When asked to name any two natural predator for vegetable pest only 44.44 per cent of respondents could answer it correctly which was the least score achieved by the respondents. This signifies that majority of the farmers did not have adequate knowledge on the role of natural predators for pest management in vegetable crops.

On analyzing the panchayat wise distribution given in appendix V, it was found that all the farmers in Chenkal panchayat could name correctly two botanicals used in vegetables and neem based insecticide. About 93.33 per cent of farmers in Chenkal and Kunnathukal panchayat responded that pheromone traps can be used as a measure to control pest in vegetable crops. Similar was the results in case of farmers in Nedumangad panchayat.

Only 43.33% of the farmers of Nedumangad panchayat had knowledge about disease resistant variety of amaranthus and 46.66 per cent of farmers in Kunnathukal panchayat had knowledge about crop rotation followed in vegetable cultivation. This highlights the necessity of extension work to percolate in these regions as knowledge on pest and disease resistant varieties and management practices like crop rotation are the basics to organic farming practices. If proper interventions are not made to educate the farmers on these fundamental aspects, whatever efforts the government and research cum extension system puts in will become futile.

4.2.5 Relation between the knowledge on organic plant protection practices with the profile characteristics of farmers.

Correlation analysis was done to check whether there is any significant relationship between the knowledge on organic plant protection practices of farmer respondents and selected independent variables. The result is depicted in the Table 23.

Table 23. Relation between knowledge and profile characteristics.

Variable	Independent Variables	Correlation co-efficient
X1	Age	-0.043
X2	Education	0.173
X3	Farm size	0.821**
X4	Farming experience	0.728**
X5	Economic motivation	0.037
X6	Market perception	0.774**
X7	Environmental concern	0.124
X8	Risk orientation	0.133
X9	Attitude towards organic plant protection practices	0.843**
X10	Extension orientation	0.789**
X11	Information source utilization	0.766**
X12	Awareness on plant protection practices	0.784**

**= significant at 1%

On analyzing the Table 23 it was found that out of 12 variables 7 variables namely farm size, farming experience, market perception, attitude towards organic plant protection practices, extension orientation, information source utilization and awareness on plant protection practices are significantly and positively correlated with knowledge at 1% significance.

Age, education, economic motivation, environmental concern and risk orientation possessed no significant relation with knowledge.

Farm size was significantly and positively related with knowledge. This could be because as knowledge of farmers increase there would be a natural tendency to increase the farm size either by scaling up the spatial or temporal dimensions with special reference to vegetable crops. Likewise, it was sure that as farmers gain more experience in crop cultivation, it will have a positive and significant bearing on knowledge and hence, in this study farming experience was significantly and positively correlated with knowledge.

The relation between market perception and knowledge was positive and significant. This was natural as the ultimate motive of the farmers is more returns or remunerative production. However, it was against the expectation that economic motivation and knowledge was positive but not significant which are not in line with the study results of Thomas (2004) and Krishnan (2013).

The relation between dependent variable knowledge with the independent variables, viz., attitude towards organic plant protection practices, extension orientation, information source utilization and awareness on plant protection practices was positive and significant at 1% significance. The results highlight the importance of psychological constructs with ideas such as lowering transaction costs in stimulating the adoption of organic management practices. Also the extension orientation through available sources and rendering input supply or quality service at farmers field will create more awareness among adopters and will positively influence the knowledge level.

The relation between knowledge with environmental concern and risk orientation was positive but not significant.

4.2.6 ANOVA for knowledge level of different panchayat.

Table 24. ANOVA for knowledge of organic plant protection practices among farmers of different panchayat

Groups	*Average*	SE
Nedumangad	9.97	1.54
Kunnathukal	10.3	1.31
Chenkal	10.47	1.54

Source of variation	SS	df	MS	F	P value	F crit
Between groups	3.89	2	1.94	0.164	0.849	3.10
Within groups	1032.73	87	11.87			
Total	1036.62	89				

Knowledge scores of three panchayat were determined for significance using single factor ANOVA. The table clearly validate that there is no significant difference between knowledge level of farmers among Nedumangad, Kunnathukal and Chenkal panchayat.

4.3 PREFERENCES, PERCEIVED USEFULNESS AND EFFECTIVENESS OF SELECTED ORGANIC PLANT PROTECTION PRACTICES.

4.3.1 Protection preferences of organic plant protection practices

Protection preferences refer to the reason or criterion due to which the farmer respondents preferred adopting organic plant protection practices. The selected criterion from the practices was ranked in the decreasing order of preferences and the results are illustrated in the Table 25.

Table 25. Protection preferences of organic farming practices for selected components.

N=90

Sl No.	Protection criterion	Mean score	Rank
1	The organic plant protection available for purchase should be cost effective	8	2.5
2	Sustainability of farm	8	2.5
3	Family safe food concept	9	1
4	Ease in operation	5	6
5	Compatibility with management practice	5	6
6	Eco friendliness	3	8.5
7	Local resource utilization	2	10
8	Safety in handling	3	8.5
9	Availability of inputs	6	4
10	Immediacy of effect	5	6

The preferences of organic plant protection were worked out for 10 dimensions as mentioned in table 25.

Organic plant protection was preferred by farmers for multiple reasons. Family safe food concept was the foremost reason for preferring organic plant protection practices. When a farmer cultivate crop they give importance to their family. The next two important reasons for opting organic plant protection practices selectively were cost effective and sustainability of farm.

4.3.2 Perceived Effectiveness of selected organic plant protection practices

The results of the perceived effectiveness of selected organic plant protection practices are presented in table 26.

From Table 26 it was evident that 97.78 per cent of farmers reported use of botanicals and cultivating crop mixtures was effective for them, followed by 56.67 per cent stated that application of pseudomonas in vegetables was effective

Table 26. Perceived effectiveness of organic protection practices (in percentage)

N=90

PP practices	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
	E	NE	E	NE	E	NE	E	NE
1	40	60	40	60	70	30	50	50
2	100	0	100	0	93.33	6.67	97.78	2.22
3	100	0	100	0	93.33	6.67	97.78	2.22
4	46.67	53.33	60	40	63.33	36.67	56.67	43.33
5	60	40	53.33	46.67	26.66	73.33	46.66	53.33
E- Effective; NE- Not Effective								

1- Use of bio pesticides

2- Use of botanicals

3- Cultivating crop mixtures

4- Application of pseudomonas in vegetables

5- Use of resistant variety

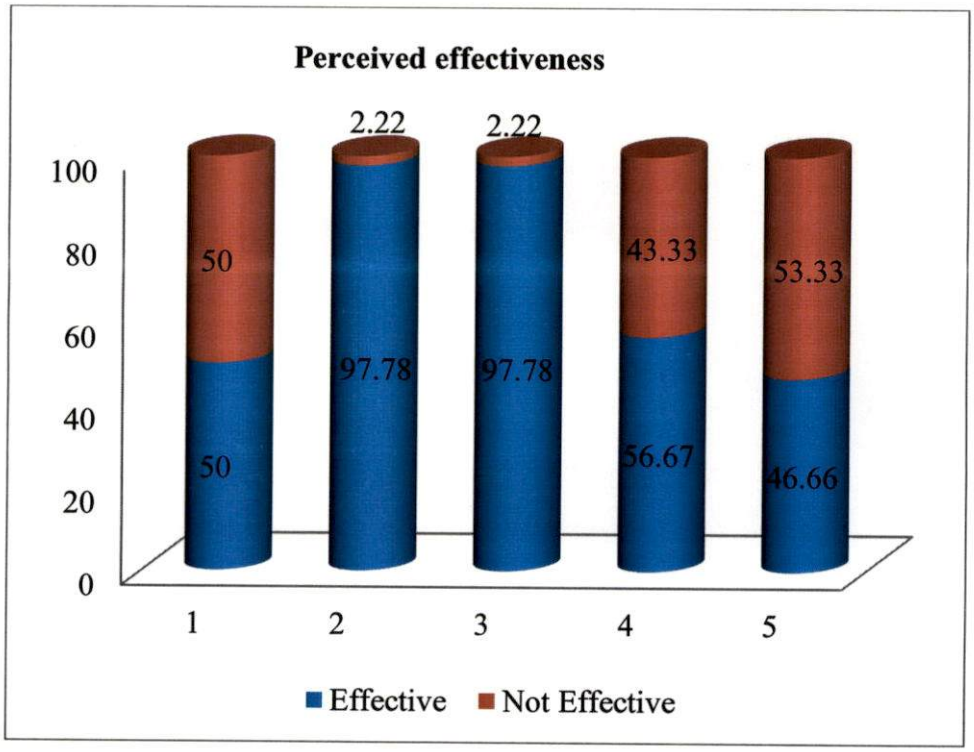

Fig 21. Distribution of respondents based on perceived effectiveness

1- Use of bio pesticides

2- Use of botanicals

3- Cultivating crop mixtures

4- Application of pseudomonas in vegetables

5- Use of resistant variety

for them. About 53.33 per cent of farmers reported that use of resistant variety was not much effective for them.

In case of panchayat wise distribution similar was the pattern of results except for the case of Nedumangad and Kunnathukal panchayat , where 60 per cent of farmers reported that use of biopesticides were not much effective for them.

4.3.3 Perceived Usefulness of selected organic plant protection practices

The results on perceived usefulness of selected organic plant protection practices are mentioned in table 27.

On analyzing the Table 27 it was evident that most of the farmers (97.78%) reported that cultivating crop mixtures was useful for them followed by 69.8 per cent farmers who stated that use of botanicals was useful for them. About 63.33 per cent of farmers stated that use of resistant variety was not much useful for them.

From the panchayat wise distribution it was observed that all the farmers in Nedumangad and Kunnathukal panchayat stated that use of botanicals and cultivating crop mixtures was useful for them. About 73.33 per cent of farmers in Chenkal panchayat and 70 per cent of farmers at Nedumangadu panchayath stated that use of resistant variety was not much useful for them.

Table. 26 Perceived usefulness of selected organic plant protection practices (in percentage).

PP practices	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
	U	NU	U	NU	U	NU	U	NU
1	40	60	40	60	70	30	50	50
2	100	0	100	0	10	90	69.8	30
3	100	0	100	0	93.33	6.67	97.78	2.22
4	46.66	53.33	56.67	43.33	63.33	36.67	55.55	44.44
5	30	70	53.33	46.67	26.66	73.33	36.66	63.33
U- Useful; NU- Not Useful								

1- Use of bio pesticides

2- Use of botanicals

3- Cultivating crop mixtures

4- Application of pseudomonas in vegetables

5- Use of resistant variety

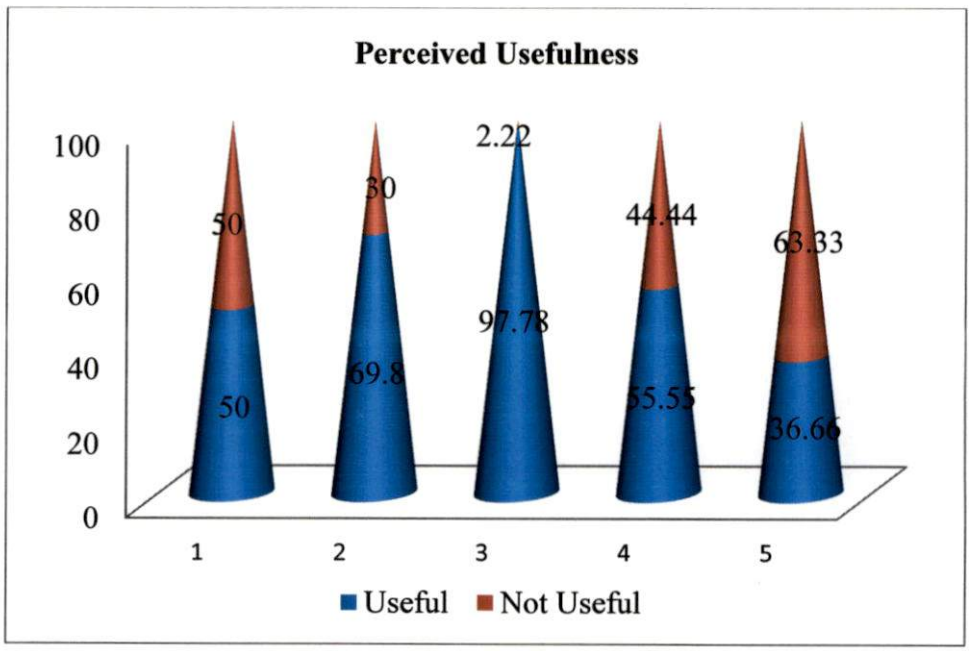

Fig. 22. Distribution of respondents based on perceived usefulness

1- Use of bio pesticides

2- Use of botanicals

3- Cultivating crop mixtures

4- Application of pseudomonas in vegetables

5- Use of resistant variety

4.4 LEVEL OF ADOPTION OF SELECTED ORGANIC PLANT PROTECTION PRACTICES

4.4.1 Distribution of respondents based on the level of adoption of selected organic plant protection practices.

The distribution of respondents based on the extent of adoption of selected organic plant protection practices in cultivation of crops by farmers is presented in Table 28. The respondents were categorised into high, medium and low.

Table 28. Distribution of respondents based on extent of adoption

N=90

Category	Class limits	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)		Total	
		No.	%	No.	%	No	%	No	%
High	>5.54	6	20	2	6.67	7	23.33	15	16.67
Medium	1.27-4.27	24	80	28	93.33	23	76.67	75	83.33
Low	<1.27	0	0	0	0	0	0	0	0
Mean-4.27									SD- 1.27

Measured Range: 1-7 Actual range: 0-9

On analyzing the Table 28 it was found that majority of the farmers (83.33%) belonged to medium category of adoption. Only 16.67 per cent of farmers belonged to high category of adoption. The most important thing noticed was that no farmers belonged to low category. It clearly indicates that farmers resort to some or the other organic practices in their field. However, caution should be maintained to describe that none of the farmers belong to low category as majority of the respondents were not practicing organic farming in full.

From the panchayat wise distribution, similar pattern was observed in case of extent of adoption where majority of farmers belonged to medium category of adoption.

Hence it was concluded that majority of farmers (83.33%) belonged to medium level of adoption followed by high adoption (16.67%). The result is in agreement with the study of Sujitha (2015).

4.4.2 Adopter categorisation of organic farmer respondents on the level of adoption of selected organic plant protection practices.

Total adoption score was further categorized in line of Rogers standard adoption category. The farmers were grouped into five adopter category based on the mean value of adoption percentage and its Standard deviation. The results are depicted in Table 29.

Table 29. Adopter categorisation of vegetable farmer respondents on level of adoption of recommended practices.

Respondent category	No.	Adoption per cent	Rogers std per cent
Innovators	1	1.11	2.5
Early adopters	9	10.00	13.5
Early majority	40	44.44	34
Late majority	24	26.67	34
Laggards	16	17.78	16

From Table 29 it was found that majority of farmers (44.44%) belonged to early majority followed by late majority (26.67%). From the Table 28 it was clearly seen that the innovators and early adopters fell below Rogers standard normal category indicating the low adoption of organic plant protection practices. The result is further vindicated wherein the score percentage for early majority, late majority and laggards are higher than that of standard Roger values.

Adoption of organic practices is basically psychological. It can be inferred that farmers who believe to act in unity with their neighbours hope are more likely to adopt organic agriculture. But in this study, the results indicate an overall low adoption of organic plant protection practices and hence the perceived positive productivity spillovers to neighbouring plots decrease the probability of adoption. Therefore there need to be a serious retrospect by the university, state extension

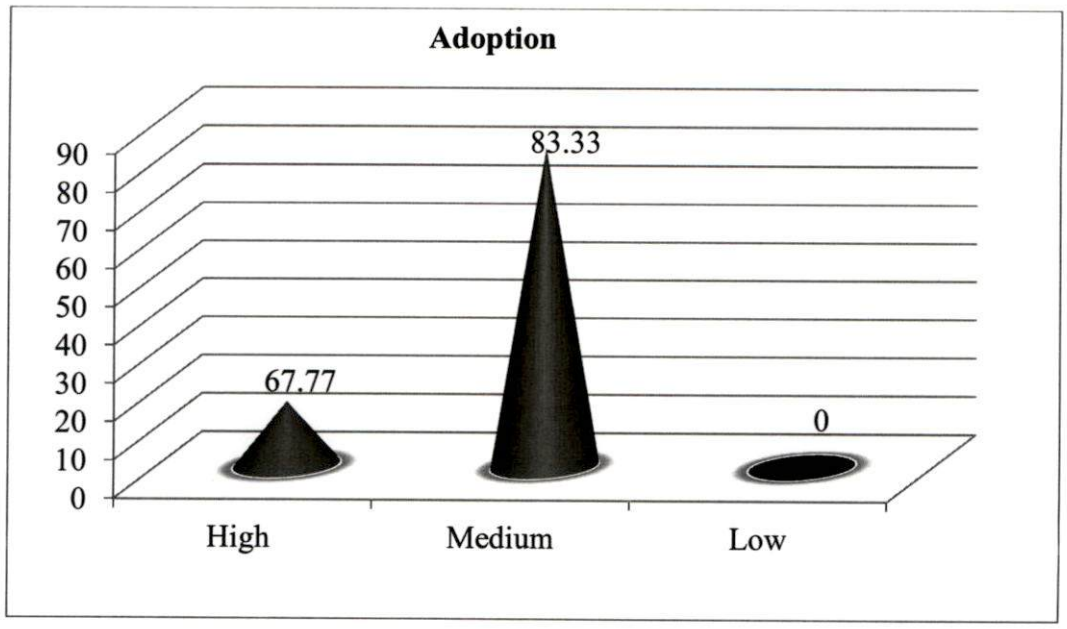

Fig. 23. Distribution of respondents based on extent of adoption

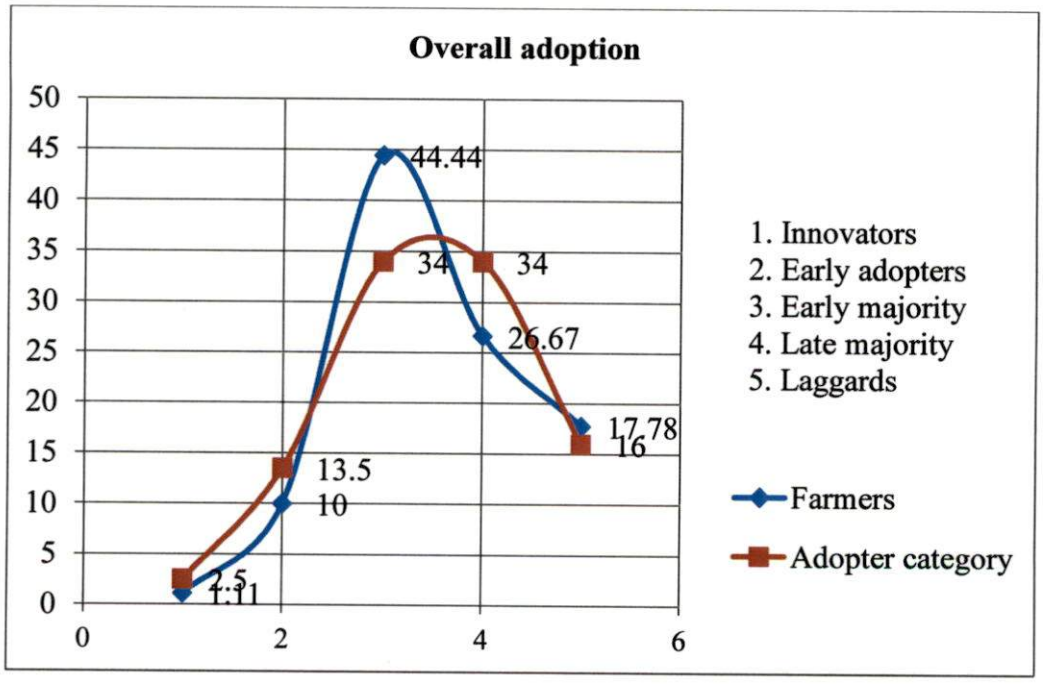

Fig. 24. Adopter categorisation of recommended practices

system and the government on realistic measures to ensure that the productivity of the crop is not affected when attempting to make all production activities organic. Farmers should not be put to confusion on aspects of compliance to sole organic practices as a means of improving productivity. If it is so, farmers should be given with proven, effective and comparatively 'fast technologies' with reference to organic plant protection techniques.

4.4.3 Adoption of selected organic plant protection practices by the respondents in percentage

The percentage of adoption of the recommended plant protection practices were found out and presented in Table 30.

Table 30. Distribution of respondents based on adoption of organic plant protection practices

N=90

Organic plant protection practices	Nedumangad		Kunnathukal		Chenkal		Total	
	No.	%	No.	%	No.	%	No.	%
Pheromone trap	17	56.67	13	43.33	12	40	42	46.67
Botanicals	28	93.33	19	63.33	30	100	77	85.56
Biocontrol agents(Pseudomonas, *Beauvaria bassiana*)	20	66.67	23	76.67	13	43.33	56	62.22
Trap crop	10	33.33	14	46.67	13	43.33	37	41.11
Crop rotation	29	96.67	24	80	13	43.33	66	73.33
Resistant variety	2	6.67	8	26.67	8	26.67	18	20
Tobacco decoction	2	6.67	7	23.33	11	36.67	20	22.22
Quality seed materials	11	36.67	19	63.33	9	30	39	43.33
Bordeaux mixture	5	16.67	6	20	21	70	32	35.56

On analyzing the Table 30 it was found that majority of farmers (85.56%) adopt botanicals followed by crop rotation (73.33%). This was because these types of organic practices are age old and the farmers have been preparing many organic botanicals by themselves and applying the same in vegetable crops. Hence, even without training and other forms of extension classes farmers know to prepare and

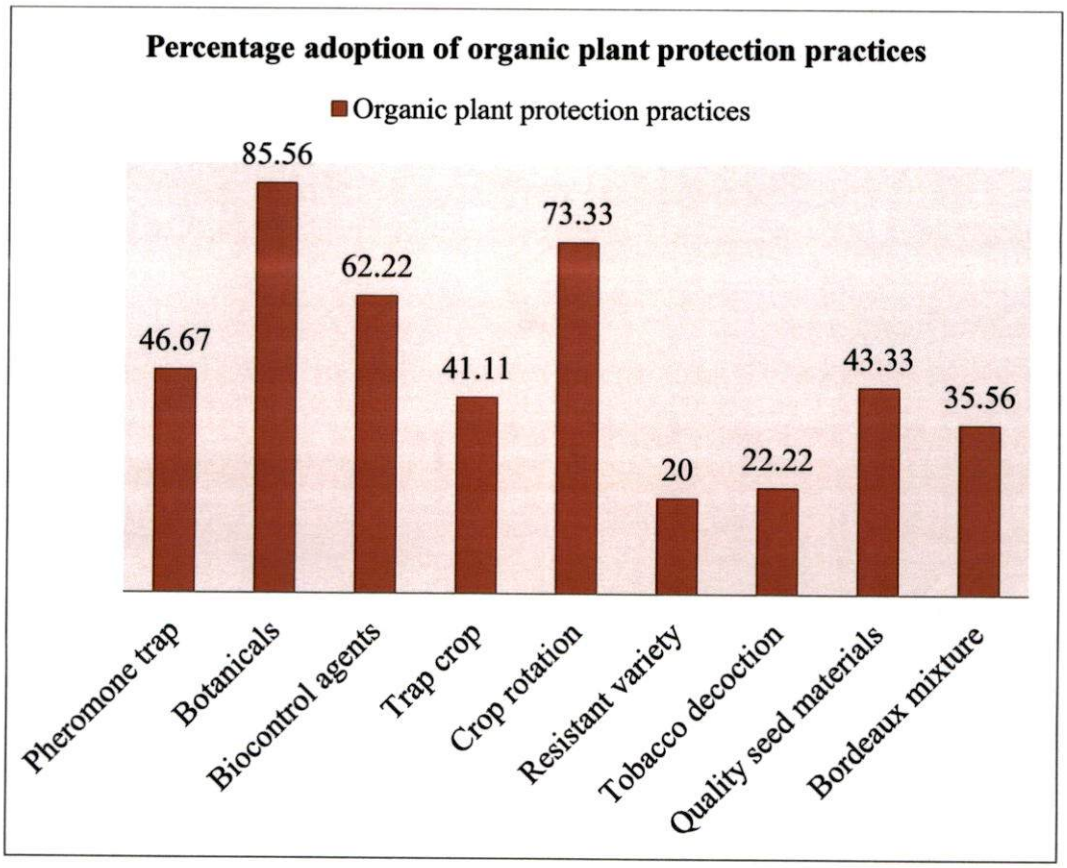

Fig. 25. Percentage of respondents adopting the recommended organic plant protection practices

use botanicals and practice the right type crop rotation. Many botanicals are locally available such as neem seed kernel extract, neem oil emulsion, neem oil – garlic emulsion, chilli- garlic emulsion and tobacco decoction. Hence, these botanicals can be prepared or be made available in their farmstead.

The farmers also had a fairly good level of adoption in using bio control agents. This was because of the effective extension delivery and timely and ample input supply to the farmers on demand by the State Department of Agriculture as well as the technology transfer by Kerala Agricultural University both in terms of quality inputs and service. The role of all the Krishi Vigyan Kendras (KVK) in the state is admirable for such technology generation and transfer.

Use of pheromone traps and quality seed or seedlings was an area to be focused as the adoption percentage is less than 50 per cent. Least amount of adoption was noticed wherein only 22.22 per cent of farmers adopt tobacco decoction followed by 20 per cent of farmers who adopt resistant varieties. State extension system under DoA and university should render extension system to educate the farmers through trainings and demonstrations on the importance of using the same as a means to successful organic farming.

4.4.4 Relation between the level of adoption of organic plant protection practices with the profile characteristics of farmers.

The result of correlation between level of adoption and selected independent variables is illustrated in the Table 31.

Table 31. Correlation between level of adoption and profile characteristics.

Variable	Independent Variables	Correlation co-efficient
X1	Age	-0.043
X2	Education	0.173
X3	Farm size	0.821**
X4	Farming experience	0.728**
X5	Economic motivation	0.037
X6	Market perception	0.774**
X7	Environmental concern	0.124
X8	Risk orientation	0.133

X9	Attitude towards organic plant protection practices	0.846**
X10	Extension orientation	0.789**
X11	Information source utilization	0.766**
X12	Awareness on organic plant protection practices	0.784**

**= significant at 1%

From the Table 31 it was observed that out of 12 variables 7 variables namely farm size, farming experience, market perception, attitude towards organic plant protection practices, extension orientation, information source utilization and awareness on organic plant protection practices were significantly and positively correlated with adoption at 1% significance.

As expected, increases in organic production both spatial and temporal have been closely paralleled by increase in customer demand. Increasing domestic demand for organic products, along with environmental interests, has enthused policymakers and governments to encourage organic production through a variety of farm programs, mass media sources, campaign and sensitisation programmes to encourage more farmers to adopt organic production techniques.The results of this study falls in the aforesaid statement and are in conformity with studies of Sasidharan (2015) and Schneeberger et al (2002).

Unexpectedly, farmers' market perceptions about cost differences between organic and conventional farming practices in marketing does possess a mismatch, however, the farmers are not risking due to the uncertainty of premium price for organic produce. This will influence other important factors in determining the probability of complete or partial adoption of organic practices. Also, for a conventional farmer who does not have any firsthand knowledge and experience in organic farming or has not consulted with an organic farmer about the impact of various factors, these factors may still influence initial adoption decisions but need not facilitate others for enhanced adoption. The results are associated with studies of Chanu *et al.*(2014).

In short, those farmers who are more satisfied with their marketers allocate more of their land to organic practices. Similarly, the effect of modern

communication aids in technology dissemination and market intelligence. Especially the effect as a result of increased reliance on mass media sources integrated with internet have motivated the farmers to more adoption of organic plant protection practices. The results from constraints can be inferred at this point wherein farmers indicated that lowering transaction costs could encourage farmers to allocate more of their cultivated area to organic practices.

4.4.5 ANOVA for adoption of organic plant protection practices among farmers of different panchayat

The results for adoption of organic plant protection practices among farmers of different panchayat is mentioned in table 32.

Table 32. Adoption of organic plant protection practices among farmers of different panchayat

Groups	*Average*	SE
Nedumangad	4.13	0.57
Kunnathukal	4.30	0.40
Chenkal	4.37	0.62

Source of variation	SS	df	MS	F	P value	F crit
Between groups	0.87	2	0.43	0.26	0.77	3.10
Within groups	142.73	87	1.64			
Total	143.6	89				

The adoption scores of three panchayats were determined for significance using single factor ANOVA. From the Table it was evident that there is no significant difference between adoption level of farmers among Nedumangad, Kunnathukal and Chenkal panchayat.

4.5 TECHNOLOGY NEED/GAPS FOR THE SELECTED PRACTICES AS PERCEIVED BY THE FARMERS

Farmers perception varied based on technology needs. Though various institutions have disseminated different technologies, its adoption by the farming community varies due to diverse reasons. Hence the needs for individual farmers with special reference to organic practices are widely differing. Technology needs as perceived by the farmers is relevant in this respect. The result is depicted in the Table 33.

Table 33. Distribution of respondents based on technology needs.

Technologies	Nedumangad	Kunnathukal	Chenkal	Total	Rank
	Score	Score	Score	Score	
Soil solarisation	66	55	70	99	1
Biocontrol agents	75	66	73	159	2
Biopesticides	80	85	60	202	3
Trap crop	61	85	92	204	4
Resistant variety	78	69	79	210	5
Natural predators	55	88	92	219	6
Equipments	75	82	84	228	7
Seed treatment	89	84	86	242	8
Pheromone traps	90	89	93	269	9
Botanicals	115	105	101	298	10

From the Table 33 it was noticed that technology like soil solrarization is the most sought technology by farmers followed by bio-control agents, bio-pesticides, trap crop, resistant variety and natural predators, in the decreasing order of requirements. The table clearly demonstrates that adequate technologies are available on organic botanicals, pheromone traps and organic methods of seed treatment which is indicative by fetching the maximum scores.

4.6 FARMERS PRACTICES

Organic agriculture mainly seeks to sustain productivity of the land by encouraging natural biological processes. This means that farmers think about the

Table 34. Distribution of respondents based on farmers practices.

N=90

Farmers practices	Nedumangad (n=30)	Kunnathukal (n=30)	Chenkal (n=30)	Total	Rank
	Score	Score	Score	Score	
One kg of fresh cowdung is mixed with10 litres of water with crushed neem leaves and kept for 6 hours. The clear solution then is filtered and the supernatant liquid is sprayed at regular intervals.-leaf spot of amaranth	90	79	90	259	1
Spray diluted rice gruel once in 10 days against aphid of brinjal	30	57	60	147	2
Fruit fly trap -taking 20 g banana pulp in a coconut shell and beer 3 ml and palm oil 3 drops.bittergourd	30	45	60	135	3
Turmeric powder and baking soda mixture (5:1ratio/litre) –leaf blight of amaranth	42	40	39	121	4
Spray soap-garlic-castor oil emulsion (2%). Epilachna beetle of brinjal	30	57	30	117	5
Smear the seeds with coconut oil or ground nut oil 1:100 (W/W)-pulse beetle of cowpea	47	39	30	116	6

effects of their farming practices on the soil that determines the quality of the food the wider environment and at the same time focusing to generate high-value products that can be harvested for a profit using their own practices. An attempt was made to document 'farmers practice' and the results are described in table 34.

From the Table 34 it was found that maximum score attained by the top 3 practices were:

One kg of fresh cow dung was mixed with10 litres of water with crushed neem leaves and kept for 6 hours. The clear solution then is filtered and the supernatant liquid was sprayed at regular intervals to manage the leaf spot of amaranthus.

Spraying diluted rice gruel once in 10 days against aphid of brinjal and Fruit fly traps were prepared by taking 20g banana pulp in a coconut shell and mixing the same with 3 ml each of beer and palm oil. This was then hanging in the bittergourd plots for guarding against fruit flies.

However it was observed that many practices said to be done by the farmers were in fact the standard practices suggested by KAU.

4.7 REASONS FOR NON-ADOPTION OF THE RECOMMENDED PRACTICES

Non adoption of plant protection practices suggested and recommended by various institutions are attributed to multiple reasons. Various general reasons were gathered after discussion with selected sample respondents at random and then administered to the farmer respondents for scoring.

The reasons were ranked by assigning a weightage of 5 to 1 wherein the highest score indicated the most important reason. Mean score was calculated for each reason and the same was accordingly ranked. The major reasons are illustrated in the Table 35.

Table 35. Distribution of respondents based on reasons for non adoption.

N=90

Sl no.	Reasons for non adoption	Mean score	Rank
1	Lack of knowledge on organic plant protection products and its preparation cum use	5	1
2	Lack of support from extension agents	4	2
3	Many organic plant protection practices are not effective especially in commercial growing tracts.	3	3
4	Time consuming in terms of preparation, maintenance and its application	2	4
5	Non availability of quality organic plant protection inputs	1	5

The most important reason for non adoption was lack of knowledge on organic plant protection products and its preparation cum use. The insight of a farmer about an organic plant protection technology is influenced based on the farmers level of knowledge. This can influence the adoption of organic plant protection technologies. The study falls in line with the findings of Mathilagan and Senthilkumar, 2012.

Farmers forming an opinion based on the experience of other farmers regarding the practice will be an influencing factor as farmers themselves are the inventors of new formulations as a result of their experience and intuitions. Some of such non-standardized practices need not be effective in real but the other farmers may adopt the same misunderstanding the same to be practices suggested by the university or other recognised bodies.

Lack of support from extension agents especially personals of Agriculture department and time consumption in terms of preparation, maintenance and application of organic plant protection formulations were also reported by farmers.

4.8 CONSTRAINTS EXPERIENCED BY THE FARMERS WITH SUGGESTIONS FOR REFINEMENT

4.8.1 Distribution of respondents based on constraints experienced by the farmer

Farmers face a number of problems in the cultivation of vegetables especially when it comes to adopting organic practices. Such constraints experienced by the farmers were identified, ranked and presented as a list. The constraint with the maximum score got the top rank and the results are presented in Table 36.

Table 36. Distribution of respondents based on constraints faced by the farmers in adoption of organic practices.

Constraints	Score	Rank over total
Crops affected by drought (at the time of interview)	303	1
Lack of extension service to facilitate TOT scientifically on Organic plant protection	299	2
Organic produce fetched same price or even more than that of the produce obtained through inorganic practices	297	3
Time consuming while resorting to organic input preparation, storage and its application.	292	4
Organic practices are labour intensive and non availability cum high cost of labour	240	5
KB not active in rendering support by way of helping farmers with quality inputs and services	234	6
Lack of crop insurance schemes or facilities to help farmers mitigate the loss through price fall or crop loss as a result of practicing organic practices	220	7
Lack of motivation resulting from low price for organic agricultural produce	181	8
Non availability of subsidies and credit for organic inputs	174	9
Low effectiveness and slow action of organic plant protection chemicals	120	10
Lack of knowledge and awareness about organic plant protection practices	114	11

The table 36 exemplify that the top most constraint experienced by the farmers at the time of interview was that the crops were severely affected by drought.

Lack of extension service to facilitate TOT scientifically on organic plant protection was ranked second important constraint followed by the constraints like, 'produce fetching same price or even more than that of the produce obtained through inorganic practices; time consuming while resorting to organic plant protection input preparation, storage and its application; organic practices are labour intensive and non availability cum high cost of labour; krishibhavan was not active in rendering support by way of helping farmers with quality inputs and services; lack of crop insurance schemes or facilities to help farmers mitigate the loss through price fall or crop loss as a result of practicing organic practices; lack of motivation resulting from low price for organic agricultural produce; non availability of subsidies and credit for organic inputs; low effectiveness and slow action of organic plant protection chemicals; lack of knowledge and awareness about organic plant protection practices' in the decreasing order of importance as perceived by the farmers.

4.8.2 Suggestions for refinement

Table 37. Distribution of respondents based on top 5 suggestions made as perceived by the farmers.

Sl no	Suggestions	Percentage
1	Regular and frequent farm visit, diagnostic and consultancy by KB officials	90.44
2	Availability of low cost organic inputs and feasible technologies	88.33
3	Inclusion of more no of classes, demonstrations and seminars about organic plant protection practices	75.22
4	Timely access of organic plant protection inputs	70.22
5	Construction of low cost mini dams or water storage facilities like technologies developed and popularised by RARS, Ambalavayal.	65.22

The top five suggestions to overcome the constraints as perceived by the farmers and subsequently finalized through focus group discussions were listed the Table 37. Majority of the farmers (90.44%) suggested that regular and frequent farm visit, diagnostic and consultancy by krishibhavan officials should be ensured at farm plots with standing crops. Availability of low cost organic inputs and feasible technologies should be provided at the right time in required quantity and quality was the second popular suggestion as perceived by 88.33 per cent of the farmers. Inclusion of more no of classes, demonstrations and seminars about organic plant protection practices; followed by farmers right to have timely access to organic inputs and the construction of low cost mini dams or water storage facilities like technologies developed and popularised by RARS, Ambalavayal were the suggestions for refinement as perceived by the farmer respondents with rank three, four and five respectively.

Hence in general, in addition to development of need based and easy to use organic plant protection technologies efforts are to be taken to improve the awareness and knowledge level of the farmers regarding the recommended standard organic plant protection practices which will in turn persuade the farmer adoption of such good practices. Thrust should be given for gathering and utilisation of traditional farmer organic practices and the same should be validated through scientific rationalisation. This will ensure research system to standardise the same for its effectiveness. It will also make sure that cultivation of crops using standard organic practices be a sustainable one with more remunerative returns to the farmers.

Summary

CHAPTER V

SUMMARY

The Government of Kerala focusing on farming keeping an eye on back to nature policy has created a situation for Kerala farmers to change and evolve. But, some farmers are reluctant due to doubts of its practicality. New options are being tested out by many. In this study, the focus was to look into the adoption of organic practices for plant protection with more focus on vegetable crops. The observations made could serve as guidelines to take a realistic view for those who plan to switch over to eco-friendly agricultural practices.

Government of Kerala in Kerala State Organic Farming Policy: Strategy and action plan reported on the role of Kerala Agricultural University Under the main head 'strategy 21' mainly focussing on reorienting research, education and extension system to support the laid in Organic farming Policy of the state. (GOK , 2008). Agricultural practices, world over, have been undergoing changes over a period of time. The intensification of land use with increased dependence on agro-chemicals resulted in stagnation of crop yield in many situations, which necessitated a change to a sustainable farming system approach having inbuilt features of equilibrium between farming and nature. This type of farming system, later on, came to be known as organic farming (KAU, 2009). With a view to promote organic practices Kerala Agricultural University has developed standard organic Plant Protection practices and has been given the mandate of further exploration of organic plant protection practices by the Government of Kerala. Hence, it becomes essential to study the extent of adoption of such practices and factors affecting the rate of adoption. The objectives of the study are

- Adoption of standard organic plant protection practices.
- Factors affecting rate of adoption of organic plant protection practices.
- Constraints in the process of adoption, if any with suggestions for refinement

The study was conducted during the year 2015 - 2016 in Thiruvananthapuram district covering a sample of 90 farmers in three panchayats, namely, Kunnathukal, Nedumangad and Chenkal, which were purposively selected on the basis of area of cultivation. Level of adoption and knowledge about organic plant protection practices was selected as the dependent variable and the independent variables were age, education, occupation, farming experience, farm size, information source utilization, extension orientation, economic motivation, rational orientation, risk orientation, market perception, environmental concern, attitude towards organic plant protection practices and awareness on organic plant protection practices.

The data were collected from the field through personal interview using a well structured and pre tested interview schedule. Focus group discussion was also conducted to get information regarding constraints experienced by farmers with suggestions for refinement. Using the data, results were generated after appropriate statistical analysis and interpretations were made.

The salient findings of the study were:

1. Majority of farmers belonged to old aged category followed by middle aged category.
2. More than half of the farmers (63.33%) had high school level education followed by middle school (22.22%) level education.
3. Most of the farmers (84.44%) depend on agriculture as their livelihood.
4. Majority of farmers had farm size between 1 and 2 acre and were marginal farmers.
5. Majority of farmers had fairly long years of experience in vegetable cultivation/farming.
6. Majority of farmers believe in both scientific recommendations and are superstitious in terms of their belief in stars.
7. Most of the farmers (88.89%) farmers belonged to medium category of economic motivation.

8. Majority of farmers (67.78%) belonged to medium category in market perception.
9. Majority of farmers (62.22%) belonged from medium to high category of environmental concern.
10. Most of the farmers belonged to medium category of risk orientation
11. Majority of farmers (67.78%) belonged to medium category of organic plant protection practices.
12. Majority of farmers rely on krishibhavan as reliable agency for extension contact. Most of the farmers (55.56%) belonged to medium category of extension orientation.
13. Television and newspaper was the main source of information. Television was most useful medium of information. Majority of farmers (54.44%) belonged to medium category of 'information source utilisation'.
14. More than half of the farmers (77.78%) belonged to medium category of awareness level.
15. Most of the farmers (100%) had awareness about the statement 'Safe use of pesticides' followed by 94.44 per cent of farmers who were aware about the statement 'Red and yellow labeled plant protection chemicals were banned and 91.11 per cent of farmers on botanical pesticides.
16. Majority of farmers (64.44%) belonged to medium category in terms of knowledge possession. About 22.22 per cent of farmers' belonged to high category followed by 13.33 per cent in low category.
17. Farm size, farming experience, market perception, attitude towards organic plant protection practices, extension orientation, information source utilization and awareness on plant protection practices are significantly and positively correlated with knowledge at 1% significance.
18. There is no significance difference between knowledge level of farmers among Nedumangad, Kunnathukal and Chenkal panchayat.
19. Family safe food concept was the foremost reason for preferring organic plant protection practices.

20. About 97.78 per cent of farmers reported use of botanicals and cultivating crop mixtures was effective for them, followed by 56.67 per cent stated that application of pseudomonas in vegetables was effective for them. Most of the farmers (91.11%) reported that cultivating crop mixtures was useful for them followed by 68.89 per cent farmers who stated that use of botanicals was useful for them.
21. Majority of farmers (83.33%) belonged to medium level of adoption followed by high adoption (16.67%).
22. Majority of farmers (44.44%) belonged to early majority followed by late majority (26.67%).
23. Majority of farmers (85.56%) adopt botanicals followed by crop rotation (73.33%).
24. Farm size, farming experience, market perception, attitude towards organic plant protection practices, extension orientation, information source utilization and awareness on organic plant protection practices were significantly and positively correlated with adoption at 1% significance.
25. There is no significance difference between adoption level of farmers among Nedumangad, Kunnathukal and Chenkal panchayat.
26. Technology like soil solarization was the most soughted technology by farmers followed by bio-control agents, bio-pesticides, trap crop, resistant variety and natural predators, in the decreasing order of requirements.
27. Maximum score attained by the practice is one kg of fresh cow dung was mixed with10 litres of water with crushed neem leaves and kept for 6 hours. The clear solution then is filtered and the supernatant liquid was sprayed at regular intervals to manage the leaf spot of amaranthus.
28. The most important reason for non adoption was lack of knowledge on organic plant protection products and its preparation cum use.
29. Top most constraint experienced by the farmers at the time of interview was that the crops were severely affected by drought.

30. Majority farmers (90.44%) suggested that regular and frequent farm visit, diagnostic and consultancy by krishibhavan officials should be ensured at farm plots with standing crops

Suggestions for future research

1. Repetition of the same study in other districts as well.
2. Thrust should be given for developing and disseminating organic plant protection technologies that are fast effective and easy to use and handle.
3. Field level demonstrations of organic plant protection practices should be popularized which is accompanied by Participatory Action Research and Learning.

References

REFERENCES

Adesope, O. M., Matthews-Njoku, E. C., Oguzor, N. S., and Ugwuja, V. C. 2011. Effect of Socio-Economic Characteristics of Farmers on Their Adoption of Organic Farming Practices. In: Sharma, P. and Abrol, V. (ed.), *Crop Production Technologies*, Rijeka: In Tech. 211-220.

Ananthmanikandan, M. D. 2003. Content analysis and audience research on farm and home programmes of Dooradarshan Kendra, Pondicherry. M.Sc. (Ag) thesis, Tamilnadu Agricultural University, Coimbatore, 105p.

Anupama, S. 2014. Content development for agricultural expert system on organic vegetable cultivation. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 134p.

Arunkumar, A. 2002. Retrospect and prospects of commercial cassava cultivation. M. Sc. (Ag) thesis, Tamil Nadu Agricultural University, Coimbatore, 109p.

Assis, K. and Ismail, M. H. A. 2011. Knowledge, attitude and practices of farmers towards organic farming. *Int. J. Eco. Res.* 2(3): 1-6

Baiyegunhi, L. J. S. 2013. Rural households' social capital and welfare: A case study of Msinga, KwaZulu-Natal, South Africa. *J. Agric. Rural Dev. Trop. Subtrop.* 114(2): 123-132.

Balachandran, V. 2004. Future in the past: A study on the status of organic farming in Kerala. Kerala research programme on local level development, Centre for Development Studies, Thiruvananthapuram. 110p.

Basheer, N. 2016. Technology utilisation of bittergourd in Thiruvananthapuram district. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 157p.

Bernice, T. S. 2000. Eco-friendly pest management in brinjal (*Solanum melongena* L.). M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 100p.

Best, H. 2010. Environmental concern and the adoption of organic agriculture. *Soc. Nat. Resour.* 23(5): 451-468.

Bhaskaran, C. 1979. A critical analysis of the interpersonal communication behavior of small and other farmers in a less progressive and more progressive village in Kanyakumari district of Tamilnadu. Ph. D. thesis, University of Agricultural Sciences, Bangalore, 147p.

Bourdillon, M., Hebinck, P., Hoddinott, J., Kinsely, B., Marondo, J., Mudege, N., and Owens, T. 2002. Assessing the impact of HYV maize in resettlement areas of Zimbabwe. Discussion Paper 161. International Food Policy Research Institute, Washington, DC

Burns, N. and Grove, S. K. 2003. *Understanding nursing research.* Philadelphia: Saunders Company. 37p.

Census report. 2011. Government of India [on-line]. Available: htpp://www.censusindia.gov.in./2011census/PCA/PCA*Highlights/pca*_highlights_file/india/chapter-1.pdf [8 July 2017].

Chandrashekar, H. M. 2010. Changing scenario of organic farming in India: An overview. *Int. NGO J.* 5(1): 34-39.

Chanu, T. M., Baite, J. D., Singh, M. K., and Rao, D. U. M. 2014. Adoption of pineapple cultivation practices by the farmers in Manipur state. *Indian Res. J. Ext. Edu.* 14(1): 17-20.

Chattopadhy, S. N. 1963. A study of some psychological correlates of adoption innovations in farming. Ph. D. (Ag) thesis, Indian Agricultural Research Institute, New Delhi, 110p.

Chouichom, S.1. and Yamao, M.I. 2010. Comparing opinions and attitudes of organic and non-organic farmers towards organic rice farming system in north-eastern Thailand. *J. Org. Syst.*5 (1): 23-30.

Cornejo, F. J., and McBride, W. 2002. Adoption of bioengineered crops. *Agric. Econ. Rep.* (810), 1-61.

De Graaff, J., Amsalu, A., Bodnár, F.,Kessler, A., Posthumus, H., and Tenge, A. 2008. Factors influencing adoption and continued use of long-term soil and water conservation measures in five developing countries. *Appl. Geogr.* 28: 271-280.

Elakkia, N. (2007). Training needs of vegetable growers on organic farming practices in Western Zone of Tamil Nadu. M.Sc.(Ag) thesis (unpub.).Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University, Coimbatore.

Erenstein, O. 2006. Intensification or extensification? Factors affecting technology use in peri-urban lowlands along an agro-ecological gradient in West Africa. *Agric. Syst.* 90: 132–158.

FAO [Food and Agriculture Organisation of the United Nations]. 2001. Guidelines for the production, processing, labeling and marketing of organically produced foods (GL 32-1 999/2001). Codex Alimentarius. Pp.5-1 1

Fayas, M. 2003. Viability of self help groups in Vegetable and Fruit Promotion Council Keralam- A multidimensional analysis. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 111p.

Floyd, C. N., Harding, A. H., Paddle, K. C., Rasali, D. P., Subedi, K. D., and Subedi, P. P. 1999. The adoption of associated impact of technologies in the western hills of Nepal. Agricultural Research and Extension Network Paper No.90.

Foster, C. and Lampkin, N. 2000. Organic and in-conversion land area, holdings, livestock and crop production in Europe. Commission of the European Communities, Agriculture and Fisheries (FAIR). pp. 2-15. ftp://ftp.fao.org/codex/standard/ organic/gl9932e. pdf

Gangadharan, K. K. 1993. Adoption of improved agricultural practices by pepper growers of Idukki district. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 150p.

GOI [Government of India]. 2011. Census of India, Provisional Population Totals. Office of the Registrar and Census Commissioner, India, pp.144.

GOK [Government of Kerala]. 2008. Kerala State Organic Farming Policy: Strategy and action plan. Government of Kerala. 27p.

Gopal, B. T. and Kanokporn, R. 2011. Adoption and extent of organic vegetable farming in Mahasarakham province, Thailand. *Appl. Geogr*. 31: 201-209.

Hanjabam, S. 2013. Analysis of constraints and strategies for scaling up of precision farming in Kerala. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 107p.

Istrate, A., Rotaru, L., Ioniţa, F., Stoleru, V., Sellitto, V. M., and Haras, D. G. 2014. Study regarding the farmers attitude towards organic agriculture. *J. oLucrari Stiintifice, Universitatea de Stiinte Agricole Si Medicina Veterinar "Ion Ionescu de la Brad" Iasi, Seria Horticultura*. 57(2): 67-72.

Jacob, R. 2015. Technology assessment on the production practices of economically dominant crops in homegardens. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 139p.

133

Jaganathan, D. 2004. Analysis of organic farming practices in vegetable cultivation in Thiruvananthapuram district. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 115p.

Jaganathan, D. 2009. A multidimensional analysis of organic farming in Tamil Nadu. Ph.D. (Ag) thesis, Indian Agricultural Research Institute, New Delhi, 107p.

Jaganathan, D. 2010. Knowledge level of farmers on organic farming in Tamil Nadu. *Indian Res. J. Ext. Edu.* 12(3):70-73.

Jaganathan, D., Bahal. R., Burman.R.R. and Lenin,V. 2012. Knowledge Level of Farmers on Organic Farming in Tamil Nadu. Indian *Res. J. Ext. Edu.* 12(3):70-73.

Jayawardhana, J. K. J. P. 2007. Organic agricultural practices in coconut based homesteads in Thiruvananthapuram district. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 124p.

Jeyaraj, N. 1997. Adoption of bio-pesticides among cotton growers. M. Sc. (Ag) thesis, (unpub.). Tamil Nadu Agricultural University, Coimbatore,

Kabir, M. H and Rainis, R. 2015. Do Farmers Not Widely Adopt Environmentally Friendly Technologies? Lesson from Integrated Pest Management (IPM). *Mod. Appl. Sci.* 9(3): 208-215.

Kafle, B. 2011. Factors affecting adoption of organic vegetable farming in Chitwan District Nepal. *World J. Agric. Sci.* 7(5): 604-606

Kamalakkannan, K. 2003. Research and extension gaps in commercial vegetable farming in eastern Palakkad. . M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 110p.

Kamalakkannan, T. 2001. Content analysis of selected mass media in dissemination of farm technology- an analysis. M.Sc. (Ag) thesis, Tamilnadu Agricultural University, Coimbatore, 101p.

KAU [Kerla Agricultural University]. 2009. *Package of Practices Recommendations for Organic Farming.* Directorate of Extension, Kerala Agricultural University, Thrichur. 360p.

KAU [Kerala Agricultural University]. 2011. *Package of Practices Recommendations: Crops* (14th Ed.). Kerala Agricultural University, Thrissur, 360p.

Kelly, H., David, L., and Suraiya, B. 2003. An Integrated Economic and Social Analysis to Assess the Impact of Vegetable and Fishpond Technologies on Poverty in Rural Bangladesh. EPTD (Environment and Production Technology Division) Discussion Paper No. 112. International Food Policy Research Institute. Washington, D.C. U.S.A. 88p.

Kerala Land Use Board, Govt.of Kerala. 1997.Kerala State resource based Perspective Plan 2020 AD.

Kerlinger, F. N. 1983. *Foundations of Behavioural Research.* Published by Holt, Rinehart and Winson, New York, p.53.

Khaledi, M., Weseen,S., Sawyer, E., Ferguson, S., and Richard, G. 2011. Factors influencing partial and complete adoption of organic farming practices in Saskatchewan, Canada. *Can. J. Agric. Econ.* 58(1): 37-56.

Kratdemiryrek., Vedatceyhan., and Mehmetbozolu. 2012. Risk Attitudes of Organic and Conventional Hazelnut Producers in Turkey, Human and Ecological Risk Assessment. 18(2): 471-482.

Krishnamurthy, B., Venkatarnganlika., Nataraja, M.S., Somashekharappa., and Shivaramu. 1997. Impact of radio lesson in knowledge and adoption of fertiliser in Karnataka. Indian J. Extn. Eddu. 8(3): 1748-1751.

Krishnan, R. 2013. Techno socio-economic characterization of specialized homegardens: a dominance-diversity approach. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 136p.

Kumar, S., Singh, S. R. K., and Sharma, R. C. 2014. Farmers Knowledge Level on Organic Cultivation in Madhya Pradesh. *Indian Res. J. Ext. Edu.* 14 (3): 131-133.

Kumar, V. H. V. 2012. Knowledge and adoption of chemical fertilisers and pesticides by cole crop growers. M. Sc. (Ag) thesis, University of Agricultural Sciences, Dharwad, 108p.

Kuttan, S. 2005. Credibility of the news media. *J. commn. & Media studies*. Department of communication and journalism, University of Kerala. 103p.

Lapar, M. L. A. and Ehui, S. K. 2004. Factors affecting adoption of dual-purpose forage in the Philippine uplands. *Agric.Syst*. 81: 95-114.

Liew, A. 2007. Understanding Data, Information, Knowledge and Their Inter-Relationships, *J. Knowl. Manag. Practice.* 8(2): 1p.

Loganadhan, N. 2002. Socio-economic implications of organic farming in Tamil Nadu, Ph.D. thesis, IARI, New Delh,. 214p.

Loganandhan, N. and Singh, P. 2003. Adoption of Organic Farming: Profile and Motives of Farmers. *Indian J. Ext. Educ*. 39 (1 and 2): 35-40.

Majjusha, A. R. 2000. Techno socio economic assessment of farmer practices in cultivation of cowpea (*Vigna unguiculata. L*) in Thiruvananthapuram District. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 110p.

Manoj, S. 2000. Techno-economic assessment of farming practices in rice cultivation in Thiruvananthapuram district. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 102p.

Mathilagan, P. and Senthilkumar, K. 2012. Extent of awareness and adoption of disease prevention and control by poultry farmers. *Int. J. Food. Agric. Vet. Sci.* 2(2): 1-4.

Mc Graw, H.1982. *Mc Graw Encyclopedia of Science and Technology*. Mc Graw Hill Book Company, New York, 502p.

Mohan, J.D. and Helen, S. 2014. Attitude of farmers towards organic vegetable cultivation. *Agric update* 9(3): 364-36.

Mondal, S., Haitook, T., and Simaraks, S. 2014. Farmers' knowledge, Attitude and Practice toward Organic Vegetables Cultivation in Northeast Thiland. *Kasetsart J. Soc. Sci.* 35:158-166.

Nair, J. M. 1981. Report of the One Man Commission on the problems of Paddy cultivators in Kerala. Govt. of Kerala.

Nayakarathna, N. M. S. K., Athauda, A. M. T. P., Abeynayake, N. R., and Anjalee. G. H. I. 2013. Farmer Knowledge, Awareness and Attitudes towards Organic Paddy Farming in the Kurunegala District, International Symposium on Agriculture and Environment 2013 University of Ruhuna Sri Lanka.

Noorjehan, A.K.A. Hanif. 2004. Organic Farming in Tamil Nadu: A Multi Dimensional Analysis. (Unpub.). Ph. D. Thesis, TNAU, Coimbatore.

Oelhaf, R. C. 1978. Organic agriculture. Allanheld, Osmun &Co. Publishers, Inc. USA.

Ogunyemi, O.M. 2005. Principles and practice of Agricultural Extension. Deen-Lat Litho print and publishers, Ado, Nigeria. Pp.56.

Oinam, T. and Sudhakar, B. 2014. Adoption of recommended paddy practices by the farmers of Bishnupur district of Manipur State. *EPRA Int. J. Econ. Bus. rev.* 2(7): 18-22. Available: htpp// www.epratrust.com. [3 March 2016]

Oluwasusi, J. O. 2014. Vegetable farmers' attitude towards organic agriculture practices in selected states of South West Nigeria. *J. Agric.Ext. and Rural Devel.* 6(7): 223-230.

Oyesola., Olutokunbo, B., Obabire., and Ibikunle, E.2011. Farmers' perceptions of organic farming in selected local government areas of ekiti state, Nigeria. *J. Org. Syst.* 6(1): 83-91.

Panyakul, V. and Sukjirattikarn, J. 2003. The situation of organic agriculture in Thailand and the world. Bangkok: Earth Net Foundation.

PARC [Pakistan Agricultural Research Foundation]. 2012. National Coordinated Wheat Programme.Available:htpp://www.parc.gov.pk/1Subdivisions/NARCCSI/CSI/CSI /wheat.html[12 Nov.2015].

Patel, M. 2008. A study on production and marketing management behavior of organic vegetable growers in Belgium district. M. Sc. (Ag) thesis, University of Agricultural Sciences, Dharwad, 83p.

Pornpratansombat, P., Bauer, B., and Boland, H. 2011. The adoption of organic rice farming in northeastern Thailand. *J. Org. Syst.* 6(3): 4-12.

Priya, R. D. 2003. Micro credit and technology utilization in vegetable production by self help group in Thiruvananthapuram district. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 72p.

Quazi, A. R. and Iqbal, M. 1991. The relationship between personal characteristics and adoption of recommended farm practices. *J. Rural Dev. Admn.* 23:126-129.

Rajendran, P. 1992. Feasibility and utilization of agricultural technologies among scheduled caste farmers. Ph. D. thesis, Kerala Agricultural University, Thrissur, 272p.

Ram, D., Pandey, D.K., Devi, S., and Chanu, T.M. 2012. Adoption level of IPM practices in cabbage and Cauliflower growers of Manipur. *Indian Res. J. Ext. Edu.* 12(2): 34-37.

Rathinasabapathi, S. 1987. Study on knowledge and extent of adoption of integrated pest management for cotton. M.Sc. (Ag) thesis, Tamilnadu Agricultural University, Coimbatore, 155p.

Reddy, S.S. 2003. A study on entrepreneurial behavior of sericulture farmers in Chittoor district of Andra Pradesh. M.Sc. (Ag) thesis, Acharya N.G. Ranga Agricultural University, Hyderabad, 135p.

Richard, M. 1998. 'Suicide by Pesticide'. Article in 'Down to Earth'. 116 (17).

Rogers, E. M. 1962.In: *Diffusion of innovations*". The Free Press, New York. 24p.

Rogers, E.M. 2003. *Diffusion of innovations*. 5. Auflage, Free press, New York, London. 251p.

Rousan. 2007. Factors influencing adoption of improved farm practices among women farmers in Northern Jordan. *Am.-Eurasian J. Agric. and Environ. Sci.* 2(3): 220-226.

Sadati, S. A., Fami, H. S., Kalantari, K., Mohamadi, Y., and Asakere, A. 2010. Investigating effective factors on attitude of paddy growers towards organic farming: a case study in Babol County in Iran. *Res. J. Appl. Sci. Eng. and Technol.*2 (4): 362-367. On-line] Available: http://maxwellsci.com/print/rjaset/v2.

Sasidharan, A. 2015. Adoption of organic farming technologies in banana and vegetable crops in Kasargod district. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 150p.

Schneberger, W., Darnhofer, I. and Eder, M. 2002. Barriers to adoption of organic farming by cash crop producers in Austria. *Am. J. Altern. Agric.* 17(1): 21-31.

Schwall, R.A. 2012. *Defining Age and Using Age- Relevant Constructs* [e-book]. Oxford handbooks online. Available: http://www.oxfordhandbooks.com .

Shaban, A. A. 2015. Factors influencing farmers' decision to shift to organic farming: the case of Gaza Strip. *British J. Econ. Manag. Trade*.5(1): 78-87 [On-line] Available:http://www.sciencedomain.org/abstract.

Sharma, A. K. 2006. The potential of organic farming in drylands of India. htpp://org.arizona.edu/OALS/ALN/aln58/Sharma.html, (58).

Sharma, O. P. 2012. *Development perspective of extension education.* Agrotech publishing academy, Udaipur. 1p.

Sheeder, R. and Lynne, G. 2009. Empathy conditioned conservation: "walking-in-theshoes- of-others" as a conservation farmer. *Agric and Appl Econ.*5(2): 85-89

Sherief, A. K. 2002. Potential for organic agriculture system in Kerala, Paper presented in the National Seminar on Market oriented Agriculture, Organized by Department of Agricultural Extension, Annamalai University, Tamil Nadu.

Sidram. 2008. Analysis of organic farming practices in pigeon pea in Gulbarga District of Karnataka state. M. Sc. (Ag) thesis, University of Agricultural Sciences, Dharwad, 94p.

Singh, K. M. P. and Singh, R. P. 1967. Ginger cultivation in Himachal Pradesh, *Indian FMG* 30 (11): 25-26.

Singh, R. N. 2004. Problems in adoption of improved dry land practices among arid zone farmers, *Indian Fmg.*, 53(12): 24-26p.

Singh, S. and George, R. 2012. Organic farming: awareness and beliefs of farmers in Uttarakhand. India. *J. Human Ecol.* 37(2):139-149 [on-line] Available: http://www.krepublishers.com/02Journ.

Singh, S., Singh, D. R., Singh, L.B.,Singh,V.N. and Roy, S.D. 2015. Technologies for vegetable production in Andaman and Nicobar Islands. CARI, Port Blair, India. pp.1-36.

Sivakumar, T. 2001. Eco-friendly pest management in snakegourd. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 122p.

Smith, R.T. 2002. Organic farming sustaining earth and people. Centre for Organic Agridevelopment in association with Environmental Economics and Global Affairs Division of the Ministry of Environment and Natural Resources. pp. 68.

Sobha, S. 2013. Farm telecast in Kerala. A critical appraisal. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 112p.

Solomon, O. 2008. Small scale oil palm farmer's perception of organic agriculture in Imo State, Nigeria. *J. Environmental Ext.* 7: 67-71.

Sreedaya, G.S.2000.Performance analysis of the self help groups in vegetable production of Thiruvananthapuram District. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 154p.

Sreevalsan, J.M. 1995. Taxonomical analysis of agricultural modernity of farmers. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 68p.

Sriram, N.1997. Eco-friendly agricultural practices in cotton cultivation- farmer's Awareness, Attitude and Adoption. UNpub. M.Sc. (Ag) Thesis, A.C.&R.I., T.N.A.U., Coimbatore, 85p.

Sujitha, P.S. 2015. Technology assessment of plant protection practices of economically dominant crops in homegardens. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur,177p.

Suthan, L. 2003. Analysis of farmers participation in the Participatory Technology Development (PTD) process vis- a-vis plant protection in vegetable at Kunnathukal panchayat, M.Sc. (Ag) thesis, Kerala Agricutural University, Thrissur, 113p .

Thiagarajan, S. and Ramachandran, N. 2001. Adoption of bio-fertilisers in rice cultivation. *Indian J. Ext. Educ.* 37(3, 4): 79-182.

Thomas, A. 2004. Technology assessment in the homegarden systems. Ph.D. thesis, Kerala Agricultural University, Thrissur, 230p.

Thrustone, L. L. (1946). *Comment. Amer. J. Sociology*. 52: 39-59.

Tippeswamy, R. 2007. A study on knowledge and adoption of plant protection measures in coconut cultivation by farmers of Chitraduga district. M. Sc. (Ag) thesis, University of Agricultural Sciences, Dharwad, 117p.

Truong, T. N. C. and Ryuichi, Y. 2002. Factors affecting farmers adoption of technologies in farming system: A case study in Omon district, Can Tho province, Mekong Delta. *Omonrice*. 10: 94-100.

Ullah, A., Shah, S.N.M., Ali, A., Naz, R., Mahar, A., and Kalhoro, S.A. 2015. Factors Affecting the Adoption of Organic Farming in Peshawar-Pakistan. *Agric. Sci.* 6, 592 [on-line] Available: http://www.scirp.org/journal/as http:// dx. doi. org/ 10.4236/as.2015.66057

UNFCCC [United Nations Framework Convention on Climate Change]. 2014a. Issues related to agriculture. Subsidiary Body for Scientific and Technological Advice. Fortieth session. Bonn, 4-15 June 2014. FCCC/SBSTA/2014/L.14.

Verma, R.S., Sengar, M.K., Chaturvedi., and Verma, L. R. 2012. Adoption of organic farming practices in paddy cultivation by tribal farmers of Chhattisgarh. *Agric. Update*, **7**(3&4): 436-440.

Vogeler, I., Cichota, R., Sivakumaran, S, Deurer, M., and McIvor, I. 2006. Soil assessment of apple orchards under conventional and organic management. *Aust. J. Soil Res*. 44:745-752.

Wood, R., Lenzen, M., Dey, C., and Lundie, S. 2006. A comparative study of some environmental impacts of conventional and organic farming in Australia. *Agric. Syst.* 89:324-348.

Yadav, D. S.,Sood, P., Thakur, S. K., and Choudhary, A. K. 2013. Assessing the training needs of agricultural extension workers about organic farming in the North-Western Himalayas. *J. Org. Syst.* 8(1): 17-27.

Zutinic, D. and Tratnik, M. 2009, Organic Vegetable Growing Attitude of the Croatian Farmers. International society of horticultural science. [on-line] Avilable: htpp: //www. Actahort.org.

Appendices

APPENDIX I

Farmers profile analysis

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Department of Agricultural Extension
Date: 09 -08-2016

Sir/Madam,

Ms. Aparna. K.V (Ad. No. 2015-11-076), the Post graduate scholar in the Department of Agricultural Extension, College of Agriculture, Vellayani is undertaking a research study entitled "Technology utilisation of organic plant protection practices of KAU" as part of him 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

This study will assess the impact of the technologies of organic plant protection practices in terms of three impact indicators *viz*., the adoption of standardized practices, factors affecting the rate of adoption and constraints in the process of adoption, if any with suggestions for refinement.

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. A score of 5 indicates maximum relevancy and a score of 1 indicates the least relevancy.

Sl. No	Independent variables for students	1	2	3	4	5
1	**Age** It is defined as the number of calendar years completed by the respondents at the time of investigation.					
2	**Education** It refers to highest academic qualification possessed by the farmer at the time of data enumeration.					
3	**Occupation** It is defined as the main vocation and other additional vocations that the respondents were possessing at the time of interview.					
4	**Family size** It is defined as the total no of family members who are dependent on the head of family for their living.					
5	**Farming experience** It is defined as the number of completed years in farming.					
6	**Information source Utilization** It is defined as the different sources through which information on organic plant protection practices is obtained by farmer.					
7	**Extension orientation** It is defined as the point of reference wherein the farmers seek help and support for technology know how and is measured in terms of both extension participation of farmers and extension contribution by different agents/agencies engaged in the field of agriculture.					

8	**Economic motivation** It is defined as the occupational motives of farmers practicing organic measures intended for profit maximization and relative value the farmer places on monetary gain.					
9	**Awareness** It is defined as the extent to which the respondents were familiar with organic plant protection practices.					
10	**Farmer practices** It is defined as the agricultural practices done by the farmer on his own farm.					
11	**Infrastructure facility** It is the basic facility and installations required or available for a farmer basically intended for practicing organic farming practices.					
12	**Training attended** It is defined as the number of trainings related to organic plant protection practices by respondent.					
13	**Area under organic cultivation** It is defined as the extent of area of crops under organic farming.					
14	**Innovativeness** It is defined as the degree to which an individual is relatively earlier in adopting new ideas.					
15	**Risk orientation** It refers to the degree to which an organic farmer is oriented towards risk and uncertainty in adopting organic plant protection practices.					
16	**Market perception** It is operationalised as the organization wide generation of market intelligence pertaining to current and future customer needs, dissemination of intelligence across departments and organization wide responsiveness to it.					
17	**Livestock possession** It is operationalized as the total number of animals maintained by an individual in his or her farm.					

18	**Technology availability** It is the degree to which farmer has accessibility to right technology in time.					
19	**Credit orientation** It is defined as the respondents ability and willingness to avail credit for organic farming.					
20	**Self confidence** It is the extent of feeling about one's own power, abilities and resourcefulness to perform any activity which the respondent desires to undertake.					
21	**Attitude towards organic pp practices** Positive or negative feeling of the farmer towards organic plant protection practices.					
22	**Information Acquisition Behaviour** It is defined as the sources or channels from which the respondent gets technological information regarding organic plant protection practices. Respondents are categorized based on their information acquisition through personal-cosmopolite channels.					
23	**Motivation** It refers to the need satisfying and goal oriented behaviour of farmers with special reference to the support they get from Government/Non Government/fellow members for adopting organic farming practices.					
24	**Satisfaction** Level of satisfaction is defined as the contentment the farmers get as a result of the degree of better price of the farm produce generated through organic practices.					
25	**Farm size** It is defined as the total farming land owned by the farmer for agricultural activities and is expressed in hectares.					
26	**Annual income** It is operationalized as the total amount of income in a year earned by the family members through primary and secondary occupations.					

27	**Resource generation** It refers to the quantity of organic plant protection inputs generated in the farm through farmers own effort.					
28	**Environmental concern** It refers to the farmers concerns for the environment that have prompted them for embracing organic farming practices in their farm.					
29	**Adaptability** Adaptability shows the ability of farmer to learn from experience and improve the fitness of the learner as a competitor with special reference to organic farming practices.					
30	**Scalability** A system that scales well will be able to maintain or even increase its level of performance or efficiency when tested by larger operational demands.					
31	**Cosmopoliteness** Defined as the extent of contact of farmers with outside village such as visiting the nearest town, the purpose of visit and membership in organizations outside the village may influence their behavioural pattern.					
32	**Scientific orientation** Defined as the degree to which a farmer was oriented towards the use of scientific methods in farming.					
33	**Rational orientation** Defined as the extent of rationality and scientific belief of organic farmer in relation to the different scientific recommendation applicable to organic farming.					
34	**Literacy** Defined as the ability to read and write and use simple arithmetic by a farmer.					

35	**Simplicity** It is the degree to which the technology (organic plant protection measures) simple to be adopted by the farmer.					
36	**Social acceptability** Defined as the degree to which a technology is considered useful, practical and feasible majority of social system.					
	Any others (Specify)					

APPENDIX 11

The variables with mean relevancy score

Sl no.	Independent variable	Mean relevancy score
1	Age	**4.26**
2	Education	**4.4**
3	Occupation	**3.86**
4	Family size	3.50
5	Farming experience	**4.6**
6	Information source utilization	**4.33**
7	Extension orientation	**4.46**
8	Economic motivation	**4.40**
9	Awareness on plant protection practices	**4.33**
10	Farmer practices	3.22
11	Infrastructure facility	3.43
12	Training attended	3.11
13	Area under organic cultivation	3.00
14	Innovativeness	3.12
15	Risk orientation	**4.26**
16	Market perception	**4.40**
17	Livestock possession	3.65
18	Technology availability	3.62
19	Credit orientation	3.66
20	Self confidence	3.7
21	Attitude towards organic plant protection practices	**4.46**
22	Information acquisition behavior	3.25
23	Motivation	3.55
24	Satisfaction	3.42
25	Farm size	**3.9**
26	Annual income	3.11
27	Resource generation	3.25
28	Environmental concern	**4.06**
29	Adaptability	3.62
30	Scalability	3.00
31	Cosmopoliteness	3.05
32	Scientific orientation	3.55
33	Rational orientation	**3.93**

34	Literacy	3.7
35	Simplicity	3.09
36	Social acceptability	3.13
	Mean – 3.78	

APPENDIX 111

DATA ENUMERATION SCHEDULE

1. Name:
2. Address:
3. Family Details

Name Of Member	Sex	Age	Relationship with head	Education	Occupation	
					Primary	Secondary

4. Experience in organic farming :

   No of years:

5. Irrigation:
   a. Rainfed/ irrigated:
   b. Frequency of irrigation:
   c. Type of irrigation: (Drip, Spray…etc)
6. Water resource

Type	Y/ N	No./ Area
Well		
Pond		
Pipe		

7. Area (Ha)

Total Area	Total infrastructure area	Area under organic cultivation	Rent/ Owned	Leased out land

8. Information source utilisation

Information source	Frequency			Usefulness		
	Regularly	Often	Not often	Very useful	Useful	Not useful
Newspaper						
Television						
Magazines						
Friends/ relatives						
Mobile advisory services						
Kiosk						
Radio						

9. Technology need assessment

Sl no	Technology	Technology not available	Technology available but not applicable	Technology available but not sustainable	Technology available, applicable and sustainable
1	Botanicals				
2	Soil solarization				
3	Seed treatment				
4	Equipments				
5	Pheremone traps				
6	Biocontrol agents				
7	Resistant variety				
8	Trap crop				
9	Natural predators				
10	Bio pesticides				

10. Plant protection preferences in organic farming

No	Criteria	Botanicals	Compost	pheromones	Bio pesticides	Resistant variety
1	Cost effectiveness					
2	Sustainability					
3	Family safe food concept					
4	Ease in operation					
5	Compatibility with management practice					
6	Eco friendliness					
7	Local resource utilization					
8	Safety in handling					
9	Availability of inputs					
10	Immediacy of effect					

11. Usefulness and effectiveness of plant protection technologies

Sl no	plant protection practice	NU	U	NE	E
1	Use of bio pesticides				
2	Use of botanicals				
3	cultivating crop mixtures				
4	Application of pseudomonas in vegetables				
5	Use of resistant variety				

NU- Not Useful U- Useful NE- Non Effective E- Effective

12. Farmer practices

Practices	Rarely	Moderately	Frequently
One kg of fresh cowdung is mixed with10 litres of water with crushed neem leaves and kept for 6 hours. The clear solution then is filtered and the supernatant liquid is sprayed at regular intervals.-leaf spot of amaranth			
Turmeric powder and baking soda mixture (5:1ratio/litre) –leaf blight of amaranth			
Spray diluted rice gruel once in 10 days against aphid of brinjal			
Spray soap-garlic-castor oil emulsion (2%). Epilachna beetle of brinjal			
Fruit fly trap -taking 20 g banana pulp in a coconut shell and beer 3 ml and palm oil 3 drops.bittergourd			
mear the seeds with coconut oil or ground nut oil 1:100 (W/W)-pulse beetle of cowpea			

13. Rational orientation What are the factors that improved your life and increase your income through organic farming?

Belief in stars alone	
Belief in stars and scientific recommendations	
Belief only in scientific recommendations	

14. Extension orientation based on extension contact

Sl no	Agency	Frequency of contact		
		Regularly	Often	Not often
1	Kerala Agricultural University			

2	Krishi bhavan			
3	KVK			
4	Friends and neighbors			
5	NGO			

15. Extension orientation based on extension participation

Programmes	Whenever conducted	Sometimes	Never
Study tour			
Seminar			
Mela			
Meeting			
Demonstration			

16. Economic motivation

Sl no	Statements	Economic motivation		
		SA	A	DA
1	Organic farming gives more profit than conventional farming			
2	Supermarkets/ retailers want more organic fruit and vegetables.			
3	Consumers are ready to pay premium price for organic products.			
4	It is difficult for the farmer children to make good start unless he provides them with economic assistance.			

SA: Strongly Agree A: Agree DA: Dis Agree

17. Market perception :

Statement	**Response**	
Organic commodities are expensive by nature; therefore, not all the	Yes	No

consumers can afford to buy them, is it so?				
Do you find it difficult to sell the produce in the local market?	Very difficult	Difficult	Easy	Very easy
How much price the organic produce will fetch compared to those produced under conventional methods?	Low	Same		High

18. Environmental concern:

Sl. No.	Statement	Agree	Disagree
1	Excessive and exploitative uses of pesticides pose threat to earth and human kind.		
2	Soil pollution, air pollution and water pollution are the major environmental issues concerned by humans.		
3	Do you agree that older method of farming were safer than the present ones by the statement that present trend reduce the use of chemical measures?		
4	Tastier and healthier agricultural products obtained by the use of organic plant protection measures.		
5	Agro chemicals can be used during emergency situations		
6	Recommended dose of agro chemicals in correct quantity shall be used		
7	Man is destroying the earth too much.		

8	Organic plant protection measures cannot harm surroundings.		

SA: Strongly agree A: Agree D: Disagree

19. Risk orientation

Risks	HR	MR	LR
Production risk -yield loss as a result of weather and/or weeds and/or insects			
Market risk -low prices			
Contamination and commingling risk –crops not meeting organic standards as a result of contamination			
large farms entering and swamping the organic market			
Processing risk			

HR-Highly Risk, MR-Moderately Risk, LR-Low Risk

20. Attitude towards organic plant protection practices

Sl. No.	Statement	Agree	Undecided	Disagree
1.	Organic plant protection practices are eco friendly in nature.			
2	Organic plant protection practices are not effective for pest and disease.			
3	Availability of organic plant protection is easy.			
4	Traditional plant protection practices are more economic than the organic plant protection practices.			
5	Adoption of organic plant protection practices is practically not feasible.			
6	Organic plant protection practice is the sub component of traditional plant protection practices.			
7	It is possible to get good yield by adopting organic plant protection practices			
8	In organic farming only organic plant protection measures used.			

9	Chemical pesticides are more suitable to control pests			
10	Integrated pest management (IPM) has considered organic farming			

21. Awareness about organic plant protection practices

Sl.No.	Statement	Aware	Unaware
1	Safe use of pesticides.		
2	Red and yellow labeled plant protection chemicals were banned		
3	PGPR mix I and II		
4	Bio control agents and its applications (*Pseudomonas, Beauvaria, Verticellium etc)*		
5	Botanical pesticides (neem based products)		
6	Eco shops are functioning for the marketing of the produce		
7	Animal husbandry is an important component in organic farming		
8	Leaf axial filling with *Bevaria*or neem cake is an important management practice for the control of pseudostem weevil		
9	Nanma and Menma products which are extracted from the tapioca leaves for the control of pseudostem weevil		
10	Conservation of natural enemies is one of the important practice in organic farming		

22. Extent of knowledge about organic plant protection

Sl no	Statements	Yes	No
1	Name any two green label pesticides/fungicides available in markets for vegetables		
2	Pheromone traps can be used in organic vegetable cultivation? Y/N		
3	Name any two botanicals used in vegetables.		

4	Name two biological control agents to control pests in vegetables		
5	Name any disease resistant variety of amaranthus		
6	what are the ingredients used for preparation of panchagavya?		
7	Name the pest and diseases in banana		
8	How many hours you will soak tobacco waste in water and what proportion you will dilute it before application in vegetables?		
9	What is the crop rotation pattern followed in vegetables in a year to decrease the incidence of pest and diseases ?		
10	What is the control measures for preventing the incidence of rhinoceros beetle?		
11	Name any two 2 neem based insecticide		
12	Name any resistant plant varieties of bitter gourd to reduce pest/disease attack in plants		
13	Name any trap crops used as a method to control pests and diseases in vegetables.		
14	What is the proportion of mixing CuSO4 and milk of lime in Bordeaux mixture?		
15	Name any 2 natural predators		

23. Organic plant protection – adoption

Sl no	Practices	Adopt	Not adopt
1	Pheromone trap		
2	Botanicals		
3	Biocontrol agents(Pseudomonas, *Beauvaria bassiana*)		
4	Trap crop		
5	Crop rotation		
6	Resistant variety		
7	Tobacco decoction		
8	Quality seed materials		
9	Bordeaux mixture		

24. Constraint analysis

Sl no	Constraints	MI	I	LI	Li
1	Lack of extension service				
2	Lack of crop insurance				
3	KB not active				
4	Time consuming.				
5	Low effectiveness and slow action of organic plant protection chemicals				
6	Lack of knowledge and awareness about organic pp practices				
7	Non availability of subsidies and credit for organic inputs and				
8	Crops affected by drought (at the time of interview)				
9	Same price or even more than that chemical produce				
10	Lack of motivation resulting from low price for organic agricultural produce				
11	Organic practices are labour intensive and non availability cum high cost of labour				
12	Political intervention				
13	Non availability of equipments				
14	Lack of information about latest organic plant protection practices				
15	Non availability of quality organic inputs				

MI- Most Important I- Important LI- Less Important Li- Least Important

Appendix 1V

Percentage of respondents' awareness about selected plant protection practices in farming.

Statements on awareness assessment	Nedumangad (n=30)		Kunnathukal (n=30)		Chenkal (n=30)	
	A	NA	A	NA	A	NA
Safe use of pesticides	100.00	0.00	100.00	0.00	100.00	0.00
Red and yellow labeled plant protection chemicals were banned.	100.00	0.00	96.67	3.33	86.67	13.33
PGPR mix 1 and 11	56.67	43.33	36.67	63.33	43.33	56.67
Biocontrol agents and its applications	56.67	43.33	90.00	10.00	50.00	50.00
Botanical pesticides	76.67	23.33	96.67	3.33	100.00	0.00
Eco shops are functioning for the marketing of produce	63.33	36.67	43.33	56.67	53.33	46.67
Animal husbandry is an important component in organic farming.	60.00	40.00	96.67	3.33	96.67	3.33
Leaf axial filling with *Bevaria* or neem cake is an important management practice for the control of pseudostem weevil	56.67	43.33	23.33	76.67	26.67	73.33
Nanma and Menma products which are extracted from the tapioca leaves for the control of pseudostem weevil	40.00	60.00	20.00	80.00	30.00	70.00
Conservation of natural enemies is one of the important practice in organic farming	46.67	53.33	16.67	83.33	70.00	30.00

Appendix V.

Percentage of respondents' knowledge about selected plant protection practices in farming.

Statements for knowledge assessment	Nedumangad (n=30)		Kunnthukal (n=30)		Chenkal (n=30)	
	No.	%	No	%	No	%
Name any two green label pesticides/fungicides available in markets for vegetables	15	50.00	20	66.67	11	36.67
Pheromone traps can be used in organic vegetable cultivation? Y/N	24	80.00	28	93.33	28	93.33
Name any two botanicals used in vegetables.	27	90.00	25	83.33	30	100.0
Name two biological control agents to control pests in vegetables	19	63.33	18	60.00	15	50.00
Name any disease resistant variety of amaranthus	13	43.33	23	76.67	17	56.67
what are the ingredients used for preparation of panchagavya?	26	86.67	21	70.00	17	56.67
Name the pest and diseases in banana	19	63.33	20	66.67	18	60.00
How many hours you will soak tobacco waste in water and what proportion you will dilute it before application in vegetables?	23	76.67	23	76.67	14	46.67
What is the crop rotation pattern followed in vegetables in a year to decrease the incidence of pest and diseases?	18	60.00	14	46.67	15	50.00
What are the control measures for preventing the incidence of rhinoceros beetle?	21	70.00	20	66.67	14	46.67
Name any two 2 neem based insecticide	16	53.33	18	60.00	30	100.0
Name any resistant plant varieties of bitter gourd to reduce pest/disease attack in plants	15	50.00	15	50.00	12	40.00
Name any trap crops used as a method to control pests and diseases in vegetables.	18	60.00	18	60.00	19	63.33
What is the proportion of mixing CuSO4 and milk of lime in Bordeaux mixture?	26	86.67	27	90.00	17	56.67
Name any 2 natural predators.	22	73.33	18	60.00	0	0.00

APPENDIX V1

Plate. 1

Plate. 2

Plate. 3

Plate. 4

Plate. 5

TECHNOLOGY UTILISATION OF ORGANIC PLANT PROTECTION PRACTICES OF KAU

by

APARNA. K. V
(2015-11-076)

Abstract of the thesis

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ABSTRACT

The present study entitled "technology utilization of organic plant protection practices of KAU" was undertaken with the objectives of studying the adoption of standardized practices, factors affecting the rate of adoption and constraints in the process of adoption, if any with suggestions for refinement of organic plant protection practices.

From Thiruvananthapuram district three panchayts namely, Nedumangad, Kunnathukal and Chenkal panchayats were selected from three blocks having more number of farmers practicing commercial vegetable cultivation along with organic practices for plant protection. Ninety such farmers were selected through simple random sampling procedure from the list of farmers provided by the respective agricultural officers. Two dependent variables and fourteen independent variables were studied and analyzed with the help of different scales and techniques.

On analysis of data it was found that most of the respondents (53.33%) belonged to old age group and majority of respondents (63.33%) were having high school level of education and 5.56% of farmers were identified as illiterate. Majority of farmers (84.44%) had agriculture as their primary occupation. More than half of the respondents (73.33%) were having experience in farming for more than 5 years. More than 50% of farmers (87.78%) had 1-2 acres of farm land. Most of farmers (51.11%) followed scientific practices only. Majority of farmers belonged to medium category with respect to information source utilization (54.44%), extension orientation (55.56%), economic motivation (88.89%), environmental concern (62.22%), market perception (67.78%), risk orientation (74.44%), and attitude (67.78%). The results also points to the fact that the most widely used information source was television (43.33%) followed by magazines (37.78%) and newspapers (33.33%) respectively. When 63.34% of respondents felt that television was the information source that was more useful, and 81.11% of respondents felt that information kiosk was the source that was not that useful

for the farmers. Distribution of respondents based on extension contact showed that the majority of respondents (50%) visited Krishi bhavan for getting information and support. In case of distribution of respondents based on extension participation 36.67% reported that they participated in seminars as and when conducted.

Majority farmers (77.78% and 64.44%) were having medium level of awareness and knowledge about organic plant protection practices. Seven out of 12 variables were significantly correlating with extent of knowledge on organic plant protection aspects at 1% significance. They were farm size, farming experience, extension orientation, information source utilization, market perception, awareness on organic plant protection practices and attitude towards organic plant protection practices.

In case of plant protection preferences family safe food concept ranked one followed by cost effective plant protection practices, and sustainability. Majority (97.78% each) of farmer respondents reported that use of botanicals and cultivating crop mixtures were the two practices that were effective for them. In case of extent of perceived usefulness of the technology 97.78% opined that cultivating crop mixtures followed by use of botanicals (69.8%) was useful.

More than half of farmers belonged to medium (83.33%) level of adoption and majority (44.44%) of farmers belonged to early majority group in Rogers standard adopter category curve. The results of ANOVA revealed that there was no significant difference among the three *panchayats* of study in terms of adoption level. Extent of adoption was positively and significantly correlated with seven out of 12 independent variables at 1% significance, namely, farm size, farming experience, extension orientation, information source utilization, market perception, awareness and attitude.

Technology need assessment as perceived by organic farmers revealed that maximum need was observed for soil solarization technologies. One kg of fresh

cow dung was mixed with10 litres of water with crushed neem leaves and kept for 6 hours. The clear solution then is filtered and the supernatant liquid was sprayed at regular intervals to manage the leaf spot of amaranthus.

Lack of knowledge on organic plant protection products and its preparation cum use was perceived to be the most important reason for non adoption of organic plant protection practices followed by lack of support from extension agents and many organic plant protection practices were not effective especially in commercial growing tracts. The major constraint experienced by farmers was the ongoing drought situation during the time of data collection followed by, Lack of extension service to facilitate transfer of technology scientifically on organic plant protection, same price or even more than that of chemical produce, time consuming while resorting to organic plant protection preparation, storage and its application and organic practices that were labour intensive coupled by non availability cum high cost of labour.

The top five suggestions for refinement for tackling the constraints as perceived by farmers and refined through focus group discussions were facilitating regular and frequent farm visit, diagnostic and consultancy by krishibhavan officials on organic plant protection (90.44%) followed by making available low cost organic inputs and feasible technologies (88.33%), inclusion of more number of classes, demonstrations and seminars about organic pp practices (75.22%), Timely access to organic plant protection inputs (70.22%), construction of low cost mini dams or water storage facilities like technologies developed and popularised by RARS, Ambalavayal (65.22%).

സംഗ്രഹം

കേരള കാർഷിക സർവ്വകലാശാലയുടെ ജൈവവിള സംരക്ഷണ മാർഗ്ഗങ്ങളുടെ സാങ്കേതിക വിദ്യാവിനിയോഗം

ജൈവകീട നിയന്ത്രണത്തിന്റെ ഭാഗമായി നടക്കുന്ന പഠനത്തിൽ ജൈവവിള സംരക്ഷണ മാർഗ്ഗങ്ങളുടെ സ്വീകാര്യത, ഇതിനെ സ്വാധീനിക്കുന്ന പ്രധാന ഘടകങ്ങൾ, കർഷകർ നേരിടുന്ന പ്രശ്നങ്ങൾ പരിഹാരമാർഗ്ഗങ്ങൾ എന്നിവയാണ് പ്രധാന ലക്ഷ്യങ്ങൾ.

തിരുവനന്തപുരം ജില്ലയിലെ നെടുമങ്ങാട് കുന്നത്തുകാൽ, ചെങ്കൽ, ഗ്രാമപഞ്ചായത്തുകളിൽ വാണിജ്യപരമായി പച്ചക്കറി കൃഷിചെയ്യുന്നതിനോടൊപ്പം ജൈവകീട നിയന്ത്രണ മാർഗ്ഗങ്ങൾ ഉപയോഗിക്കുന്ന കർഷകരെയാണ് പഠനത്തിനായി തെരഞ്ഞെടുത്തത്. കൃഷിഭവനിൽ നിന്നും കിട്ടിയ വിവരങ്ങളുടെ അടിസ്ഥാനത്തിൽ 90 കർഷകരിലാണ് പഠനം നടത്തിയത്. പഠന പ്രക്രികയിൽ 2 ആശ്രിത പരിവർത്തിത വസ്തുതകളും 14 സ്വതന്ത്ര പരിവർത്തിത വസ്തുതകളുമാണ് ഉപയോഗിച്ചത്.

പഠന പ്രക്രിയയുടെ വിശകലനം ചെയ്തപ്പോൾ 53 ശതമാനം കർഷകർ പ്രായം ചെന്നവരാണെന്ന് മനസ്സിലാക്കാൻ സാധിച്ചു. ഭൂരിഭാഗം കർഷകർക്കും ദ്വിതീയ തല വിദ്യാഭ്യാസമാണുള്ളത്. പകുതിയിലധികം കർഷകരും 5 വർഷത്തിനുമേൽ കൃഷി ചെയ്യുന്നവരാണ്. ഭൂരിഭാഗം കർഷകർക്കും 1-2 ഏക്കർ വരെ കൃഷി സ്ഥലം ഉണ്ട്. ഏകദേശം 51 ശതമാനം കർഷകർ ശാസ്ത്രീയ വിദ്യകളാണ് ഉപയോഗിക്കുന്നത്. വിവര സാങ്കേതിക വിദ്യ, വിജ്ഞാപന വിന്യാസം, സാമ്പത്തിക പ്രേരണ, പിപണന വിന്യാസം, നഷ്ടസാധ്യത, പരിസ്ഥിതിയെക്കുറിച്ചുള്ള ഉത്കണ്ഠ, മനോഭാവം എന്നിവയിൽ കർഷകർ ഇത്തരം വിഭാഗത്തിലാണ് ഉൾപ്പെടുന്നത്.

മാസികയിലൂടേയും പത്രങ്ങളിലൂടെയുമാണ് വിവരങ്ങൾ അറിയുന്നുണ്ടെങ്കിലും ടെലിവിഷൻ ആണ് കർഷകരുടെ മുഖ്യ മാധ്യമം. 63 ശതമാനം കർഷകർ ടെലിവിഷൻ ഉപയോഗപ്രദമാണെന്ന് പറയുമ്പോൾ 81 ശതമാനം കർഷകർ കിയോസ്ക് ഉപയോഗപ്രദമല്ലെന്നാണ് പറയുന്നത്. 50 ശതമാനം കർഷകർക്കും കാർഷിക വിവരങ്ങൾ ലഭിക്കുന്നത് കൃഷിഭവനിൽ നിന്നുമാണ്. ഏകദേശം 36 ശതമാനം കർഷകർ സെമിനാറിൽ പങ്കെടുത്ത് വിവരങ്ങൾ മനസ്സിലാക്കുന്നു. ഭൂരിഭാഗം കർഷകർക്കും ജൈവവിള സംരക്ഷണത്തെക്കുറിച്ച് ഇടത്തരം അറിവും അവബോധവുമാണുള്ളത്. 97 ശതമാനം കർഷകർ

വിളമിശ്രണം ഫലപ്രദമെന്നും 69 ശതമാനം കർഷകരും ബൊട്ടാനിക്കൽസുമാണ് ഫലപ്രദമെന്നും പറയുന്നു.

ജൈവവിള സംരക്ഷണ സ്വീകാര്യതയുടെ കാര്യത്തിൽ കർഷകർ ഇടത്തരം വിഭാഗത്തിലാണ് ഉൾപ്പെട്ടിട്ടുള്ളത്. റോജേഴ്സിന്റെ നിർവ്വചനവുമായി ബന്ധപ്പെടുത്തി നോക്കുമ്പോൾ 44.44 ശതമാനം കർഷകരും ഏർളി മെജോറിറ്റി എന്ന വിഭാഗത്തിൽ ആണ് ഉൾപ്പെട്ടിട്ടുള്ളത്. ജൈവവിള സംരക്ഷണ സ്വീകാര്യതയുടെ അടിസ്ഥാനത്തിൽ 3 പഞ്ചായത്തുകളെ തമ്മിൽ താരതമ്യം ചെയ്യുമ്പോൾ ഒരു സാമ്യതയും കാണാൻ സാധിക്കുന്നില്ല.

ചെലവു കുറഞ്ഞ സംരക്ഷണ മാർഗ്ഗങ്ങളും, സ്ഥിരതയും, ഭക്ഷ്യയോഗ്യവുമാണ് കർഷകർ ജൈവവിള നിയന്ത്രണ മാർഗ്ഗങ്ങൾ തിരഞ്ഞെടുക്കാൻ കാരണം. ജൈവകീടരോഗ നിയന്ത്രണത്തെക്കുറിച്ചുള്ള അറിവില്ലായ്മ, ജൈവകീടനാശിനി നിർമ്മാണത്തെക്കുറിച്ചുള്ള അറിവില്ലായ്മ എന്നിവയാണ് കർഷകർ ജൈവവിള സംരക്ഷണ മാർഗ്ഗങ്ങൾ അകറ്റി നിറുത്താനുള്ള കാരണങ്ങൾ. വിജ്ഞാനവ്യാപനത്തിന്റെ അഭാവം, വരൾച്ച എന്നിവയാണ് കർഷകർ നേരിടുന്ന പ്രധാന പ്രശ്നങ്ങൾ. കൃഷിഭവൻ ഉദ്യോഗസ്ഥരുടെ കൃഷിസ്ഥല സന്ദർശനവും കാർഷികപ്രശ്നപഠന പരിഹാരമാർഗ്ഗവുമാണ് കർഷകരുടെ ഭാഗത്ത് നിന്നുംവന്ന നിർദ്ദേശങ്ങൾ.