Technology assessment on the production practices of economically dominant crops in homegardens

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(2013-11-171)

DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF AGRICULTURE

VELLAYANI, THIRUVANANTHAPURAM-695 522

KERALA, INDIA

2015

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by

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THESIS

submitted in partial fulfillment of the requirement for the degree of

Master of Science in Agriculture

Faculty of Agriculture

Kerala Agricultural University, Thrissur

DEPARTMENT OF AGRICULTURAL EXTENSION

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KERALA, INDIA

2015

DECLARATION

I, hereby declare that this thesis entitled **"Technology assessment on the production practices of economically dominant crops in homegardens"** is a bonafide record of research work done by me during the course of research and 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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Date: (2013-11-171)

CERTIFICATE

Certified that this thesis entitled **"Technology assessment on the production practices of economically dominant crops in homegardens"** is a record of research work done independently by Ms. Reeba Jacob, 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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ACKNOWLEDGEMENTS

I thank Lord Almighty for his invisible and immeasurable presence with me in each and every step I take and for working His way through my parents, teachers, friends and each and every person in my life.

I take it as a privilege and with cent percentage respect, gratitude and indebtedness; I thank Dr. Allan Thomas, Assistant professor, Department of Agricultural Extension and Chairman of the Advisory Committee for taking me as his student, for his worthy guidance, counsel, undivided attention, and words of encouragement that I received at every stage of research work and thesis preparation which would not have been possible without his help and support.

I thank Dr. R Prakash, Professor and Head of Department of Agricultural Extension and esteemed member of my Advisory Committee for his counsel, guidance, kind treatment and for the constructive criticisms offered to me me during the course work.

I express my sincere thanks to Dr. N Kishore Kumar, Professor and PG in-charge, Department of Agricultural Extension for his interest, timely support, suggestions, remarks and guidance rendered during the time of investigation and at the time of thesis preparation.

I extend my gratitude to Dr. Vijayaraghava Kumar, Professor and Head, Department of Agricultural Statistics for his effort and guidance given at the time of statistical analysis and interpretation of the results.

I also extend my acknowledgement to Dr. Shalini Pillai P, Associate Professor, Department of Agronomy for the orientation provided during the beginning of my research work and her valuable suggestions provided during the conduct of research.

My heartful thanks to all the teaching staffs of Department of Agricultural Extension , Dr.V. B. Padmanabhan, Dr. B. Seema, Dr. A. K. Sherief, Dr. A. Anilkumar and Dr. G. Sreedaya for their friendly approach, suggestions, advices and encouragement provided to me during the course of study and research work.

My sincere thanks to Kamrudeen Sir, Radhakrishnan A G, Aswathy P G and to all the non-teaching staffs of the Department of Agricultural Extension for the help and supported rendered to me during the course of study.

I humbly thank the authorities of Kerala Agricultural University for the financial help in the form of stipend during my study period.

My wholehearted thanks to my classmates Sujitha P.S, Sachana P.C, Akshay Sasidharan, Iby Sebastian and Revathy Chandran for their help, support and I cherish all the moments I spent with them during my P.G programme and my research work.

My grateful thanks to all my seniors and juniors especially M. Ravi Kishore and Shely Mary Koshy for their help, support and guidance during my course of study. I express my heartfelt gratitude and thanks to my friends Thanuja and Soumya for their help and support.

It is with great pleasure that I thank all the homegarden farmers, extension agents, krishi bhavan officials and all the others who had directly and indirectly involved and contributed to my research work.

Mere words of acknowledgement can never express my love and feeling towards my ever loved parents, Dr. Arthur Jacob and Mrs. D S Valsa for giving me this life, for educating me and for bringing me up to the level I am now. If it was not for their affection, love and care, me and my endeavor would have been incomplete.

Reeba Jacob

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LIST OF ABBREVIATIONS

%	: Percentage
AE	: Agro Ecological
AEU	: Agro Ecological Unit
AEU-1	: Agro Ecological Unit 1 (Southern Coastal Plain)
AEU-8	: Agro Ecological Unit 8 (Southern Laterites)
AEU-9	: Agro Ecological Unit 9 (South Central Laterites)
AEU-12	: Agro Ecological Unit 12 (Southern and Central foothills)
AEU-14	: Agro Ecological Unit 14 (Southern Highhills)
CIMMYT	:International Maize and Wheat Improvement Center
DOA	: Department of Agriculture
et al.	: and co-workers/ co-authors
Fig.	: Figure
i.e.	: that is
ITK	: Indigenous Technology Knowledge
KAU	: Kerala Agricultural University
MAS	: Mobile Advisory Services
NGO	: Non-Governmental Organization
PGPR	: Plant Growth Promoting Rhizobacteria
PPI	: Potash and Phosphate Institute
POP	: Package Of Practices
r	: Correlation coefficient
viz.	: namely

Introduction

1. INTRODUCTION

Homegardens are land use systems which involve intensive management of different crops along with or without animal husbandry components or specialized components which are managed by family labour. Homegardens are traditional agricultural practices which plays an important role in economic and cultural aspects of rural societies. They represent land use systems involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably, livestock, within the compounds of individual houses, the whole crop-tree-animal unit being intensively managed by family labour (Fernandez and Nair,1986). These farming systems which are found mainly in tropical and sub tropical regions are of great importance in the socio-economic settings of local communities. Homegardens are of vital importance to the mainly subsistence-level existence of farmers in the tropics (Nair and Sreedharan, 1986; Swift and Anderson, 1993; High and Shackleton, 2000; Mendez *et. al*., 2001). Homegardens provide economic, socio- cultural benefits and nutritional security for household with diversified agricultural crops and trees. The multi-storeyed arrangements of plants and relatively high species diversities prevent the environmental degradation that is commonly associated with monocultures (Nair, 1993). Therefore, homegarden is an integrated production system and a stable ecosystem that maintains the diversity of life as well as the biological wealth.

Homegardens of Kerala are dynamic and continuous production systems through different combinations of crop and animal mix along with or without a specialized component. It is widely believed that homegarden systems are a means to attain high sustainability and a system that is sustainable will be a system that is profitable and environmentally sound (PPI, 1990). With more than 70 lakhs individual homegardens we can say that in Kerala, homegardens are the dominating farming system or ‘land of homegardens’. Due to increased fragmentation of land and urbanization, per capita availability of land for farming activities is decreasing. It is in this scenario development and conservation of homegardens becomes relevant for the techno-socio-economic and environmental security of the homegarden farmer and its system as a whole. Research should be focused on developing technologies so as to improve the productivity and sustainability of this unique farming system. Strategies should be formulated to ensure holistic, effective and meaningful development of homegardens. Hence the study was undertaken with the following objectives:

- To analyse the social and personal characteristics of homegarden farmers.
- To identify the economically dominant crops in homegardens.
- To identify the production preferences, perceived usefulness and effectiveness of selected KAU production technologies for economically dominant crops in homegardens.
- To assess the level of adoption of selected KAU production technologies for the economically dominant crops in the homegardens.
- To establish the relationship of social and personal characteristics of homegarden farmers with the extent of adoption of production practices in homegardens.
- To identify the technology needs or gaps in homegardens as perceived by the farmer.
- To identify the constraints experienced as perceived by homegarden respondents and suggestions for refinement.

Scope and importance of the study

Kerala state which supports over 2.76 per cent of population covers only 1.18 per cent (38,863 km^2) of total land area of India. With population density of 859 persons per sq. km operational holding size is 0.23 hectare per person. Increasing number as well as increasing marginalization of holdings could be mainly due to implementation of land reform legislations particularly land ceiling; disintegration of joint family system and the consequent break-up of holdings.

Each individual household must pursue their own agenda for food security, ecological integrity and economical sustainability through the sale of surplus. There has been interplay of several institutions that have led to development of technologies cutting across different crops. Technologies that have permeated into the homegardens alone would be relevant to their sustainability. Thus, the identification of such technologies and its adoption by the farmers is an important part of the study. Technology assessment acts as a feedback system to the research and development system so that newer technologies can be designed and the available technologies can be subjected to refinement so as to suit the requirement of small and marginal farmers. In this context technology needs assessment in homegarden system becomes relevant.

Limitations of the study

The study was conducted as a part of Post Graduate research work and was restricted to Thiruvananthapuram, district alone that makes it difficult to generalise the findings of the study for the entire state. Also, being a study in the field of social science much of the data generated are the opinions of the farmer respondents which may or may not be free from their individual biases and makes generalization further more difficult. However, all efforts have been made to conduct the study as precise, objective and systematic as possible.

Presentation of thesis

The thesis is presented in five chapters. Introduction, objectives, importance and scope of the study is explained in the first chapter. The second chapter 'review of literature' deals with the available result and review of previous works in support of the study undertaken. 'Methodology' the third chapter describes the research design, sampling, measurement of variables selected, data collection procedure and statistical tools used. Results of the study are discussed in the fourth chapter 'results and discussion'. The salient findings of the study are summarized in the final chapter named 'summary'.

Review of Literature

2. REVIEW OF LITERATURE

Review of previous research studies provides a basis for developing a theoretical framework for the present study. It helps in delineating new problem areas. Review of literature also helps in operationalising the variables and concepts on the basis of which required data could be collected. In accordance with the specific objectives set, the review of literature related to the study is furnished below under the following sub-heads:

2.1 History, concept, definitions highlighting the importance of homegardens
2.2 Components of homegardens
2.3 Technology assessment on the production practices in homegardens in terms of extent of adoption and its relationship with independent variables and adoption of ITK practices on production aspects of homegardens.
2.4 Technology needs for the homegardens.
2.5 Constraints and solutions as perceived by the homegarden farmers.

2.1 History, concept and definitions highlighting the importance of homegardens

History is the study of the past, particularly how it relates to humans. Concept is an abstraction or generalization from experience or the result of a transformation of existing concepts. The concept refers to all of its actual or potential instances whether these are things in the real world or other ideas. Importance means the quality or condition of being important or worthy of note. Review of literature on the history, concept and definitions highlighting the importance of homegardens would help the researcher to identify the roots of development and worthiness of the system enabling the researcher to generate facts and figures for the ensuing study. Some of the review highlighting the history, concept, definitions highlighting the importance of homegarden system is stated below:

Homegardens are age old farming system which might have originated when nomadic life of pre historic man changed to settlements and domestication. Homegardens can be defined as 'land use practices involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and, invariably, livestock, within the compounds of individual houses, the whole crop-tree-animal unit being intensively managed by family labour' (Fernandez and Nair, 1986). Homegardens had long existed as the principle farming systems as reported by Arnold (1987) on dryland accounting for a substantial proportion of land use, with irrigated rice cultivation. For centuries, small plots of land near homesteads have been used as home gardens, which have been an integral component of family farming and local food systems (Odebode, 2006 and Galhena *et al*., 2013).

Agroforestry is a collective name for land-use systems and technologies where woody perennials are deliberately used on the same land-management units as agricultural crops and/or animals, in either a spatial arrangement or a temporal sequence, there being both ecological and economical interactions between the different components (Lundgren and Raintree, 1983). In rural areas homegardens have important social functions through the provision of gifts in the form of fruits, leaves or products for religious or medicinal purposes Soemarwoto (1984). It is a traditional land use practice around a homestead where several plant species are maintained by members of the household and their products are intended primarily for household consumption (Shrestha *et al.,* 2001).

Homegardens are recognized worldwide as an epitome of a sustainable agroforestry system (Torquebiau, 1992 and Kumar and Nair, 2004). Special type of sustainable agricultural production system practiced around the home with or without extended garden, where a multi-species of annual and perennial crops along with/without animal husbandry components and specialized components for the purpose of meeting fundamental requirements of home and to generate additional income through the sale of surplus (Thomas, 2004). Homegardens represent intimate, multistory combinations of various trees and crops, sometimes in association with domestic animals, around the homestead. (Kumar and Nair, 2006). Homegarden is a small system of household plant production and an unpopular age-long food security strategy partly because of its wide variety of produce and its informal nature (Cherry and Di Leonardo, 2010). Bibliographic evidence suggests that homegardens contribute to income generation, improved livelihoods, and household economic welfare as well as promoting entrepreneurship and rural development (Calvet-Mir *et al.,* 2012).

Specialised homegardens are special type of sustainable agricultural production system practiced around the home with or without extended garden, with homegarden primary structure supplemented with specialized components (Rahul, 2013).

2.2 Components of homegardens

Homegardens are the most predominant type of farmng system in Kerala. The available resources are utilized to the maximum extent in each individual homesteads. Development should start from these farm units. So it becomes necessary to identify the different components. As stressed by Soemarwoto *et al.* (1985) in their study of Javanese homegardens, true plant diversity is far greater than indicated by the numbers of species, since many species are represented by numerous cultivars.

In the homegardens of West Java (Michon *et al.,*1983) and Kerala (Nair and Sreedharan, 1986) maximum species are reported to be found in first storey (ground layer). In general terms, all homegardens consist of an herbaceous layer near the ground, a tree layer at upper levels and an intermediate layer in between (Fernandez and Nair, 1986). Salam and Sreekumar (1990) concluded that in a homegarden of 68 cents of land with cropping component, livestock component and irrigation component could meet the home demands as well as educational requirement of a seven member family consisting of five children.

It was explained by Shehana *et al.* (1992), that spices were a major component in the cropping strategy of the homegardens where it occurred 83 per cent, in every eight out of ten homegardens. 35 crop components, 22 forestry components and 4 livestock components were identified by Shehana *et al.* (1994) in varying intensities in the homegardens of South Kerala. “Tree gardens” in the settlements in Yap, in the Federated States of Micronesia, for example, had 21 coconut cultivars, 28 breadfruit cultivars, and 37 banana cultivars (Falanruw, 1995).

Thampan (1996) reported the scope and advantages for mixed farming in coconut garden involving cultivation of shade tolerant fodder crops in the interspaces of coconut and integrating animal enterprises and recycling the byproducts. The maintenance of multispecies and multistrata agroforests is deemed worthwhile because of the growing interest in developing multifunctional land use systems, which contribute not only to production objectives, but also to the objectives of biodiversity and environmental conservation (Peyre *et al.,* 2006).

The fact that home production is less cost-intensive and requires fewer inputs and investment makes home gardening extremely important for resource-poor households that have limited access to production inputs (Galhena *et al.,* 2013).

2.3 Technology assessment on the production practices in homegardens in terms of extent of adoption and its relationship with independent variables and adoption of ITK practices on production aspects of homegardens.

2.3.1 Technology Assessment

Technology assessment is the study and evaluation of new technologies. Technology is any tool or technique, product or process, physical equipment or method of doing or making (Goldring, 1976). According to Rogers (1982) technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationship involved in achieving the desired outcome. Several number of technologies and developments are arising in the field of agriculture but the impact study is less. Onazi (1982) suggested that although scientific research into new varieties, fertility factors, improved farming system and new technology has continued, impact of these research results on production is still minimal.

The new technology in the context of agriculture means all forms of new farm inputs, practices and services such as fertilizers, insecticides, herbicides, tube-well water, improved farm machines and equipments, agricultural extension services etc. (Raju, 1982). As submitted by Uwakah (1985) farmers could achieve higher yields if they adopt recommended scientific farming techniques in place of their traditional practice. Agricultural productivity growth will not be possible without developing and disseminating cost effective yield-increasing technologies, since it is no longer possible to meet the needs of increasing numbers of people by expanding the area under cultivation or relying on irrigation (Hossain, 1989 and Datt and Ravallion, 1996).

Availability of irrigation facilities, quality of population engaged in the field of agriculture, transportation and market facilities, quality of population engaged in the field of agriculture, innovations in high productive seeds, agricultural equipments, modern technology, use of chemical fertilizers and hybrid seeds, etc. nonphysical factors play a crucial role in the field of agriculture. Without increasing the land area the production of homegardens may be increased considerably by using management technology of horticulture and agroforestry under multi-storied cropping system (Malik *et al.,* 2001). It is also of considerable significance that when agricultural production increases through the use of improved varieties of crops in a given area, farmers and their communities derive added socioeconomic benefit (Awotide, 2012).

2.3.2 Extent of Adoption

Technology adoption is the choice of an individual to acquire and use an invention or an innovation and the process of dissemination of an innovation is termed as diffusion. Contribution of a new technology can only be realized if the same is widely accepted and use by the society.

Ban and Hawkins (1988) defines adoption of innovations as the decisions to apply an innovation and to continue to use it. The adoption of any agricultural innovation is influenced by factors such as characteristics of the farmers, characteristics of the innovations, and social circumstances (Rogers, 1995). Adoption was modeled as three simultaneous choices by Smale *et al.,* (1995) – the choice of whether to adopt the components of the recommended package, the decision of how to allocate different technologies across the land area, and the decision on how much of some inputs, such as fertilizer, to use. The theory of maximisation of utility is generally used to explain the response of farmers to adoption of a new technology (Greene, 2003). According to the theory, a new technology will be adopted by a farmer if the utility obtained from the new technology exceeds that of the former one.

Santha *et al.* (1993) observed that the adoption of green manure and cover crops in coconut gardens, only 6.22 per cent of the farmers adopted this practice. The extent of non adoption was 93.8 per cent. Jaganathan (2004) observed that majority of the vegetable growers (64%) had medium level of adoption followed by low (19%) and high (17%) levels of adoption. Kavasakar and Govind (2005) reported that the mean adoption score of the respondents on organic manures and fertilizers, micronutrients and biofertilizers was found to be low with 32.49, 7.08 and 5.0 per cent respectively.

Jayavardana (2007) observed that the adoption level of farmers varied with situation. Adoption of improved seed is an important component of agricultural productivity, food security and sustainable economic growth (Faltermeier and

Abdulai, 2009). The incidence of poverty was however higher among the non-adopters than the adopters (Mendola, 2007; Diagne *et al.,* 2009; Javier, *et al.,* 2010 and Awotide, 2012).

2.3.2 Extent of adoption and its relationship with independent variables.

Extent of adoption is influenced by social and personal characteristics of farmers or respondents. Bourdillon *et al.* (2002), reveals that the adoption of improved varieties of maize leads to a moderate increase in income of the adopters. Extent of adoption of organic farming practices was greatly influenced by knowledge, environmental orientation and awareness of vegetable growers (Jaganathan, 2004).

It was reported by Jaganathan (2004) that education, mass media exposure, training attended, innovativeness, self confidence, environmental orientation awareness, knowledge and attitude showed a significant and positive relationship in adoption of organic farming practices.

i) Age

Age is the number of years older farmers may have more experience, resources, or authority that would allow them more possibilities for trying a new technology (CIMMYT, 1993). Theory of human capital; young members of a household have a greater chance of absorbing and applying new knowledge (Sidibe, 2005).

Gangadharan (1993) reported that regarding the adoption of improved agricultural practices in pepper, majority of the respondents belonged to the medium category. Elderly farmers often have different goals other than income maximization, in which case, they will not be expected to adopt an income – enhancing technology (Tjornhom, 1995).

Singha (1996) studied the socio-economic characteristics of coconut growers in a progressive area of Assam and revealed that majority of the farmers (66.67%) were middle aged between 30 to 50 years. The age of household head is incorporated as it is believed that with age, farmers accumulate more personal capital and, thus, show a greater likelihood of investing in innovations (Nkamleu *et al.,* 1998). Lapar (1999) suggests that for technologies requiring long-term investment, age may also indicate the time horizon of the farmer, with younger farmers having a longer frame in which to gain the benefits.

Manjusha (1999) reported that there is a non- significant relationship between age and extent of adoption of recommended practices by farmers. Thomas (2000) reported that age had positive and significant relationship with knowledge of farmers. Farmers' perception that technology development and the subsequent benefits, require lot of time to realize, can reduce their interest in the new technology because of farmers' advanced age, and the possibility of not living long enough to enjoy it (Caswell *et al.,* 2001 and Khanna, 2001).

Jaganathan (2004) observed that majority of the vegetable growers (48%) belonged to old age category. Thamban *et al*. (2006) reported that distribution of coconut farmers according to their age, majority (80 per cent) of the farmers are old *ie.,* above 45 years. Jayawardana (2007) observed that majority of the coconut based homestead farmers (80%) were old aged while 14 per cent were found in the middle group. Six percent of the respondents belonged to the young category.

Home garden owners with 60–90 years of age grow fewer plants used for consumption but cultivate many medicinal plants and, to a slightly lesser extent ornamental plants. (Buchmann, 2009).

ii) Education

Education may make a farmer more receptive to advice from an extension agency or more able to deal with technical recommendations that require a certain level of numeracy or literacy. Many adoption studies show some relationship between technology adoption and the educational level of the farmer. The more complex the technology, the more likely it is that education will play a role (CIMMYT,1993). Education creates a favourable mental attitude for the acceptance of new practices especially of information-intensive and management-intensive practices (Waller *et al.,* 1998 and Caswell *et al.,* 2001).

Gangadharan (1993) reported that educational status had positive and significant relationship with the attitude of pepper growers towards improved agricultural practices. Sriram and Palanisamy (1997) found that educational status was positively and significantly related with the awareness of the ecofriendly farming practices of homestead farmers. Education is thought to create a favourable mental attitude for the acceptance of new practices, especially information-intensive and management-intensive practices (Waller *et al.,* 1998 and Caswell *et al.,* 2001). In Ethiopia, it was reported by Weir and Knight (2000) that household-level education affects whether a farmer is an early or late adopter, but is less important in determining whether or not the farmer ever uses fertilizer.

Education of the household head and the education of the person with the highest level of education in the household was included by Asfaw and Admassie (2004) and this assumes that production is enhanced by having someone in the household with more education, even if it is not the head. Ekwe and Nwachukwu (2006) opined that high educational status of farmers enables them to make better assessment of the technology.

The maximum level of education within the farm household was found to have a positive relationship with the probability of adoption and significant at 1 percent level. The implication of this is that farm households with well educated members are more likely to adopt modern agricultural production technologies than those without (Mamudu, 2012).

iii) Occupation

Occupation is the main vocation and other vocations undertaken by the respondent. Primary occupation means work that involves taking raw material from the environment. eg. farmers, fisherman, miners, etc.. Rathinasapabathi (1987) reported that there is a non-significant relationship of occupation with extent of adoption of integrated pest management practices in cotton. It was reported by Krishnamoorthy (1988) that there was no significant relationship between extent of adoption of scientific practices in irrigated cotton and millets and occupation. Vocational training improves the level of the farmer's knowledge and having agriculture as the main occupation will also enable the farmers to seek for productivity improved information and be more devoted to farming. Having agriculture as the main occupation had a negative and significant effect on the adoption of improved rice varieties (Awotide, 2012).

iv) Effective homegarden area

Homegardens are farming system in and around the home which is effectively managed by the family members so as to obtain maximum output from the available resources.

Feder *et al.,* (1985) noted that only larger farms will adopt innovations. It is often assumed that larger-scale farmers will be more likely to adopt a technology, especially if the innovation requires an extra cash investment (CIMMYT, 1993). Job *et al.,* (1993) in their study to analyse the productivity variation and input use efficiency in coconut based homesteads of Kerala found a positive influence of the farm area on mean farm income. The increase in farm income in large sized holdings is due to the adoption of large number of coconut trees in those farms. They also found that the farmers grow mostly traditional crops including perennial and annuals without identifying t1he optimum mix and generally follow their own cultivation practices. Kandy gardens, located in the Kandy district of Sri Lanka, combine intensely managed mixtures of agriculture, forestry and livestock and are usually small, following the rule, "smaller the farm, the more intense the cultivation" (Ranasinghe, 1995).

McNamara *et al.,* (1991); Abara and Singh, (1993); Feder *et al.,* (1985); Fernandez-Cornejo, (1996) and Kasenge (1998) found farm size to be positively related to adoption.

Harper *et al.,* (1990) and Yaron *et al.,* (1992) found negative relationship between adoption and farm size.

Mugisa-Mutetikka *et al.,* (2000) found that the relationship between farm size and adoption is a neutral one. With increase in holding size, more variations in species composition were also reported by Das and Das (2005).

Studies of homegardens in Mexico (Rico- Gray *et al*., 1991) and Indonesia (Abdoellah *et al*., 2006) indicated that the number of species or individuals is not related to homegarden size. Farm size was found to have a positive relationship with the probability of adoption of modern agricultural production technologies (Mamudu, 2012).

v) Family size

Family size is the total number of family members who are dependent on the head of family for their living. Verma and Rao (1969) reported that family requirement has a direct relationship to garden size. So, size of family is important in influencing garden size. An analysis of land use in Pananao, in the Dominican Republic showed that women were responsible for providing homegarden products to the household, for working in the gardens, and for controlling the resources and processes of the gardens (Rocheleau, 1987).

Home gardens allow for all family members to be involved in some form or other. It allows for greater participation by the female members, thereby perhaps increasing their feelings of self worth (Moreno-Black, 1996). According to Rahman (2003) the Chayanovian theory of the peasant economy contends that higher subsistence pressure increases the tendency to adopt new technology. Single men (households) tend to grow plants mainly for consumption. More than three fourth of the sampled farmers had a family size with 3-4 members (Thomas, 2004). Single women (households) tend to cultivate medicinal and ornamental plants and home gardens cultivated by couples, especially in rural areas, harbour a more similar mixture of plants for consumption and medicine but fewer ornamental plants (Buchmann, 2009).

vi) Farming experience

As farming experience increases knowledge level of farmers increases which might have an effect on their adoption behavior.

Majority of the respondents, had farming as major occupation, also they are mainly natives of the study area and had spent an average of 42 years in the study area. Propensity to adopt decreases as experience in farming, measured by the number of years put into farming activities increases. (Awotide, 2012). Farming experience showed a positive and significant relationship with the adoption of improved technologies by the farmers (Zanu, 2012)

vii) Rational orientation

Hiranand and Kumar (1980) concluded in a study that it becomes necessary that the scientists investigate the rationality of each one of the technical belief held by farmers so that they can clearly accept or reject a technical belief. Models of technology acceptance make use of predictors that are exclusively cognitive, relating the acceptance and usage of a new technology to beliefs, attitudes and perceptions (Davis, 1989; Ajzen, 1991 and Davis *et al.,* 1992). Rajendran (1992) reported that there was a positive and significant relation between rational orientation of schedule caste farming families to the extent of adoption. It was reported that there was no relation between rational orientations of homegarden farmers to the extent of adoption (Thomas, 2004). More than 50 per cent of the sampled farmers had belief on science and religion rather than belief on religion or science alone (Rahul, 2013).

viii) Irrigation potential

Mann (1978) reported that farmers have adopted selectively from technological packages, and that this selectivity can be associated for example, the suitability of a technology to soil and rainfall conditions. Perumal and Mariyappan (1982), Shivaraja (1986) and Chenniappan (1987) reported that there is a positive relationship between irrigation index and extent of adoption.

Geethakutty (1993) reported that there is a non-significant relationship between irrigation index and adoption. Babu (1995) reported a significant relationship between irrigation potential and extent of adoption of scientific practices in homegardens.

Pouring water on fields is still the most common method of irrigation reported by farmers using irrigation. In 2002, 76 per cent of those using irrigation used manual irrigation followed by gravity with 18 per cent. Use of pumps is negligible (Uaiene, 2009).

Irrigation facilities is the most significant factor influencing adoption, in this case, a tendency towards increased adoption of a three cropping system. The aim of increasing food production and raising farmers' economic conditions can be enhanced by promoting irrigation schemes.

ix) Knowledge

Nair (1993) emphasized in his essay on "environment and development" that we are in need of a system which endeavours to create a way of thinking, requiring people to overcome prejudice and to develop an open way of looking at things around them. Thus the individuals and the community would gain awareness and require the needed skills to solve the problems. Thomas (1998) reported that majority of farmers had medium to high level of knowledge on medicinal values of the crop they cultivate and it had no relationship with their level of education. Kala (2010) emphasized the importance of traditional ecological knowledge of homegarden farmers in conserving many threatened wild species in homegardens in Pachmaru Biosphere Reserve in India.

x) Evaluative perception on sustainability of the production practices of homegardens

The purpose of perception is to help individual to cope with the world by assigning meaning to it, which can stand the test of subsequent experiences (Toch and Maclean, 1970). Evaluative perception of homegarden farmers varies from individual to individual. A positive perception/attitude towards an innovation by a household is expected to lead to subsequent adoption of such technology (He *et al.*, 2007).

Jambulingam and Fernandez (1986) reported that the woody perennials in farm with other agricultural crops are better able to cope with poor growing conditions and thereby increasing integration on farmlands, which represented a strategy to minimize the risk of crop failure. Soemoarwoto (1986) opined that while it is relatively easy to increase yield and income, there are difficult problems in achieving long term sustainability of the homegardens. These difficulties are both in the biophysical and in the socio-economic realm. Early workers in agroforestry economics (Raintree, 1987) argued that most traditional agroforestry systems followed the classical political economic theory of ‘basic needs’ approach, which states that ‘goods have value because people find them useful in satisfying needs for food, shelter, or clothing’. Salam *et al.* (1991), developed a model that is capable to maintain soil health and to ensure environment safety. Neher (1992) defined sustainable agriculture as a system, which contains four equally important components namely environmental quality, ecological soundness, plant and animal productivity and socio economic viability. Optimal use of environmental resources is the key for development as otherwise it would affect the basic life support system of our planet, as the progress of mankind and preservation of ecology goes hand in hand. Sreevalsan (1995) reported that nearly two-third of the farmers were less environmentally oriented.

It is argued that structurally and functionally these multistrata systems are the closest mimics of natural forests yet attained (Lefroy *et al.,* 1999). Natural forests and other naturally occurring ecosystems are considered to be long-term products of evolution and the accommodation of organisms to environment, for they change with time as both environment and biota change, and they run on solar power, thus making them self-sustaining (Ewel, 1999). Nair (2001) opined that homegardens have flourished for a long time, without any apparent symptoms of soil-nutrient-depletion. Indeed, homegardens and other multistrata systems present an ecological ‘mystery.’ Pushpakumara *et al.* (2010) reported that homegardens also provide a number of ecosystem services such as habitat for animals and other beneficial organisms, nutrient recylcling, reduced soil erosion, and enhanced pollination.

Seneviratne *et al.* (2010) opined that, in homegardens abundance of plant and animal litter and continuous recycling of organic soil matter contributes to a highly efficient nutrient cycling system. More than 80 per cent of the sampled respondents had high evaluative perception on sustainability of farming systems and cropping patterns in the homegardens (Rahul, 2013).

xi) Mass media / Information Support contribution

Different types of media play a major role in technology dissemination to the farmers. The information they provide is vast and easily available on demand. The use of these mass media in the field of agriculture can be crucial for overall development in the field of homegarden research.

Information about the improved variety increases awareness, a farmer cannot adopt a technology without being aware of it (Diagne and Demont, 2007). Zanu (2012) revealed that farmers obtained information on pig technology from various sources ranging from interpersonal to mass media. About half (53.75%) of the sampled farmers indicated Veterinary officers as their major source of information on pig technology. This is followed by Radio (50%), contact farmers (45%), extension agents (41.25%). Access to media creates awareness and hence increases the probability of adoption. Communication about available, source, price can be passed from one farmer to the other through the use of mobile phone and this can positively influence adoption (Awotide, 2012).

xii) Extension contribution

An effective adaptive research effort should involve both researchers and extension agents (CIMMYT, 1993). Rosezweig (1995) find that own experience and neighbor’s experiences with high yielding varieties in India significantly increased the profitability from these varieties. The absence of formal or informal links between the home gardens on the one side and the national research and extension service on the other does not allow this important production system to benefit from the outcome of research or from the services of the extension system. (Engles, 2001).

It is hypothesized that the respondents who are not frequently visited by extension agents have lower possibilities of adoption than those frequently visited

(Adesina and Zinnah, 1993, Shiferaw and Holden, 1998, Oluoch-Kosura *et al.,* 2001 and Bamire *et al.,* 2002). Conley and Udry (2002), looking at pineapple cultivation in Ghana, analyze whether an individual farmer's fertilizer use responds to changes in information about the fertilizer productivity of his neighbor.

The problems encountered within home gardens are neither addressed by public- or private-sector funded research nor is the production of food in any way reflected in the national statistics (Engles, 2001). Bandiera and Rasul (2002) looked at social networks and technology adoption in Northern Mozambique and found that the probability of adoption is higher amongst farmers who reported discussing agriculture with others. According to Agbamu (2006) certain research findings, which are deemed to improve farm production, may be beyond the understanding of rural farmers, even with the interpretation of extension agents. Participation in group activities and being connected to social systems proved to be positively associated with early adoption of technologies (Birungi and Hassan, 2007 and Katungi, *et al.,* 2007). Most of them occasionally do not attend trainings and also do not avail themselves of the opportunity to meet with extension agents.

Farmers contact with new technologies depends mostly on the presence of non-governmental organizations (NGOs), donor supported projects, or outgrower schemes for crops like cotton and tobacco (Uaiene, 2009). Farm households are more likely to adopt modern agricultural production technologies if they have access to extension services (Mamudu, 2012). The higher the degree of connectedness of a community the more easily people would be able to transfer information and the more people this information is likely to reach (Baiyegunhi, 2013). Floyd *et al.* (2013) revealed that in the Western Hills of Nepal, the level of adoption of technologies was consistently and significantly affected by the level of extension input.

xiii) Livestock possession

Joshi (1978) revealed a positive and significant association between adoption of dairy innovations and family education. Sohal and Tyagi (1978) indicated that family education has no significant relationship with the adoption of dairy innovations. Male farmers followed new technologies for animal raising meanwhile female farmers followed traditional practices because their education was lower than men which limits them in adoption of new technologies (Truong, 2002).

Milind *et al.,* (2007) observed that family size, annual income, had positive and significant association with the knowledge of the farmers regarding adoption of poultry management practices. Only 18 per cent farmers adopted vaccination, clearly indicating the lack of adoption of improved management techniques. This might be due to the lack of awareness or because of the under-valuation of the risk of livestock diseases compared to the cost involved in getting the animal vaccinated. The size of the livestock holding was higher in the case of non-adopters than in the case of the adopters possibly because the adopter farmers were undertaking better management of the productive stock, limiting the stock size small size (Suresh, 2007). Livestock is means of income diversification, and can be a source of additional income and can also be an insurance against risk and uncertainty. Possession of livestock could therefore increase the probability of adoption through its influence on income (Awotide, 2012).

2.7 Technology needs for the homegardens.

Evolving new technology is an endeavour in the direction of increasing production efficiency (Swaminathan, 1979). Gladwin (1980) provided a case in which prior ethno-scientific research would have enabled agricultural research to be more responsive to local conditions. De Janvry (1981) expressed that unfortunately the green revolution proponents did not foresee the consequences of importing "technical packages" that had been 17 formulated under very different ecological and socio-economic conditions. In fact, most agronomic recommendations proved to be seriously unfit to the heterogeneous characteristics of the peasants' ecology and economy.

Altieri and Anderson (1986) suggested that incorporating indigenous knowledge in the technology development for the resource poor farmers will help in effecting moderate to high levels of food production. Farmers prefer the technology with low input but high benefit, and ensure high productivity (Truong, 2002). Despite all the technological innovation transfer, there is a wide gap between levels of production which research contends is attainable and that which farmers achieves (Oladele, 2004). The technology assessment of homegardns in a whole can serve as a useful feedback to the research system for designing technologies useful to the small and marginal farmers for large scale recommendation so as to share the benefits of development. It will aid in technology change and improvement in any sphere, increases economic returns and enhance development process of the state (Thomas *et al*.,2013).

2.8 Indigenous technology knowledge

Kshirsagar (1991) pointed out that traditional strategies continue to offer important pointers for future adaptive research that aims to find solutions, which will be readily acceptable to farmers. Sanghi and Kerr (1991) in their paper on soil and water conservation practices concluded that researchers and extensionists have much to learn from farmers regarding cost effective and relevant methods of soil and water conservation. Pulmate and Babu (1993) studied the scientific rationale of certain existing traditional practices in shifting cultivation in Manipur state. They concluded two-thirds of practices were scientifically rational.

As delined by Marrewijk (1998) indigenous knowledge is the sum total of the knowledge and skills that people in a particular geographic area possess, and which enable them to get the most out of their natural environment. Berkes (1999) has defined the ITK as the local knowledge held by indigenous peoples, or local knowledge unique to a given culture or society.

Most of this knowledge and these skills have been passed down from earlier generations, but individual men and women in each new generation adapt and add to this body of knowledge in a constant adjustment to changing circumstances and environmental conditions. According to Hyzaguirre (2001), indigenous knowledge in the form of local know-how and cultural practices is a set of tools that communities used to manage their natural resources, which include genetic resources, the building blocks of biodiversity and agriculture.

2.9 Constraints and solutions as perceived by the homegarden farmers.

Constraints in the production technology constitute the basic point in the development of new technology. According to Liberero (1984) production constraints could be classified into biological and socio-economic constraints. The biological constraints include all farm level problems, while the social economic constraints comprised of knowledge, institutions, credit, input availability, economic behavior, traditions and risk aversion. Nikhade and Bhople (1989) defined constraints as the state or quality of sense of being restricted to a given course of action.

With small farms, it has been argued that large fixed costs become a constraint to technology adoption (Abara and Singh, 1993), especially if the technology requires a substantial amount of initial set-up cost. Mendoza (1999) recorded that when faced with difficulties in implementing their activities, farmers try to innovate or adopt existing innovations, depending on the available resources. Though farmers perceived technology as good thing to them, they still faced problems in application of technologies. These comprise of lacking of capital, direction of the government and extension, lack ensure of yield by compensation policy (Truong, 2002). They lack of capitals for constructing dikes to raise fish, buying fingerlings and other materials (Truong, 2002).

Wisdom kept on growing and developing from generation to generation in families such traditional farm families are still surviving in many parts of the country and are living authorities of traditional agriculture. One of the biggest constraints to the successive adoption of improved varieties is the availability of seed. Meanwhile, access to seed is a necessary condition for improved seed adoption (Dontsop-Nguezet *et al.,* 2011).

Methodology

3. METHODOLOGY

This chapter deals with the brief description of methods and procedures that were required for meeting the objectives set forth in the study. The methodology followed in the study is presented under the following headings:

3.1 Research design
3.2 Location of the study
3.3 Selection of the respondents
3.4 Operationalisation and measurement of variables
3.4.1 Distribution of homegarden farmers based on their personal and social characteristics.
3.4.2 Other purposively selected variables
3.4.3 Dominance profile of homegardens
3.4.4 Technology assessment on production aspects of the homegarden farming system.
3.4.5 Constraints experienced by homegarden farmers
3.5 Data collection procedure
3.6 Statistical tools used
3.7 Hypothesis of the study

3.1 Research design

Research design is the process of planning and carrying out the research or investigation. A research design is “a plan that describes how, when and where data are to be collected and analysed” (Parahoo, 1997).

‘Ex-post-facto’ followed by ‘explorative’ research designs were used for conducting the study. ‘Ex-post-facto’ research design is a systematic inquiry in which the scientist does not have direct control over the variables because their manifestations have already occurred or because they are inherently not maniputable (Kerlinger, 1983).

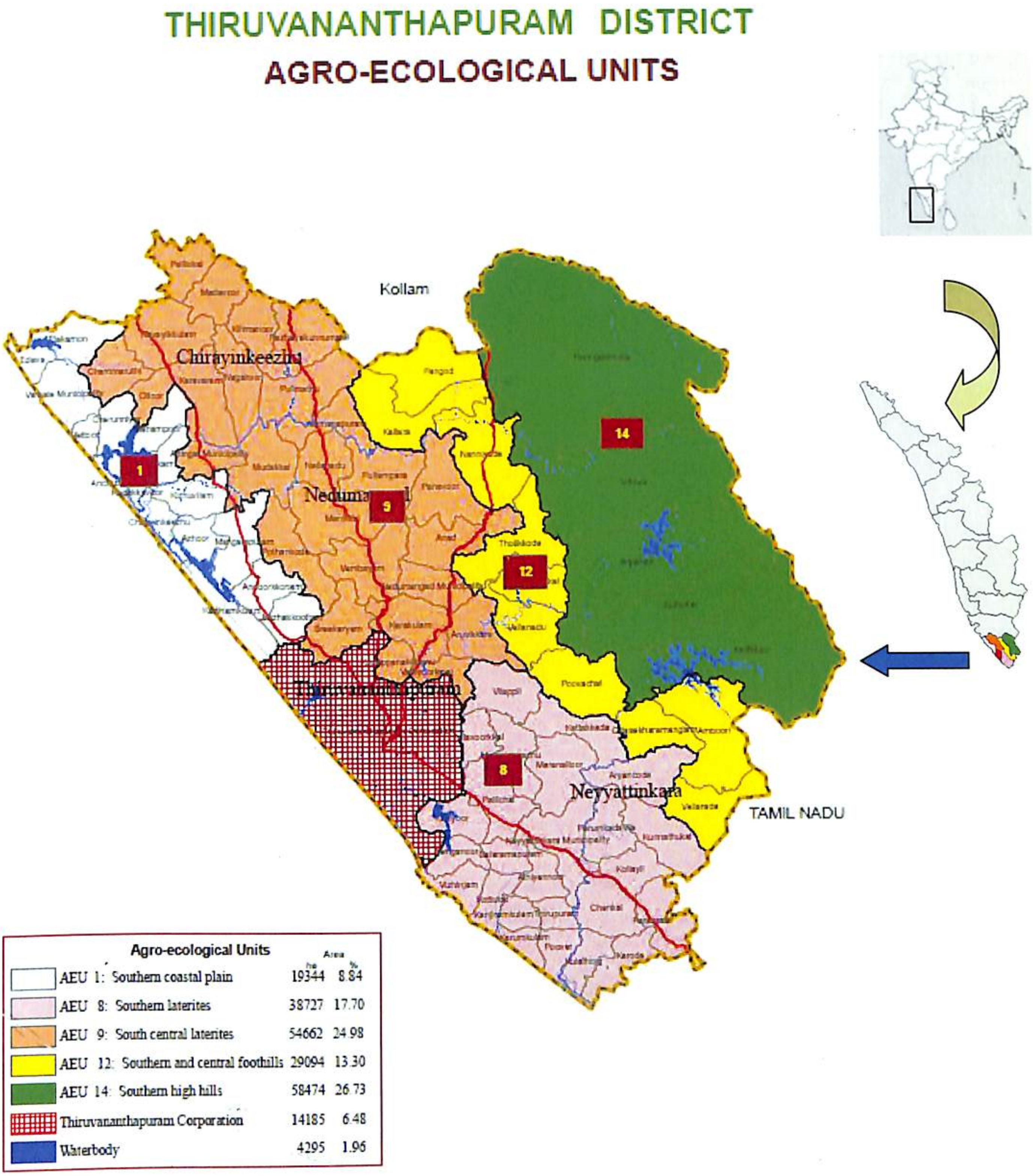


Fig 1. Location Map of the study

Explorative research design was used for the study since the researcher had to probe for crop resource, production practices and components in the homegardens.

3.2 Location of the study

The study was conducted in Thiruvananthapuram district owing to the wide variability in the structure and cropping pattern of homegarden systems in the southern zone of Kerala which is predominantly the *erstwhile* Travancore state. The maps showing the location of study are given as Fig 1.

3.3 Selection of respondents

The respondent groups of the study comprised of homegarden farmers of Thiruvananthapuram district. The study area was stratified according to five different Agro Ecological Units (AEU), *viz* AEU-1, AEU-8, AEU-9, AEU-12 and AEU-14 as identified by Kerala Agricultural University and State Planning Board. The area and list of panchayaths for study under each AEU is presented in Appendix II.

A list of all panchayats in each stratum was prepared and panchayats with maximum active and operational homegarden units were identified. From this set of panchayats one panchayat with active homegardens was selected from each agroclimatic unit in consultation with officials from Krishi Bhavans, office of the Principal Agricultural Officer and Cropping System Research Centre, Karamana.

A list of homegarden farmers of selected panchayaths was prepared with holding size not less than 0.1 ha (25 cents) from the respective agricultural offices. From each panchayat, 20 homegardens were selected using Simple Random Sampling. Thus a total of 100 homegarden farmer respondents were selected for the study. The sampling frame for the study is shown as Fig 2.

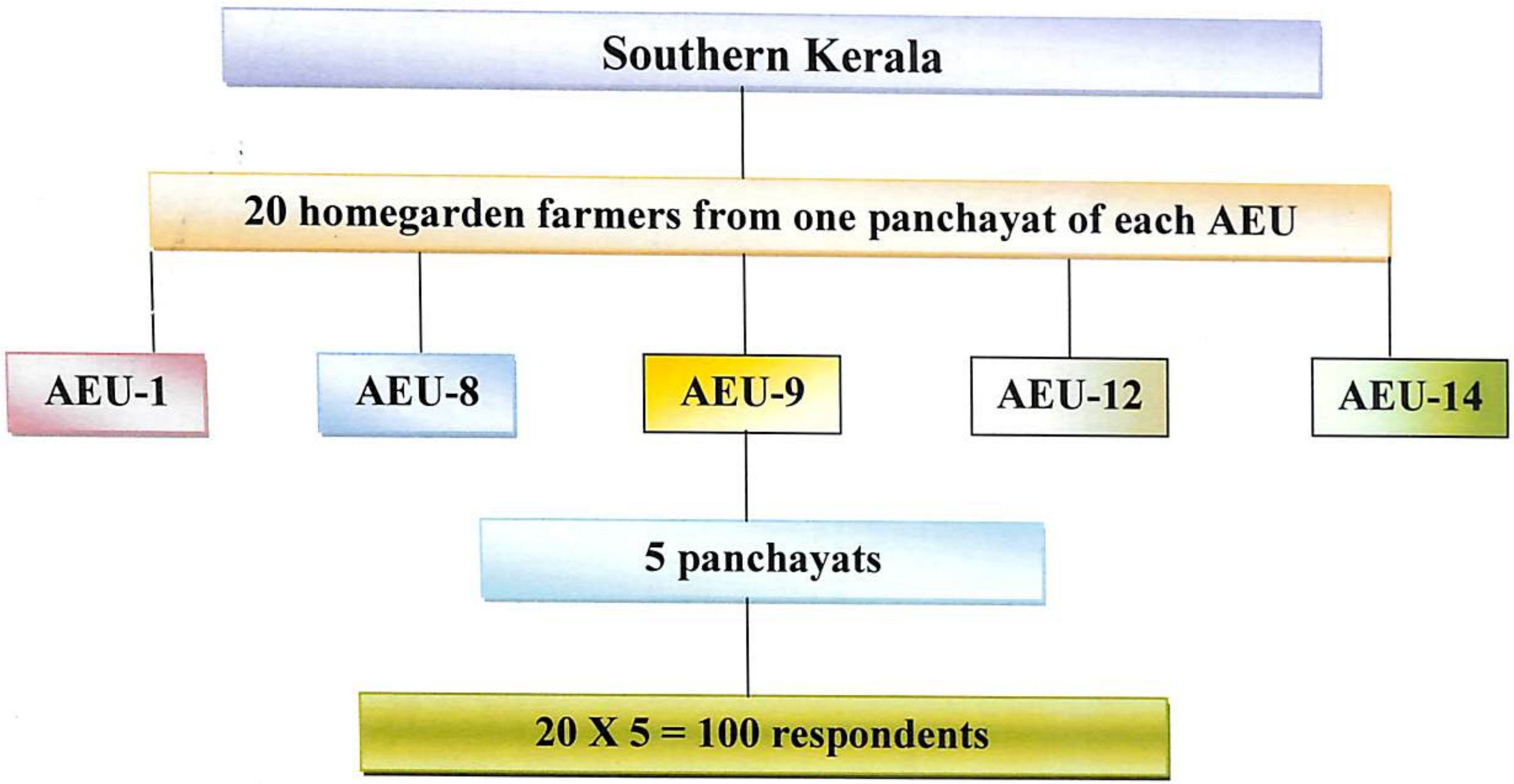


Fig. 2. Sampling frame of the study

3.4 Operationalisation and measurement of the variables

The objective of the study was to determine the levels of adoption of selected KAU production practices for the economically dominant crops in the homegardens. Production preference of homegarden farmers and constraints experienced by farmers in the utilization of agricultural production technologies with suggestions for refinement as perceived by the homegarden farmers were also studied.

Some other variables found to be useful during the course of the study were selected and included to satisfy the aforesaid objectives.

Operationlisation and measurement of the variables have been elucidated under four subheads:

3.4.1 Distribution of homegarden farmers based on their personal and social characteristics.
3.4.2 Other variables purposively selected for the study
3.4.3 Dominance profile of homegardens
3.4.4 Technology assessment on production aspects in the homegarden farming system and production preferences, perceived usefulness and effectiveness of selected KAU production technologies for selected crops in homegardens.
3.4.5 Constraints experienced by homegarden farmers

3.4.1 Distribution of homegarden farmers based on their personal and social characteristics.

Characteristics of homegarden farmers were identified in order to understand and asses the influence of the profile characteristics of homegarden farmers for meeting the objectives of the study.

After detailed review of literature and discussion with subject matter specialists a list of 25 independent variables related to the personal and social characteristics of homegarden respondents which were important for meeting the objectives of the study were collected.

The collected lists of variables were sent to 20 judges comprising of extension scientists and homegarden experts. The variables were examined critically and rated based on relevancy on a five-point continuum ranging from most relevant, more relevant, relevant, less relevant and least relevant with score of five, four, three, two and one respectively. 15 judges out of 20 responded. Independent variables that scored above mean value were selected as independent variables for the study.

Thus a total of 13 variables were selected mainly age, education, occupation, family size, effective homegarden area, homegarden farming experience, mass media participation, irrigation potential, extension contribution, knowledge of homegarden farmers on scientific production practices, evaluative perception of homegarden farmers on sustainability of homegarden production practices and livestock possession according to relevance rating in the order of decreasing importance.

Some other variables were purposefully incorporated into the study since our objective was to assess the production practices followed by homegarden farmers. The variables added were live fencing, source of irrigation, type of irrigation, labour involved and possession of soil health card.

The selected independent variables and their measurement for study are given in Table 1.

Table1: Independent variables and measurement procedure

Sl. No	Independent variables	Measurement and scoring procedures developed or adopted by
1	Age	Actual chronological age (Census report, 2011).
2	Education	Thomas (2004).
3	Occupation	Vocation of homegarden respondent at time of interview.
4	Family size	No. of family members dependent on the head of family at the time of interview.
5	Effective homegarden area	Functional area for farming.
6	Homegarden farming experience	Farming experience of respondent measured as number of years.
7	Rational orientation	Jeteley (1977).
8	Mass media contribution	Scoring procedure developed for the study.
9	Irrigation potential	Thomas (2004).
10	Extension contribution	Rahul (2013).
11	Knowledge	Test developed for the study.
12	Evaluative perception	Arbitrary scale developed for the study.
13	Livestock possession	Scoring procedure developed for the study.

1) Age

Age was operationally defined as the number of years completed by the homegarden respondent during the time of study.

Age was measured as the total number of years completed by the homegarden respondent at the time of study and was classified based on census report,2011 classification method.

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

The respondents were grouped into different categories and expressed as frequency and percentage.

2) Education

Education in this study is defined as the extent of formal learning possessed by the homegarden respondent.

The scoring procedure adopted by Thomas (2004) with slight modification was used for the study and was as follows. One score was added to every successful completion of formal schooling.

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

The respondents were grouped into different categories based on their level of education and expressed as frequency and percentage.

3) **Occupation**

Occupation is operationally defined as the vocations the homegarden respondent possessed at the time of interview. The scoring procedure was:

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

The respondents were grouped into different categories based their vocation and expressed as frequency and percentage.

4) Family size

The total number of members in the homegarden family dependent on the head of the family is referred as family size. This was measured in numbers.

Category	Code
2-4 members	1
5-6 members	2

The respondents were grouped into different categories and expressed as frequency and percentage.

5) Effective homegarden area

Effective homegarden area is operationally defined as the functional area undertaken for farming activities in homegarden. This was measured in acres. Homegarden with minimum of 25 cents were selected for the study.

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

The respondents were grouped into different categories based on effective homegarden area and expressed as frequency and percentage.

6) Homegarden farming experience

In the present study homegarden farming experience is operationally defined as the involvement of homegarden respondent in farming measured as number of years.

Category	Code
<10 years	1
10-20 years	2
>20 years	3

The respondents were grouped into different categories based on their experience in farming and expressed as frequency and percentage.

7) Rational orientation

In this study rational orientation is operationally defined as the extent of rational and scientific belief of homegarden respondent on different scientific recommendations of an enterprise. The procedure developed by Jeteley (1977) and adopted by Thomas (2004) and Rahul (2013) was used for measuring rational orientation of farmer.

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

The score obtained by the respondent was taken as rational orientation score of that respondent. The maximum score ‘three’ and minimum ‘one’ was obtained by the respondent.

8) Mass media/Information sources

Mass media/Information sources can be operationally defined as the frequency and usefulness of various mass media/information support sources as perceived by the homegarden farmer. In this study, mass media contributions to homegarden respondents were measured in terms of ‘frequency and perceived usefulness of the mass media.

a) Frequency of access to mass media/ information sources:

The frequency or access to various mass media/information sources were categorized for seven items as “very often”, “often” and “not often” with scores of “two”, “one” and “zero” respectively.

Category	**Score**
Very often	2
Often	1
Not often	0

Hence, the maximum and minimum score that could be achieved by a respondent was 21 and 7 respectively.

b) Perceived usefulness:

Perceived usefulness of categorized mass media/ information sources were measured in a three point continuum as “very useful”, “useful” and “not useful” which were scored as “two”, “one” and “zero”.

Category	**Score**
Very useful	2
Useful	1
Not useful	0

Hence, the maximum and minimum score that could be achieved by a respondent was 14 and 0 respectively.

The respondents were then categorized into high and low category with mean value as the check.

9) Irrigation potential

It was operationally defined as the extent to which irrigation water was available in the holding. It was quantified using the methodology developed by Thomas (2004), in terms of availability of irrigation water and was scored in terms of physical water scarcity, economic water scarcity and little or no water scarcity with scores of 3, 2 and 1 respectively.

Category	Score
Physical water scarcity	1
Economic water scarcity	2
Little or no water scarcity	3

The score obtained by the respondent was taken as his score for irrigation potential with a maximum score of 'three' and a minimum score of'one'.

Physical water scarcity refers to the perception of farmer that the water available in the homegarden is not enough for irrigation purposes.

Economic water scarcity refers to the perception of farmer that the water available in the homegarden is to be used very judiciously inorder to meet the requirements in the homegarden.

Little or no water scarcity refers to the perception that the water is available abundantly in homegarden.

10) Extension contribution

Extension contribution is operationalised as the agency from which the technology and knowledge about the technology has been made available.

The perception of homegarden respondent on the contribution of technology and knowledge by different agencies was scored on a three point continuum for four statements as ‘very adequate’, ‘adequate’ and ‘not adequate’ with scores of ‘three’, ‘two’ and ‘one’ respectively. The scores were summed to obtain the contribution of various institutions as perceived by homegarden respondent. Maximum score obtained by respondent was ‘12’ and minimum was ‘4’.

Statements	**Extend of contribution**
	VA/A/NA
The extent to which details about new homegarden technology is availed from: A) Agricultural department B) Private organizations C) Scientists of KAU D) Friends, neighbours etc.	

11) Knowledge of homegarden farmers on scientific production practices

In the present study, knowledge is defined as the awareness and understanding of different scientific production practices as stated in the recommended package of practices. A standardized knowledge test was constructed for the purpose.

A method of ‘teacher made test’ was employed in the present study for the measurement of knowledge of homegarden respondents about different production practices of various components in the homegarden. The questions on various items or production technologies were prepared by consulting with subject matter specialists, extension functionaries and the process was supplemented with review of literature from the package of practices recommendations of Kerala Agricultural University(2011).

On the basis of the procedure, a set of 30 knowledge questions were prepared and was further given to the specialists in the related disciplines for comments, suggestions and modifications. Finally 15 questions were selected pertaining to the production technologies or scientific practices on homegarden components after judges rating (Appendix III).

The questions selected to measure the knowledge level was explained to the farmers and the responses were selected. A score of 'one' was given to each correct answer and 'zero' for incorrect answer. The maximum score obtained by farmer was 15 and minimum score was 0.

The summation of score of correct answers given by an individual homegarden respondent indicated his knowledge level on the scientific practices in homegardens. The mean value of knowledge level of 100 homegarden respondents was computed and the respondents were grouped as low and high categoried based on knowledge level with mean value as check.

12) Evaluative perception of sustainability of homegarden production practices

Evaluative perception of homegarden farmers on the sustainability of production practices can be operationally defined in terms of the individual ability to assign meaning to the set of production practices he purposefully adopts for the overall sustainability of homegardens. This variable varies from individual to individual. The purpose of perception is to help individual to cope with the world by assigning meaning to it, which can stand the test of subsequent experiences (Toch and Maclean, 1970).

Evaluative perception of homegarden farmers on the sustainablity of production practices was measured using an arbitrary scale developed for the study. Procedure of standardization by estimating the reliability and validity of the scale were not attempted, so the scale is considered as an arbitrary one.

The perception of homegardens farmer on sustainability was measured with help of 14 statements as given in Appendix III and the statements were measured on a four-point continuum as 'very much', 'much', 'less' and 'very less' with scores 'four', 'three', 'two' and 'one' respectively.

The scores of an individual respondent were measured by summing up score of each item by the homegarden farmer. The maximum and minimum scores were 56 and 14 respectively.

The mean values of evaluative perception scores were obtained for 100 homegarden respondents and they were grouped into high and low categories.

13) Livestock Possession

Livestock possession in homegardens makes it dynamic, sustainable and economically viable. Livestock possession can be operationally defined as the livestock status of homegarden farmer in terms of possession of livestock in terms of its type and numbers.

The scores were given as "one" for respondents who possessed livestock and "zero" for homegardens without livestock component.

Category	**Score**
Crop component + Livestock	1
Crop component	0

3.4.2 Other variables purposively selected for the study

Since the objective of the study was to assess the production practices followed by homegarden farmers a few other variables were included other than the selected independent variables. They were:

i) Soil health card possession

Soil health card possession is operationally defined as whether the homegarden farmer possesses soil test card.

Category	Score
Yes	1
No	0

ii) Type of fencing

It is operationally defined as the materials used as fence in homegarden. It is expressed as number of homegardens which possess the specified type of fence.

Category	No.	Percentage
Live fencing		
Walls		
Wire fencing		
Mesh		
Mudwall		

iii) Irrigation source

Operatonally defined as the water source in homegarden for irrigation purposes.

Category	No.	Percentage
Well		
Pond		
Tap		

iv) Type of irrigation

It is defined as the type of irrigation practiced in homegarden.

Category	No.	Percentage
Basin		
Drip		
Sprinkler		
Canal		

v) Labour involved

Labour involved is to assess the involvement of homegarden family members in the homegardens farming activities.

Category	Score
Family labour	3
Waged labour	2
Family + Waged labour	1

3.4.3 Dominance profile of homegardens

The dominance of crops in homegardens was measured in terms of economical dominance as developed by Thomas (2004).

Economic dominance was worked out on a seven-point continuum with a rank 'one' for the most remunerative crop and subsequent crops were ranked from 'two' to 'seven' based on farmers perception of economical dominance. The mean score for the crops were calculated and the 7 crops which ranked highest were identified as the economically dominant crops.

3.4.4 *Technology assessment on production aspects in the homegarden farming system and production preferences, perceived usefulness and effectiveness of selected KAU production technologies for selected crops in homegardens.*

Technology assessment of production practices in homegardens was done after identifying the dominance of crops in the homegardens. Production technology assessment was made in terms of:

i) Extent of adoption of selected scientific production technology practices for the economically dominant crops as perceived by homegarden farmers.
ii) Extent of adoption of scientific production practices in homegardens and its relationship with the personal characteristics of the homegarden farmers.
iii) Extent of adoption of indigenous practices by homegarden farmers.
iv) Technology need assessment on production aspects in the homegardens
v) Production preference, usefulness and effectiveness of KAU production technology.

i) Extent of adoption of selected scientific production technology practices for the economically dominant crops as perceived by homegarden farmers.

Extent of adoption refers to the acceptance of production practices recommendations of KAU by homegarden farmers.

Technology assessment in terms of level of adoption was calculated using adoption quotient for measuring adoption behavior as developed by Chattopadhyay (1963) and modified and used by Singh and Singh (1967).

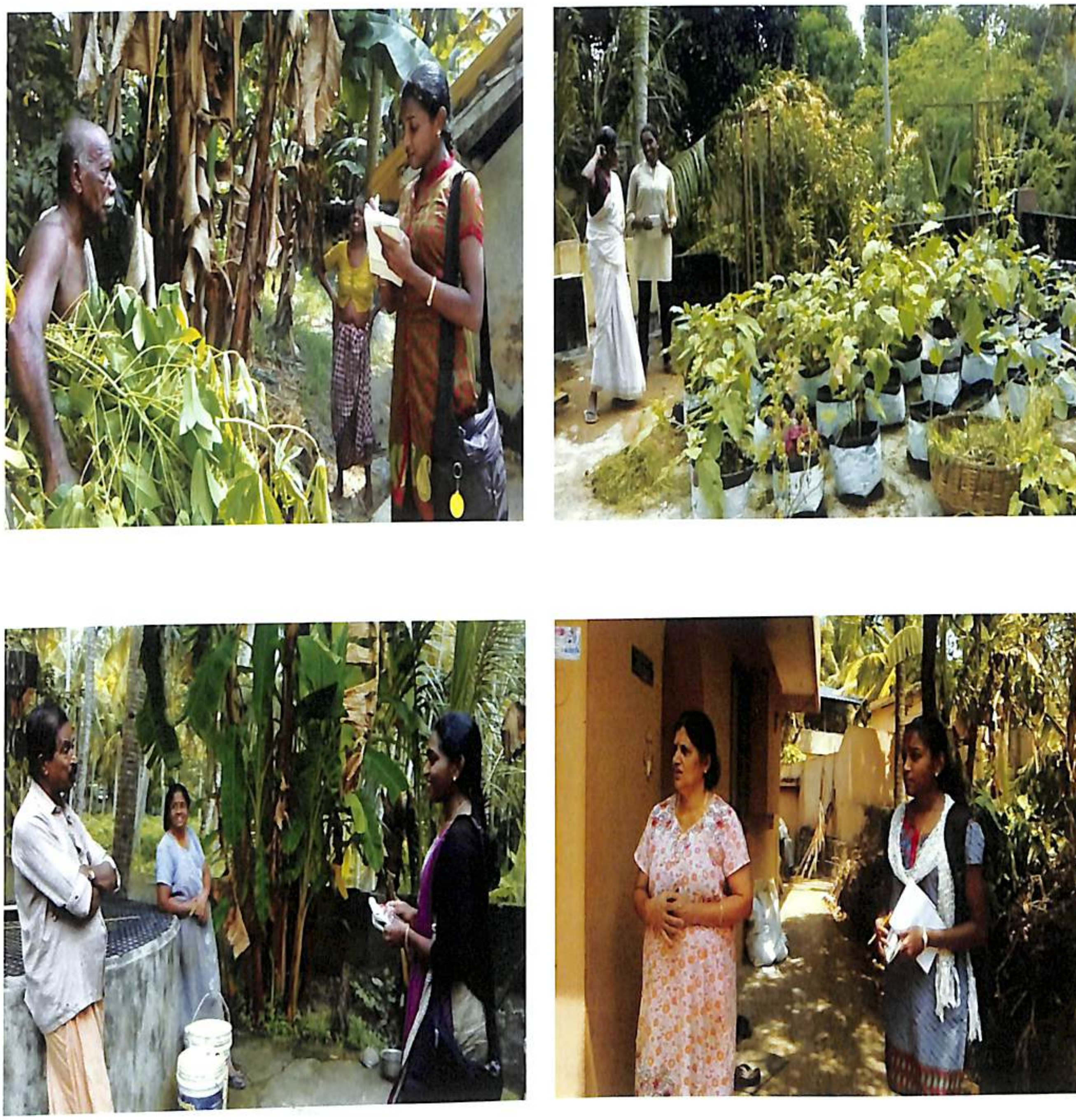


Plate 1. Field survey

Plate 2. Field survey

$$AQ = \frac{\sum_{i=1}^{n} \frac{ei}{pI}}{N} \times 100$$

Where,
AQ= Adoption quotient
ei = Extent of adoption of each practice
pI = Potentiality of adoption of each practice N = Total number of practices selected.

Different scoring procedures were undertaken for measuring the adoption quotient of various practices. The original numerical data was given as extend of adoption (ei) for quantifiable data like seed rate, pit size, spacing, quantity of fertilizers applied etc and the recommended practice was considered as the potentiality of adoption of that practice (pI).

A few practices were measured in terms of different stages of adoption. Level of adoption of each farmer was indicated on a 15 point adoption scale. The response categories and weighted values were non- adoption (0), awareness (1), interest (3), evaluation (5), trial (10) and adoption (15). For example, if the farmer was placed in the evaluation stage his extend of adoption (ei) will be 5 and the potentiality of the adoption (pI) will be the maximum possible score *i.e.* 15.

Practices which could not be quantified were scored dichotomously as 'Yes' or 'No' with the maximum possible score '1' for 'Yes' and '0' for the response 'No'. If the practice is not followed by the farmer, the response will be 'No' and the extent of adoption (ei) will be '0' and potentiality of adoption will be '1'.

After calculating the adoption quotient for the various production practices the adopters were categorised and compared with the standard Rogers (1982) curve.

ii) Extent of adoption of scientific production practices in homegardens and its relationship with the personal characteristics of the homegarden farmers.

Simple correlation was used to find out the relationships of personal characteristics of homegarden farmers with the adoption quotient of each individual farmer.

iii) Extent of adoption of indigenous practices by homegarden farmers.

Indegenous technical knowledge (ITK) is traditional knowledge which is passed on from generation to generation. Homegarden farmers due to their experience and personal intervention in farming system had developed a number of ITKs in the field of agriculture. The homegarden respondents were asked about the ITKs known to them and the practices which they follow. The major practices adopted were documented and expressed as percentage of ITK practices identified for each crops.

iv) Technology need assessment on production aspects in the homegardens

Technology needs of the homegarden farmer regarding various scientific production technologies were worked out after the pilot survey done on a non sampled population. Production technology specifications were decided based on the feedback from experts and subject matter specialists.

Scoring procedure for technology needs assessment as used by Thomas (2004) was:

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

The technology needs vary from one farmer to another. This may be due to the different managerial practices adopted by farmers, demand and supply of inputs, and other crop demands. Technology needs were calculated for all economically dominant crops with reference to 9 parameters namely, variety, planting material, selection of intercrop, spacing, irrigation management, soil amendment, nutrient management, homegarden machinery and drainage technology. The technology needs of farmers of were tabulated for further analysis. Hence, the maximum and minimum scores obtained by the respondent were '36' and '9' respectively. The parameters with the minimum score were considered as the most needed technology in homegardens.

v) Production preferences, perceived usefulness and effectiveness of selected KAU production technologies for selected crops in homegardens.

Production preference for the economically dominant crops and livestock were identified. Different production criterions were selected after discussion with experts and subject matter specialists. The criterions were: cost effectiveness, more sustainable, family needs, less management, low cost of cultivation, nutrient recycling, resource utilization, soil conservation, availability of inputs and guaranteed market.

The selected criterion from the crops and components were ranked from '10' to '1' in the decreasing order of preference *i.e.* 10 for the most preferred reason and 1 for the least. The mean score for each criterion were worked out for identifying the production preference for the different components.

Perceived effectiveness and usefulness of KAU production practices were categorized as 'very effective', 'effective', 'not effective' and 'very useful', 'useful' and 'not useful' as perceived by the homegarden farmers. The perceived effectiveness and usefulness was then expressed as percentage.

3.4.5 Constraints experienced by homegarden farmers.

Constraints faced by homegarden farmers were identified with the help of experts, officials, subject matter specialists and sufficient review of literature. A list of twenty five constraints was included in the interview schedule. The enumerated list was open ended so as to add constraints which were faced by farmers at the time of interview. The response was recorded in a four point continuum as “most important”, “important”, “less important”, and “least important” which were scored “four”, “three”, “two” and “one” respectively.

3.5 Data collection procedure

Data were collected using a well-structure interview cum data enumeration schedule prepared for the purpose. A draft interview schedule was prepared for conducting a pilot study in a non sample area and suitable modifications were made in the final data enumeration schedule which was finally administered to the homegarden farmers by the researcher and the responses were recorded at the time of interview.

3.6 Statistical tools used in the study

The collected data were scored, tabulated and analysed using different statistical methods like mean, frequency, percentage analysis and correlation analysis.

3.7 Hypothesis of the study

The major hypotheses set for the study states that no significant concurrence exists in the technology needs of the homegarden respondents on the production aspects of homegarden components. Also, there exists no significant contribution of the characteristics of the respondents (independent variables) in the extent of adoption of production technologies in the homegardens.

Results and Discussion

4. RESULTS AND DISCUSSION

The salient findings of the study undertaken are presented and discussed under the following subheads:

4.1 Distribution of homegarden respondents based on their personal and social characteristics.
4.2 Dominance profile of homegarden
4.3 Production preferences, perceived usefulness and effectiveness of selected KAU production technologies.
4.4 Technology assessment in the homegardens
4.5 Constraints experienced by homegarden farmers

4.1 Distribution of homegarden respondents based on their personal and social characteristics

The personal and social characteristics of homegarden farmers are very important as it gives an idea on the socio-economic and psychological settings of the respondents in which they belong. Distribution of homegarden respondents based on their personal and social characteristics selected through Judges rating are presented below.

4.1.1 Age

Age is the chronological years of the respondents at the time of survey. The result on distribution of respondents based on their age is presented in table 2.

Table 2.Distribution of respondents based on their age

N=100

Category (Years)	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
<35	2	10	2	10	4	20	1	5	0	0	9	9
35-55	5	25	5	25	4	20	11	55	10	50	35	35
>55	13	65	13	65	12	60	8	40	10	50	56	56

On analysis of table 2 it is clear that more than 50 per cent of the surveyed homegarden farmers belonged to the old age category, followed by middle and young age category with 35 and 9 per cent respectively.

Viewing the distribution of respondents based on age in each agro ecological units, out of five units four units had more than 50 per cent of farmers under old age category. About 50 per cent of homegarden farmers belonged to middle aged category in Mangalapuram (AEU-1) and Amboori (AEU-12) panchayaths but in all the other units only one fourth of sample belonged to the moddle aged category.

Another interesting finding was that no homegarden farmers belonged to young age category in the sample drawn from AEU-14 (Peringamala).

Hence it could be inferred that majority of the homegarden farmers came under old age category. This was typical and unique characteristics of farmer respondents of Kerala where in majority of the farmers belonged to old age or middle age category.

This could be due to the general feeling among the youngsters that farming is not that charming in case of Kerala. This also points to the fact that adequate policy and support systems should be in place for Kerala agriculture in order to facilitate or motivate youngsters of farming. The results are in agreement to the findings of Babu, 1995 and Thomas, 2004.

4.1.2 Education

Education is the learning acquired by the homegarden respondent through the formal system at the time of interview. Level of education of homegarden farmers are projected in table 3.

Table 3.Distribution of respondents based on their education

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	N	%	No	%	No	%	No	%	No	%
Illiterate	0	0	0	0	0	0	0	0	2	10	2	2
Primary	0	0	0	0	1	5	0	0	0	0	1	1
Middle	1	5	0	0	0	0	1	5	0	0	2	2
High school	14	70	7	35	9	45	16	80	8	40	54	54
Collegiate	5	25	13	65	10	50	3	15	10	50	41	41

It is evident from table 3 that 98 per cent of total farmers were literate with educational qualification ranging from primary level to collegiate level. 95 per cent of farmers have educational qualification above high school.

Unit wise distribution is also the reflection of total sample, that is more than 90 per cent of farmers in all units have undergone educational level from high school and above.

Eighty per cent of sample from AEU-12 (Amboori) had high school level of education which is highest of all the five units. 10 per cent of total respondents are illiterate in AEU-14 (Peringamala).

Hence it is inferred that 95 per cent of farmers had education level from high school to collegiate level. The high level of education attained by homegarden farmers is in conformity with studies conducted by Thomas (2004) and Rahul (2013). It also reflects to the high social indices the state had achieved.

4.1.3 Occupation

Occupation is defined as the main vocation of the homegarden respondent at the time of interview. The distribution of respondents based on their occupation are presented in table 4.

Table 4. Distribution of respondents based on their occupation

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Primary (Agriculture)	13	65	13	65	6	30	9	45	12	60	53	53
Secondary(Others + agriculture)	7	35	7	35	14	70	11	55	8	40	47	47

Occupational level of homegarden farmers shows almost equal distribution in the two categories. Table 4 reveals that 53 per cent of total respondents relied entirely on farming or agriculture as their primary source of income, where as 47 per cent of respondents practice agriculture as a secondary occupation along with their government jobs or private ventures.

More than 60 per cent of respondents from AEU-8, AEU-1 and AEU-14 have agriculture as their primary occupation whereas 70 per cent of homegarden farmers in AEU-9 have agriculture as their secondary occupation.

Hence it is inferred that there is almost equal distribution in occupation of sample farmers.

The results also points to the fact that more than 90 per cent respondents had agriculture as their primary or secondary occupation. However there is a gradual decrease in the number of respondents who take up agriculture as their primary venture which might be because of uncertainty existing in the returns from farming.

4.1.4 Family Size

Family size means the number of family members who are dependent on the homegarden respondent or head of the family at the time of interview. Distribution of respondents based on family size is given in table 5.

Table 5.Distribution ofrespondents based on their family size

N=100

Category (members)	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
2-4	18	90	18	90	17	85	15	75	15	75	83	83
5-6	2	10	2	10	3	15	5	25	5	25	17	17

Table 5 reveals that 83 % of farmers were having family size with 2-4 members. Unit wise analysis also reveals the same pattern of distribution where 90 per cent of farmers in AEU-1 and AEU-8 panchayath had 2-4 family members followed by AEU-9 with 85 per cent, AEU-14 and AEU-12 panchayath had 75 per cent of respondents with 2-4 family members.

Hence it is inferred that large percentage of respondents had a family size 2-4 members. The number of families with family size of 2-4 members is an indication of a shift towards nuclear families and decrease in the involvement of family members in homegarden activities.

4.1.5 Irrigation potential

Irrigation potential is operationalised as the ease or difficulty with which water is available for farming activities. The distribution of respondents based on irrigation potential are illustrated in table 6.

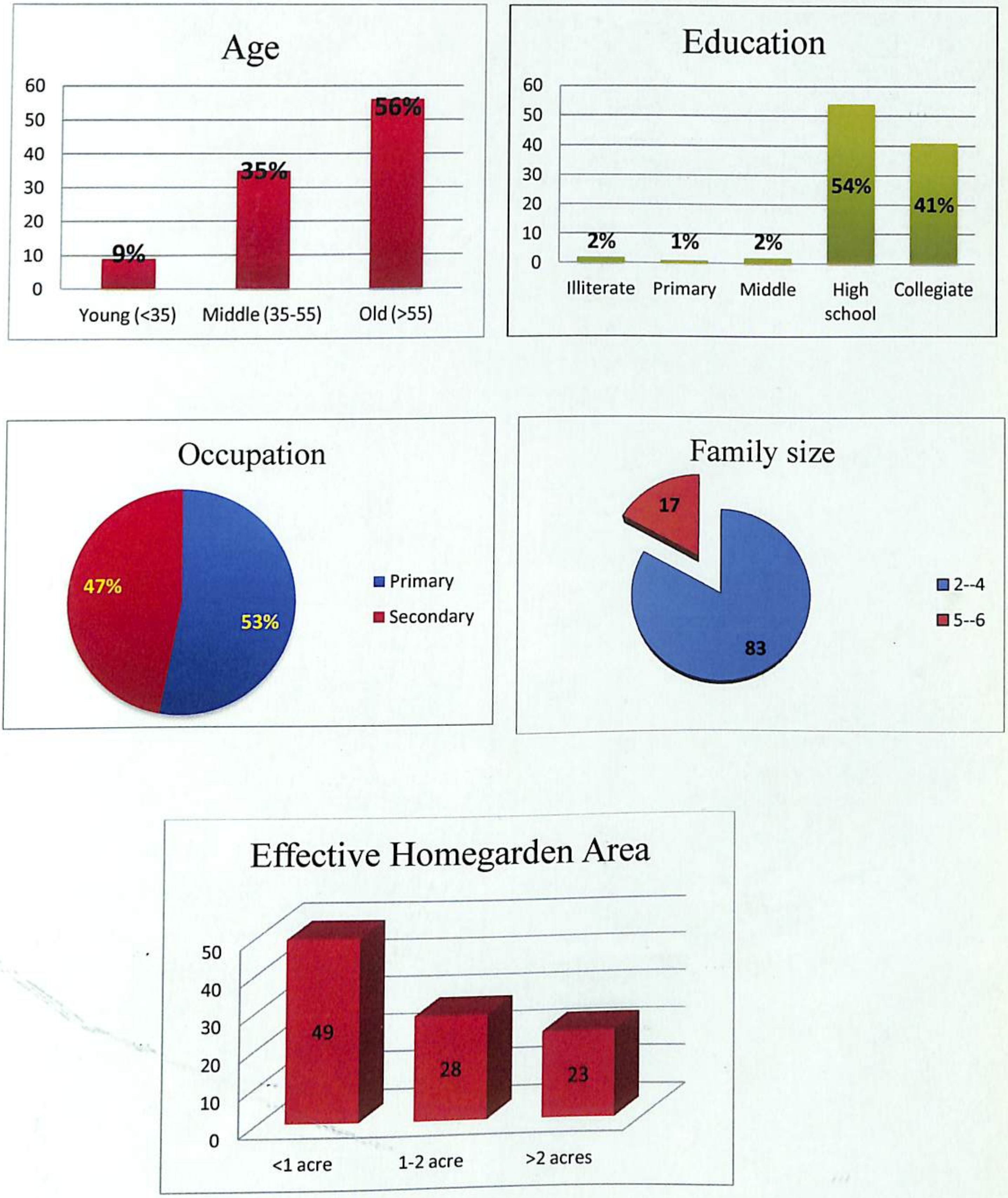


Fig. 3. Profile Characteristics of homegarden farmers

Table 6. Distribution of homegarden based on its irrigation potential

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Physical water scarcity	0	0	10	50	2	10	7	35	2	10	21	21
Economical water scarcity	2	10	8	40	5	25	8	40	2	10	25	25
Little or no	18	90	2	10	13	65	5	25	16	80	54	54

Table 6 revealed that 54 per cent of homegardens sampled had an irrigation potential of ‘little or no scarcity followed by ‘economic water scarcity’ and ‘physical water scarcity’ with 25 per cent and 21 per cent respectively.

Unit wise distribution of homegarden based on irrigation potential shows that 90 per cent of farmers in AEU-1 had little or no water scarcity followed by AEU-14 (80 %), AEU-9 (65 %), AEU-12 (25 %) and AEU-8 (10 %).

Hence it is concluded that 54 per cent of homegarden respondents were under the category ‘little or no water scarcity’ and the rest 46 per cent of homegarden respondents were either under ‘economical water scarcity’ or ‘physical water scarcity’. It may be presumed that AEU-12 and AEU- 8 are the agro ecological units that faces water scarcity in comparison to other agroecological units. It indicates that there should be a plan and an effective water use strategy for the judicial use of water resource for farming activity.

4.1.6 Effective homegarden area

Effective homegarden area is defined as the area which is functionally used for the farming activities. The distribution of homegarden based on effective homegarden area is shown in table 7.

Table 7. Distribution of homegarden based on effective homegarden area

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
<1 acre	15	75	9	45	6	30	7	35	12	60	49	49
1-2 acres	2	10	5	25	6	30	9	45	6	30	28	28
>2 acres	3	15	6	30	8	40	4	20	2	10	23	23

It was evident from the table 7 that about half of sampled homegarden (51 %) had area more than one acre of effective homegarden area. 49 per cent of homegarden farmers had effective homegarden area under one acre.

Unit wise distribution also represents the sample distribution in all units except AEU-12 were 45 per cent of respondents have effective homegarden area between 1 to 2 acres.

Hence it could be inferred that majority of the homegarden farmers are either marginal or small farmers. This decrease in effective homegarden area might be due to factors land fragmentation due to nucleotide family structure, urbanization etc.

4.1.7 Homegarden Farming Experience

Farming experience is the experience or the involvement of the homegarden farmer in the farming activities expressed as number of years. Distribution of homegarden respondents based on experience in farming is given in table 8.

Table 8. Distribution of homegarden farmers based on farming experience

N=100

Category (Years)	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
<10	5	25	5	25	4	20	0	0	1	5	15	15
10-20	8	40	3	15	4	20	8	40	8	40	31	31
>20	7	35	12	60	12	60	12	60	11	55	54	54

Table 8 shows that 54 per cent of homegarden farmers had farming experience of more than 20 years followed by 31 per cent of respondents with 10 to 20 years of experience and 15 per cent of farmers with farming experience less than 10 years.

The unit wise distribution reflects the total sample, except for AEU– 1 where 40 per cent of respondents have farming experience between 10 to 20 years. 60 per cent of homegarden respondents from AEUs 8, 9 and 12 have farming experience of more than 20 years followed by AEU-14 (55 %) and AEU-1 (35 %).

Hence it is inferred that 54 per cent of total respondents have more than 20 years of experience in farming and had a fairly good experience in farming activities. This also points out to the fact that old age farmers are still undertaking agriculture rather than the younger generation.

4.1.8 Rational Orientation

Rational orientation is the measure of identifying the influence of the belief (traditional and scientific) in the production practices of homegardens. The distribution of homegarden respondents based on their rational belief is shown in table 9.

Table 9. Distribution of respondents based on the rational belief

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Belief in stars	3	15	0	0	3	15	0	0	2	10	8	8
Belief in stars and scientific recommendations	10	50	14	70	13	65	2	10	6	30	45	45
Belief in scientific recommendations	7	35	6	30	4	20	18	90	12	60	47	47

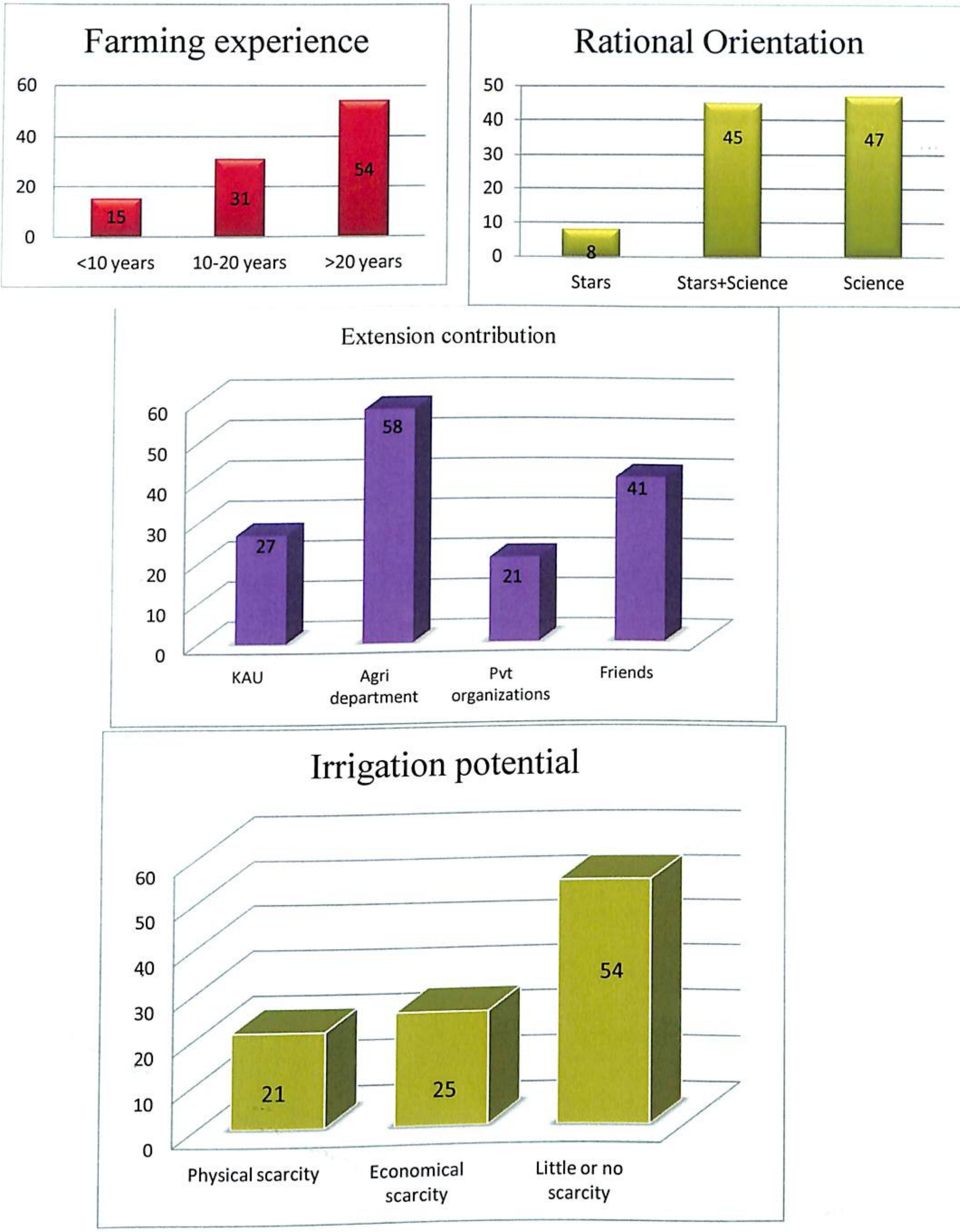


Fig. 4. Profile Characteristics of homegarden farmers (Contd.)

Table 9 clearly reveals 47 per cent of the total homegarden respondents depend solely on scientific recommendations, followed by 45 per cent of homegarden farmers who had belief on science and stars or religious aspects together. The remaining 8 per cent of farmers relied completely on traditional beliefs in their farming activities.

Unit wise interpretation showed that 90 per cent of sampled farmers in AEU-12 depend only on scientific recommendations whereas 70 per cent of homegarden farmers of AEU-8 depend on both stars or religious aspect and scientific recommendations in agriculture. None of the sampled farmers from units AEU-8 and AEU-12 relied blindly on traditional beliefs.

Hence it was inferred that more 93 per cent of homegarden farmers had medium to high level of rational orientation which is in conformity to the finding of Rahul, 2013. The results highlight the cultural settings of Kerala wherein the decisions of farmers are not just based on science alone but also with special reference to their values and beliefs.

4.1.9 Extension contribution

Extension contribution means the source from which homegarden farmers avail knowledge about a new technology. Distribution of homegarden respondents based on their perceived extension contribution is given in table 10.

Table 10. Distribution of the respondents based on perceived extension contribution

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
KAU	7	35	3	15	5	25	10	50	2	10	27	27
DOA	9	45	14	70	6	30	18	90	11	55	58	58
Private organizations	2	10	1	5	6	30	9	45	3	15	21	21
Friends/ Others	12	60	5	25	1	5	12	60	11	55	41	41
Total	30	150	23	115	18	90	49	245	27	135	147*	147

*>100 because of multiple response

The table clearly shows that 58 per cent of homegarden respondents had extension contribution from agricultural department followed by friends (41 %), Kerala Agricultural University (27 %) and other private organizations (21 %) in the respective panchayaths.

Unit wise analysis of extension contribution as perceived by farmer showed that agricultural contribution was highest for three units. The least extension contribution was witnessed in AEU-9 *i.e.* 30 per cent. Friends, neighbours, etc. were found to be a dependable extension agent in AEU-1, 8 and 12. KAU and private organization were considered least contributing in all the units except in AEU-12 were 50 per cent of farmers depended on KAU and 45 per cent of farmers considered private organizations worthy.

However it is to be noted that extension contribution of the State Department of Agriculture is mainly through technology developed and suggested by KAU. The role of extension by KAU is limited through its established mandate. Hence it could be inferred that 85 per cent of extension contribution was through institutions like KAU and Agricultural Department.

4.1.10 Livestock possession

Livestock possession is defined as the possession of animal husbandry components in homegardens along with the crop components. Table 11 states the percentage of homegarden respondents who possess livestock along with cropping components.

Table 11. Distribution of respondents based on possession of livestock.

N=100

Item	AEU-1 n=20		AEU-8 n=20		AEU-9 n=20		AEU- 12 n=20		AEU-14 n=20		Total N=100	
	No	%	No	%	No	%	No	%	No	%	No	%
Cattle	3	15	2	10	5	2	5	25	1	5	16	16
Goat	3	15	2	10	2	1	1	5	3	15	11	11
Poultry	3	15	1	5	5	2	6	30	7	35	22	22
Pisciculture	0	0	1	5	1	5	1	5	1	5	4	4
Total	9	45	6	30	13	65	13	65	12	60	53*	53

*Every homegarden need not have livestock possession

Twenty two percent of respondents possessed poultry followed by cattle, goat and pisciculture at 16 per cent, 11 per cent and 4 per cent respectively. On unit wise analysis of livestock possession we can see that livestock components were seen more in AEU-1, 9 and 12. Poultry followed by cattle was found to be the pattern in almost all the agro ecological units except AEU-8 and AEU-14. Pisciculture was practiced by 5 per cent of farmers in all units except AEU-1.

Thus it is inferred that poultry and cattle are the major animal husbandry components of homegarden. The results also shows a decreasing trend of animal husbandry components in homegardens and it could be due to the fact that homegardens are small or marginal, emerging nucleotide family structure and having agriculture as secondary occupation and the temporal concerns involved in looking after the animals.

4.1.11 Evaluative perception on sustainability of homegarden production practices

Evaluative perception is the ability of the farmer to assign meaning to the different production practices adopted by the farmer so that it contributes to the overall sustainability of homegardens. The distribution of homegarden farmers based on their evaluative perception on sustainability of production practices are illustrated in Table 12.

Table 12. Distribution of homegarden respondents based on evaluative perception on sustainability of production practices.

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
High	13	65	12	60	12	60	14	70	12	60	63	63
Low	7	35	8	40	8	40	6	30	8	40	37	37
Mean value (Overall)											38.47	

On analysis of Table 12 it is evident that 63 per cent of total homegarden respondents falls under high evaluative perception and 37 per cent of respondents have low evaluative perception on sustainability of production practices followed in homegardens. The obtained scores ranged from 33 to 49.

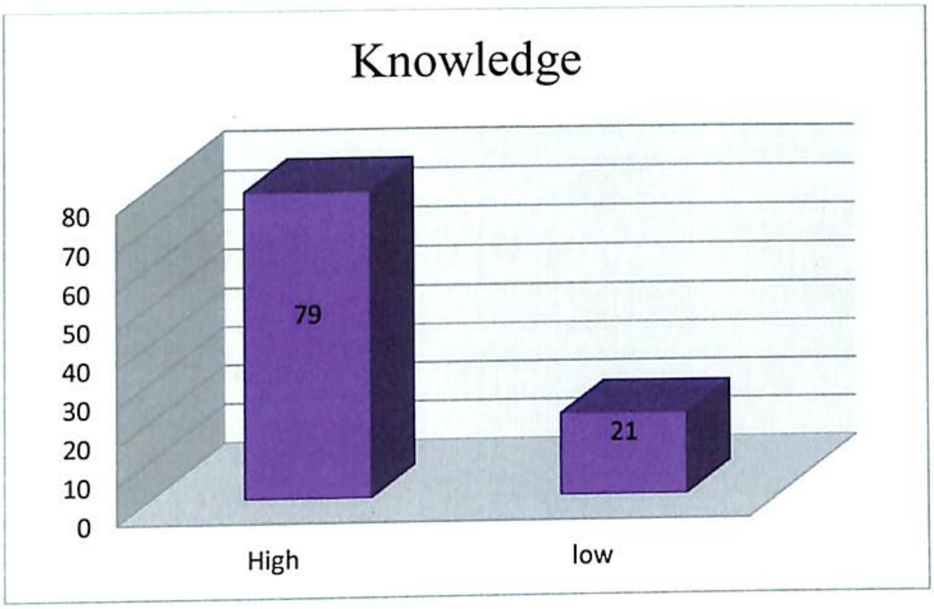
The table shows that all the five agro ecological units show the same pattern of distribution as that of total percentage. Among the agro ecological units AEU-12 has 70 per cent of farmers with high evaluative perception followed by AEU-1 with 65 per cent and AEU 14, 8 and 9 with 60 per cent.

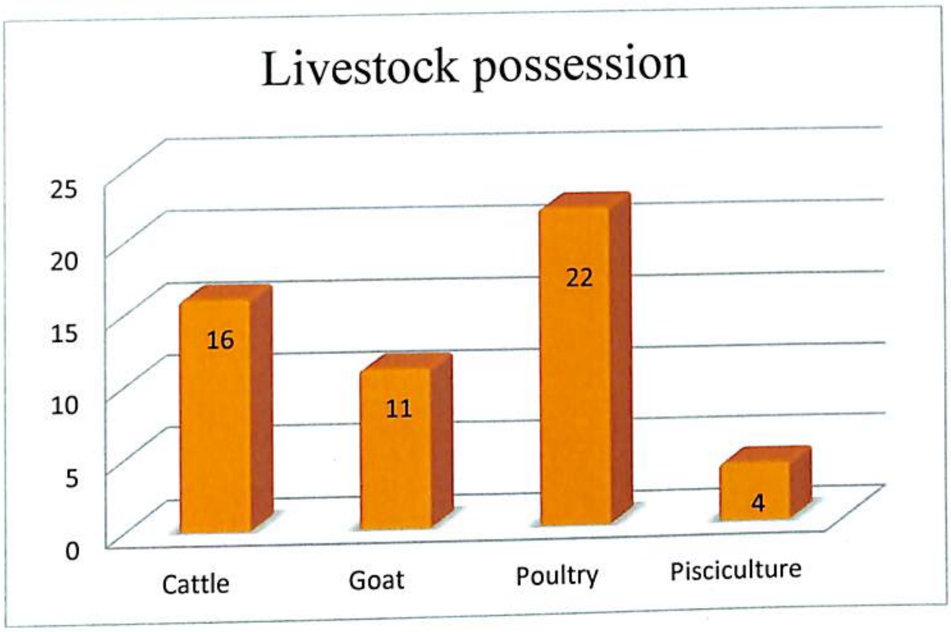
Hence it is inferred that 63 per cent of homegarden respondents have high degree of evaluative perception on sustainability of production practices in homegardens. The results hold good as homegarden farmer respondents perceive sustainability as an important factor for the sustenance of their homegarden farming system.

The high evaluative perception of farmers on sustainability of homegardens could be due to the their sustainable farming system that contributes to income generation, improved livelihoods, household economic welfare, family farming, promoting entrepreneurship and rural development, socio-religious beliefs and local food systems, source of safe and secure food etc. The results are in conformity to the findings of Lundgreen and Raintree, 1983, Arnold 1987, Thomas, 2009 and Calvet-Mir *et al..,* 2012.

4.1.12 Knowledge

Knowledge is the level awareness or the understanding of different scientific production practices of the homegarden respondent. The distribution of homegarden respondents based on their knowledge level is given in table 13.





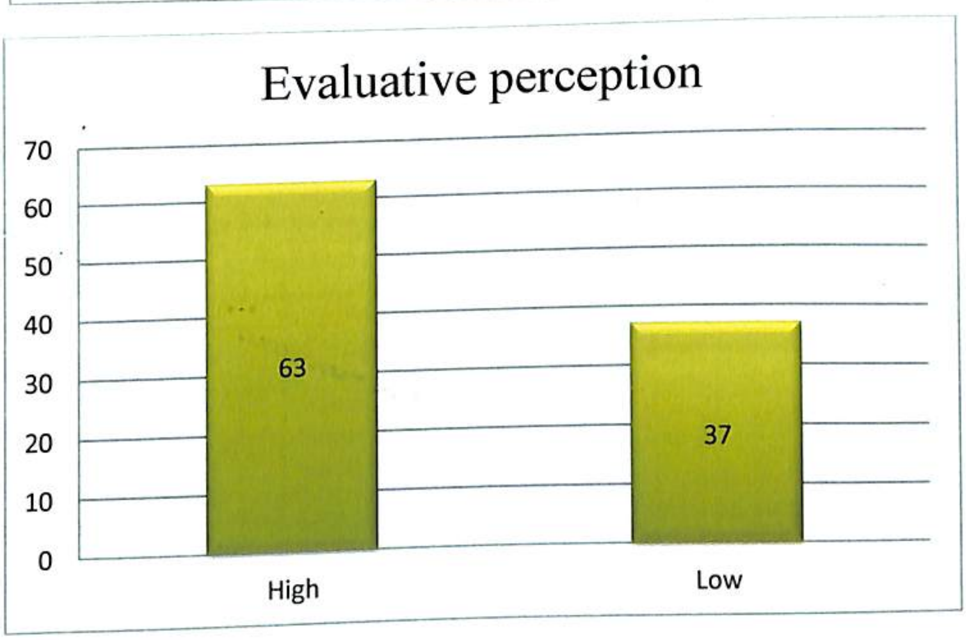


Fig 5. Profile Characteristics of homegarden farmers (Contd.)

Table 13. Distribution of respondents based on their knowledge level on the scientific production practices/technology in homegardens

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
High	15	75	18	90	17	85	18	90	11	55	79	79
Low	5	25	2	10	3	15	2	10	9	45	21	21
Mean value (Overall)											6.25	

The knowledge level of farmers in table 13 shows that 79 per cent of homegarden respondents were under high category and only 21 per cent of farmers belonged to low category.

On unit wise distribution the same pattern as that of sample were seen in all units. 90 per cent of homegarden farmers in AEU-8 and AEU-12 had high knowledge level followed by AEU-9 (85 %), AEU-1 (75 %) and AEU- 14 (55 %).

Hence it is inferred that majority of the respondents had high level of knowledge on scientific production practices technology in homegardens which is in contrary with the results of Thomas (2004). High level of literacy and education, increase awareness on homegarden safe foods and better innovative and effective extension service schemes by the DOA could be the reasons that attributes to the high level of knowledge on scientific production practices technology in homegardens.

4.1.13 Mass media /Information sources

Mass media/ information sources is the frequency and usefulness of various mass media or information support sources as perceived by the homegarden farmer. Contribution of mass media or information sources were measured in terms of frequency and perceived usefulness of the information sources and media. The distribution of respondents based on mean scores of mass media or information sources are shown in table 14 and the frequency and usefulness measured are shown in table 15 and table 16.

Table 14: Distribution of respondents based on mass media/ information sources

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
High	17	85	18	90	17	85	18	90	14	70	84	84
Low	3	15	2	10	3	15	2	10	6	30	16	16
Mean value (Overall)											5.65	

Table 14 which shows the distribution of respondents based on mass media/ information sources revealed that 84 per cent of sampled respondents had high orientation towards mass media/ information sources.

On unit wise analysis it is observed that the same pattern is followed in all AE units with majority of farmers belonging to the high category. AEU-8 and AEU-12 had 90 per cent farmers belonging to high level and the AEU-14 is the unit with more percentage farmers (30%) with low orientation towards mass media/ information sources. Scores obtained ranged from four to eleven. Hence it could be inferred that majority of the farmers belonged to the high category with reference to information support from mass media and other information sources.

Hence, it is inferred that majority of the homegarden farmers (84 %) had high level orientation towards mass media/ information sources.

The results of distribution of respondents based on access or frequency and perceived usefulness of different mass media and information sources are presented below.

a) Distribution of respondents based on frequency or access to different mass media/ information sources

Distribution of homagarden respondents based on the access or frequency to different mass media are shown in table 15. The analysis of table shows that television (67 %) and newspaper (75 %) were the most important mass media tools which are 'very often' accessed by farmers. It was followed by friends, magazines and radio which were ‘often’ accessed by 54 per cent, 45 per cent and 38 per cent of homegarden respondents respectively. The least accessed or ‘not often’ accessed mass media were MAS and Kiosk which were accessed often only by 28 per cent and 26 per cent of total population.

Unit wise analysis also replicates the sample population in which television and newspaper are the ‘very often’ accessed mass media in all the units.

Hence it can be inferred that television and newspaper are the most important mass media among homegarden farmers followed by friends.

b) Distribution of homegarden respondents based on perceived usefulness of different mass media/ information sources

Perceived usefulness of different mass media by homegarden respondents are shown in table 16. Television is considered ‘very useful’ by 62 per cent of homegarden farmers whereas 52 per cent of farmers consider newspaper and magazines to be ‘useful’. Interaction with friends, neighbours etc were found to be ‘useful’ for 48 per cent of farmers. Kiosk and MAS which are not easily accessible by farmers were considered to be ‘not useful’ by 57 per cent and 49 per cent of farmers respectively. Radio was also considered to be ‘not useful’ by almost half of the population.

Unit wise distribution also represents the sample distribution pattern where television is perceived to be the most useful mass media followed by newspaper and magazine.

However a careful analysis of table 15 and 16 showed that even though newspaper was the highest accessed media by majority of the respondents, magazines were perceived to be more useful for farmers on agriculture related topics with special reference to homegarden farming.

Table 15. Distribution of homegarden respondents based frequency or access to different mass media/information sources

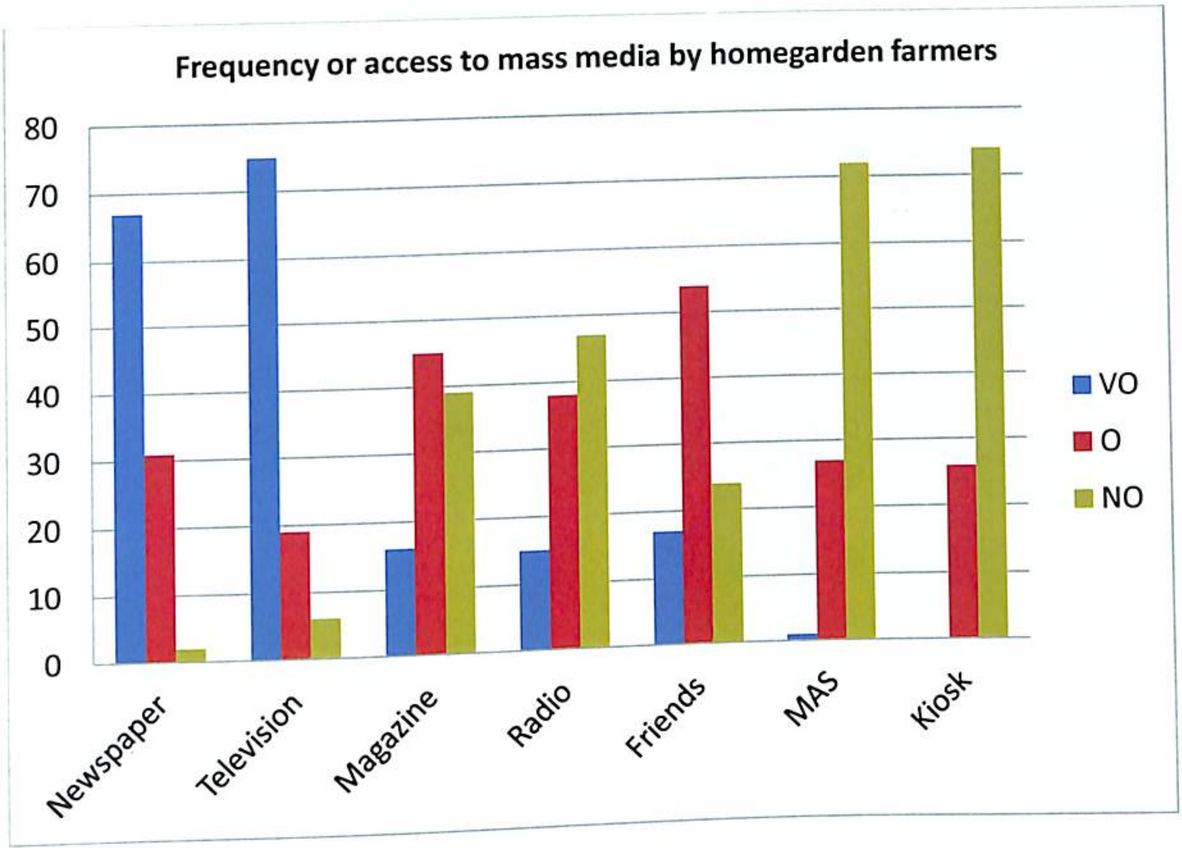
N=100

Category	AEU-1			AEU-8			AEU-9			AEU-12			AEU-14			Total		
	VO	O	NO	VO	O	NO	VO	O	NO	VO	O	NO	VO	O	NO	VO	O	NO
Newspaper	15	4	1	14	6	0	15	5	0	9	11	0	14	5	1	67	31	2
Television	11	8	1	20	0	0	16	4	0	18	2	0	10	5	5	75	19	6
Magazine	11	5	4	0	13	7	0	9	11	3	10	7	2	8	10	16	45	39
Radio	5	7	8	0	6	14	6	14	0	3	3	14	1	8	11	15	38	47
Friends	7	13	0	3	10	7	0	5	10	3	10	7	4	16	0	17	54	24
MAS	0	5	15	0	4	16	0	6	14	0	8	12	1	4	15	1	27	72
Kiosk	0	4	16	0	3	17	0	6	14	0	10	10	0	3	17	0	26	74

Table 16. Distribution of respondents based on perceived usefulness of different mass media

N=100

Category	AEU-1			AEU-8			AEU-9			AEU-12			AEU-14			Total		
	VU	U	NU	VU	U	NU	VU	U	NU	VU	U	NU	VU	U	NU	VU	U	NU
Newspaper	2	8	10	0	10	10	5	15	0	4	8	8	7	11	1	18	52	29
Television	8	11	1	14	6	0	15	5	0	12	8	0	13	3	4	62	33	5
Magazine	8	7	5	8	11	1	0	13	7	9	8	3	2	13	5	27	52	21
Radio	5	5	10	0	7	13	6	11	3	2	8	10	1	6	13	14	37	49
Friends	5	8	7	5	10	5	0	6	14	5	12	3	1	12	7	16	48	36
MAS	3	8	9	0	3	17	2	9	9	7	8	5	4	7	9	16	35	49
Kiosk	3	4	13	3	3	14	5	5	10	9	6	5	2	3	15	22	21	57



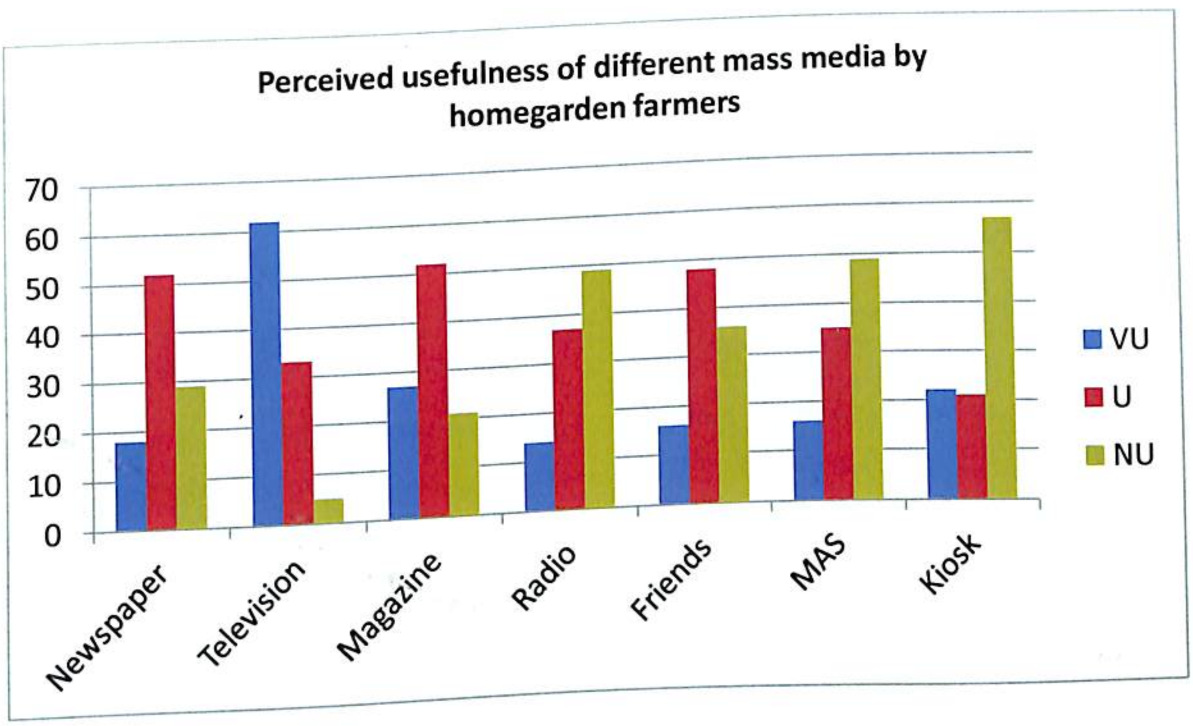


Fig. 6. Profile characteristics of homegarden farmers (Contd.)

4.1.14 Soil health card possession

Soil health card possession is to know whether that farmer has analysed the soil condition anytime during his farming activities. Table 17 shows the number of homegarden farmers who possess soil health card.

Table 17: Distribution of homegarden respondents based on possession of soil health card N= 100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	8	40	0	0	14	70	11	55	9	45	42	42
No	12	60	20	100	6	30	9	45	11	55	58	58

Table 17 reveals that 58 per cent of homegarden respondents said ‘No’ when asked about soil testing result whereas 48 per cent of farmers possess soil health card or soil testing results.

On unit wise analysis of result it is clearly seen that the response of farmers in each units reflect the overall result except in AEU-12 where 55 per cent of homegarden farmers have done soil testing.

Hence it is inferred that majority of homegarden farmers do not possess soil health card, *i.e.* 58 per cent. These points out to the fact the farmers are not concerned about the soil health status which if analysed periodically can help the farmer to apply required manures or fertilizers in the recommended dose and improve the productivity cum profitability of the homegarden farming system.

4.1.15 Fencing

Fencing is the materials which are used in the homegardens as fence. The distribution of homegardens based on type of fencing is shown in table 18.

Table 18. Distribution of homegardens based on type of fencing

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Live	8	40	12	60	15	75	19	95	6	30	60	60
Wall	9	45	16	80	13	65	12	60	14	70	64	64
Wire	0	0	1	5	4	20	3	15	2	10	10	10
Mesh	0	0	0	0	0	0	0	0	1	5	1	1
Mudwall	7	35	8	40	0	0	3	15	0	0	18	18
	24	120	37	185	32	160	37	185	23	115	153	153*

*>100% because of multiple response

Table 18 reveals the type of fencing practiced in homegardens of Trivandrum. Walls are seen in 64 per cent of homegardens followed by live fences in 60 per cent homegarden. Mudwalls, wire fencing and mesh were also seen in 18 per cent, 10 per cent and 1 per cent of homegardens respectively.

On unit wise analysis of fencing in homegardens revealed that walls are dominating in all units except in AEU-12 where 95 per cent of sampled respondents practiced live fencing in their homegardens. Mudwalls were also found in few homegardens of AEUs 1, 8 and 12. Wire fencing and mesh walls are low in all units.

Hence it can be inferred that homegarden fencing is mostly walls and live fences. It is our common perception in these modern times that there will be no or lesser number of homegardens with live fencing as the type of fencing used. But the result is a clear indication that live fencing is still a major type of fencing in homegardens which improves the sustainability and biodiversity of farming system.

4.1.16 Irrigation source

Irrigation source is the water source which is available in homegarden for irrigation. The results on the type of irrigation source is given in table 19.

Table 19.Distribution of homegardens based on irrigation source

N=100

Category		AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
		No	%	No	%	No	%	No	%	No	%	No	%
Well	Perennial	20	100	7	35	20	100	12	60	17	85	76	76
	Non-perennial	0	0	4	20	0	0	8	40	2	10	14	14
Pond	Perennial	1	5	1	5	3	15	0	0	3	15	8	8
	Non-perennial	0	0	1	5	1	5	0	0	0	0	2	2
Tap		20	100	20	100	17	85	10	50	16	80	83	83
	Total	41	205	33	165	41	205	30	150	38	190	183*	183

*>100 because of multiple responses

Wells, ponds and taps were the source of irrigation in homegarden. Eighty three per cent of farmers depend on tap for irrigation purposes. 76 per cent of farmers have perennial wells whereas only 8 per cent of sampled respondents have perennial ponds as irrigation source. Only 16 per cent and 2 percent of total homegarden farmers had non-perennial water sources.

All farmers in AEU-9 and AEU-14 had perennial wells which indicated availability of water for irrigation all round the year. Presence of perennials ponds in few homegardens of AEUs 1,8 and 9 were interesting.

Hence it is inferred that taps are the major source of irrigation in majority of homegadrens. The result shows that water which should be used for the drinking purposes is also used for irrigation practices. This practice should be avoided in homegardens by promoting water conservation techniques and strategies to increase water use efficiency.

4.1.17 Labour involved

Labour involved in farming activities was assessed to know the involvement of family members in different farming activities and the results are shown as table 20.

Table 20. Distribution of homegardens based on labour used

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Family labour	9	45	10	50	4	20	5	25	13	65	41	41
Waged labour	2	10	2	10	5	25	5	25	0	0	14	14
Both	9	45	8	40	11	55	10	50	7	35	45	45
Total	20	100	20	100	20	100	20	100	20	100	100	100

Table 20 revealed that 45 per cent of respondents use both waged labour and family labour in their farming activities followed by 41 per cent of farmers who use only family labour and only 14 per cent of respondents hire only waged labourers for farming.

Unit wise analysis shows that hiring of only waged labour in very less in all units. This may be due to high cost and non-availabity of labour.

Thus it can be inferred that family members of 86 per cent of homegarden farmers involve in farming activities.

4.1.18 Type of irrigation

The different types of irrigation practiced in homegardens are shown in table 21.

Table 21. Distribution of homegarden based on type of irrigation.

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Basin	16	80	20	100	10	50	15	75	17	85	78	78
Drip	3	15	2	10	6	30	2	10	1	5	14	14
Sprinkler	1	5	2	10	4	20	1	5	3	15	11	11
Canal	3	15	10	50	6	30	3	15	3	15	25	35
Total	23	115	34	170	26	130	21	105	24	120	128*	128

*>100 because of multiple responses

The table indicates the type of irrigation practiced in homegardens. Seventy eight per cent of homegardens were basin irrigated and 25 per cent had canal irrigation. Drip irrigation and sprinkler irrigation were seen in 14 per cent and 11 per cent of homegardens respectively.

On unit wise analysis, it was found that all the homegardens in AEU-8 practiced basin irrigation followed by AEU-14, AEU- 1, AEU-12 and AEU-9 with 85%, 80%, 75 % and 50% of homegarden respondents following basin irrigation respectively. 50 per cent of homegarden respondents from AEU-9 used drip and sprinkler irrigation.

Hence it is inferred that basin irrigation is the type of irrigation practiced in majority of homegardens. The results of the study indicates the need for effective extension for increasing the adoption of micro-irrigation techniques in homegardens thereby benefitting the homegarden with better water use efficient systems.

4.2 Dominance profile of homegardens

Dominance profile in homegardens were generated by focusing on the numerical and economical dominance of different crop species. Homegarden aspect should not only consider mere structure existing in homegardens but also on the numerical importance and above all economical aspect is given more importance.

Dominant crops in homegardens were found out based on variable levels of numerical and economic dominance exhibited by major crops in homegardens under study. The dominance pattern that is, economic dominance and their means are presented in table 22.

Table 22: Economically dominant crops identified.

Crops	Mean	Rank
Coconut	**1.59**	1
Banana	**1.68**	2
Pepper	**3.33**	4
Vegetable	**3.43**	5
Tapioca	**2.94**	3
Yams and colocasia	**4.22**	6
Arecanut	**4.56**	7

The mean of ranked scores revealed that coconut, banana, tapioca, papper, vegetables, yam and colocasia and arecanut were the most dominant crops. The other dominant crops included ornamental crops, fodder grass, turmeric, etc.

Kerala homegardens shows typical case of diversity profile. Some species of homegardens habitually dominates and have controlling effects on the fitness of their subordinates (Kurien and Sam, 2004). Farmers select the crops based on the economic benefits in the present market. As a result crops which require minimum attention but fetches high profit was observed.

This study has identified the crop species which are numerically and economically dominant in the homegarden agro ecosystem which helped to finally decide the important and the less important crops.

4.3 **Production preferences, perceived usefulness and effectiveness of selected KAU production technologies.**

4.3.1 Production preference for selected components in homegardens.

Table 23 shows the production preference of selected economically dominant crops in the homegarden.

Plate 3. Dominant crops in homegardens

Plate 4. Dominant crops in homegardens

Table 23. Production preferences for selected crops in homegardens.

Components	Cost effectiveness	More sustainable	Family needs	Less management	Low cost of cultivation	Nutrient recycling	Resource utilization	Soil conservation	Availability of inputs	Guaranteed market
Coconut	7.74	5.27	5.39	5.09	5.66	2.90	6.73	2.45	6.27	7.14
Banana	6.80	4.75	4.90	1.90	3.40	8.55	7.25	3.85	4.90	8.70
Tapioca	7.85	4.80	6.30	6.00	4.25	6.00	2.50	4.45	6.45	6.25
Pepper	8.35	6.75	5.30	5.95	1.90	4.25	5.05	3.90	6.65	6.85
Colocasia and yams	8.25	4.00	6.25	6.50	6.25	3.40	3.10	4.00	5.10	5.55
Cowpea	2.60	1.20	6.20	4.00	4.40	4.70	4.75	5.10	5.85	5.10
Arecanut	2.20	6.25	1.40	8.35	6.35	5.50	6.35	5.40	5.05	2.65
Livestock	4.85	6.40	4.90	4.60	3.70	8.50	7.20	5.90	1.75	1.30

The preference of crops were worked out for 10 dimensions *i.e* cost effectiveness, sustainabilty, family need, less management, cost of cultivation, nutrient recycling, resource utilization, soil conservation, availability of inputs and guaranteed market.

Different crops were preferred by homegarden farmers for varied reasons. Cost effectiveness was the prime reason for preference of coconut, tapioca, pepper and colocasia and yams. Guaranteed market was the second best reason for preferring coconut and pepper. Guaranteed market and nutrient recycling made farmers prefer banana. Family needs and availability of inputs were the major contributing factors for selecting cowpea in homegardens.

Addition of livestock component into the homegadren system was practiced by farmers because of nutrient recycling and resource utilization followed by their contribution to sustainability.

Thus it can be inferred that crops are mainly preferred in the homegarden agro ecosystem because of their cost effectiveness and guaranteed market. It also suggests that specific preferences are there for farmers in the process of horizontal integration or choice of crops whether the homegarden is unplanned or deliberately planned.

4.3.2 ***Perceived usefulness and effectiveness of selected KAU production technologies.***

Perceived usefulness and effectiveness of KAU production technologies are shown in table 24 and 25 respectively. 51 per cent of total homegarden farmers opined that KAU practices were ‘useful’, 29 per cent of respondents considered the practices to be ‘very useful’ whereas 19 per cent of farmers considered the same to be ‘not useful’.

Table 24: Perceived usefulness of KAU production technologies

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Very Useful	6	30	2	10	4	20	13	65	4	20	29	29
Useful	12	60	12	60	10	50	7	35	10	50	51	51
Not Useful	2	10	6	30	6	30	0	0	6	30	20	20

Table 25: Perceived effectiveness of KAU production technologies

N=100

Category	AEU-1		AEU-8		AEU-9		AEU-12		AEU-14		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Very effective	8	40	6	30	9	45	12	60	7	35	42	42
Effective	7	35	8	40	8	40	8	40	9	45	40	40
Not Effective	5	15	6	30	3	15	0	0	4	20	19	19

The effectiveness of KAU practices as perceived by the homegarden respondent showed that 42 per cent of farmers considered KAU practices ‘very effective’, 40 per cent said KAU practices were ‘effective’ but 19 per cent of homegarden farmers said that the practices were ‘not effective’.

Unit wise analysis also follows the pattern on sample where KAU production practices are considered to be ‘useful’ in all units except AEU-12 where 65 per cent of respondents said that KAU production practices are more useful. The study highlights the dominance of role of KAU in the benefit of farming community with special reference to the development and dissemination of need based technologies for the homegarden systems.

4.4 Technology assessment in the homegardens

Technology assessment in homegardens were made in terms of extend of adoption of scientific production practices in homegradens and technology need assessment study.

4.4.1 Distribution of respondents based on the extent of adoption of scientific production practices in homegardens.

The distribution of homegarden respondents based on extent of adoption is presented in table 26. The respondents were categorized into high, medium and low adopters of scientific production practices or technologies in homegardens.

Table 26: Distribution of respondents based on the extent of adoption of scientific production practices in homegardens.

N=100

Sl. No	Category	Class limits	No.	%
1	High (Mean + Standard deviation)	>71.60	20	20
2	Medium (Between mean and Standard Deviation)	31.16– 71.60	63	63
3	Low (Mean – Standard Deviation)	<31.16	17	17

Mean = 51.36 SD= 20.20

Table 26 shows the distribution of homegarden farmers based on the extent of adoption of selected scientific production practices in homegardens.

On analysis of table we can see that majority of farmers falls under medium category (63 %) followed by high category and low category with 20 per cent and 17 per cent respectively.

Hence it was inferred that majority of homegarden respondent have medium level to high level of adoption of scientific practices which is in conformity to the results of Thomas (2004) highlighting the scope and importance for further improving the overall level of adoption of production practices for the economically dominant crops in homegardens.

4.4.2 ***Overall level of adoption of production practices for the economically dominant crops in homegardens***

The study undertaken revealed that 83 per cent of farmers belonged to medium and high category of adoption. The adoption score ranged between 31.16 and 92.22 with a mean adoption score of 51. The overall level of adoption showed that 20 per cent of farmers are belonging to high category of adoption but the level of adoption is not 100 per cent for anyone which indicates that the KAU practices are not full adopted by the farmers.

An attempt was done to categorise the homegarden respondents into different adopter categories as explained by Rogers (1982) namely, innovators, early adopters, early majority, late majority and laggards. Fig. 7 and table 27 shows the overall adoption of homegarden respondents for the economically dominant crops together.

Table 27: Overall adopter categorization of homegarden respondents for the seven economically dominant crops

N=100

Category	No.	%
Innovators	0	0
Early Adopters	17	17
Early Majority	34	34
Late Majority	29	29
Laggards	20	20
Total	100	100

Overall adoption curve shows that there are no innovators in homegardens but the percentage of early adopters is 17 per cent which is above that of a standard Rogers curve which states that only 13.5 per cent of people fall under the early adopter category. 34 per cent of respondents belong to the early majority which is equivalent to that of Rogers standard normal curve. Less percentage of farmers under late majority category 29 percentage is a good indicator of adoption. However the table 27 designates the presence of 20% laggards which is higher than that of standard Rogers value.

The findings indicate that there is a need for effective and meaning full extension advisory and service supports so that the percentage of laggards and late majority can be further reduced which will invariably improve the percentage of respondents either under early majority, early adopter or innovators. Thus the extent of adoption of KAU production practices can be improved. The reason for the absence of innovators in the overall adoption curve could be due the extreme values assigned to the different and multiple selected production practices by the 100 respondents for seven different crops.

Inorder to arrive at the extent of adoption of selected scientific practices of specific dominant crop, the respondents were categorized to different adopter categories as suggested by Rogers. Adopter category curve for the identified dominant crops were worked out as presented below.

Coconut

Kerala is known very well for the coconut palms, the dominant crop of the state. This dominance is seen in and around the different households of Kerala. Coconut is known for the wide use of its different plant parts and the economic and social importance it bears. Coconut has found its place at commercial, industrial and household levels.

Distribution of homegarden respondents based on their extent of adoption of scientific practices in the most dominant crop *viz*., coconut is explained in table 28.

Level of adoption of production practices for coconut

Table 28. Distribution of respondents based on the extent of adoption of scientific production practices in homegardens for coconut

N=100

Sl. No	Category	Class limits	No.	%
1	High (Mean + Standard deviation)	>80.22	14	14
2	Medium (Between mean and Standard Deviation)	43.21-80.22	64	64
3	Low (Mean – Standard Deviation)	<43.21	22	22

Mean: 61.71 SD: 18.51

Analysis of table 28 on the level of adoption of production practices for coconut revealed that when 14 per cent of farmers belonged to high category of adoption majority, *i.e.* 64 per cent of farmers fell under medium category of adoption. Thus it could be inferred that 78 percentage of total homegarden respondents are fairly well adopting the production practices recommendations of KAU indicating the acceptability of KAU technologies among a large group of homegarden farmers of Kerala. The maximum and the minimum mean adoption quotient was 23.91% and 100% respectively

Adopter categorisation of respondents for selected production practices of coconut

Adopter categorisation for coconut was worked out and the results presented in table 28 and figure 8. Table 28 and figure 8 which shows the adopter categorization of coconut farmers in homegardens based on level of adoption of scientific production practices.

Table 29. Adopter categorization of coconut farmers based on level of adoption of scientific production practices N=100

Category	No.	%
Innovators	6	6
Early Adopters	16	16
Early Majority	24	24
Late Majority	40	40
Laggards	14	14
Total	100	100

The table showed that the percentage of innovators were 2.5 per cent in a standard Rogers curve. Innovators were followed by 16 per cent of farmers under early adopters which again is above standard Rogers curve. The percentage of early majority (24 %) is lower and the per cent of late majority is higher (40 %) than normal curve which both point towards lesser adoption of KAU production practices. Percentage of laggards or traditional in case of coconut is 14 per cent which is slightly lesser than that of a standard curve which is 16 per cent.

Hence, it can be inferred that the production practices of KAU are fairly adopted and care should be taken to focus on the early and late majority that will further improve the extent of adoption.

Banana

Bananas are one of the most important crops and their production for sale in local markets is one of the few activities that provide households with regular

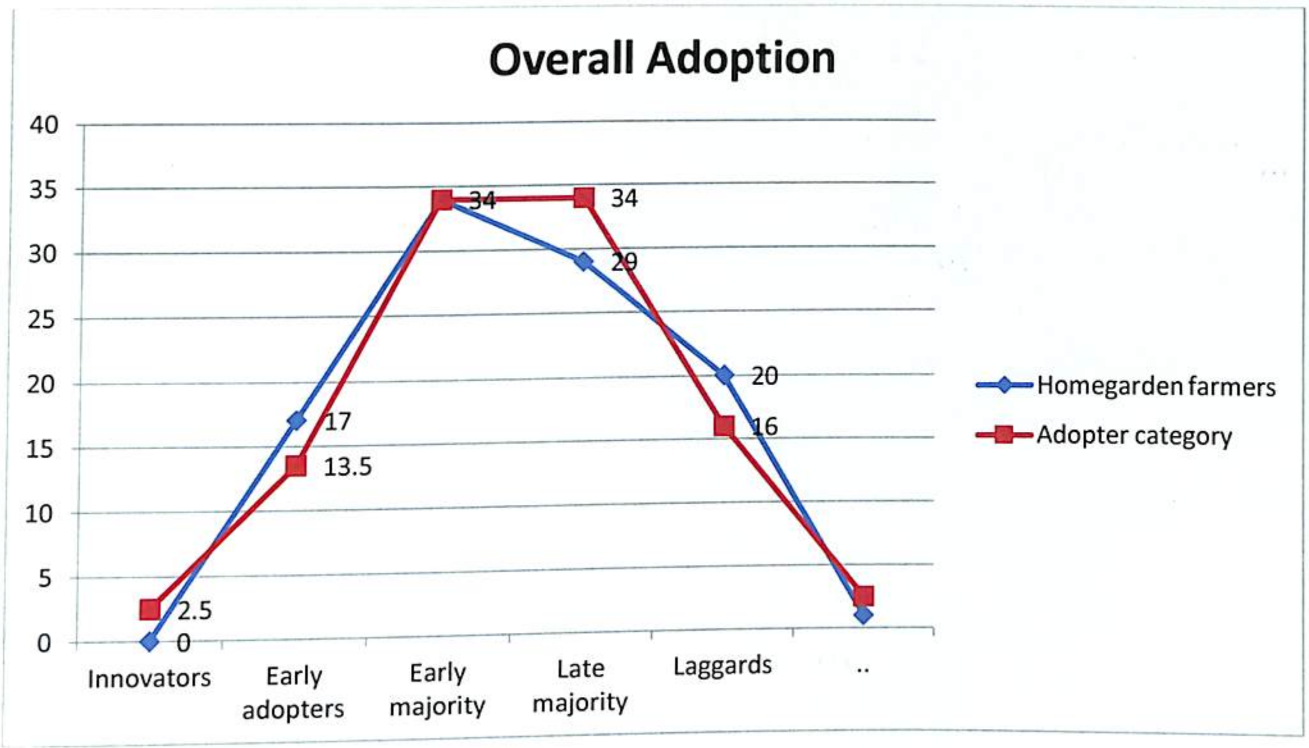


Fig. 7 . Overall adoption of homegarden respondents for the economically dominant crops

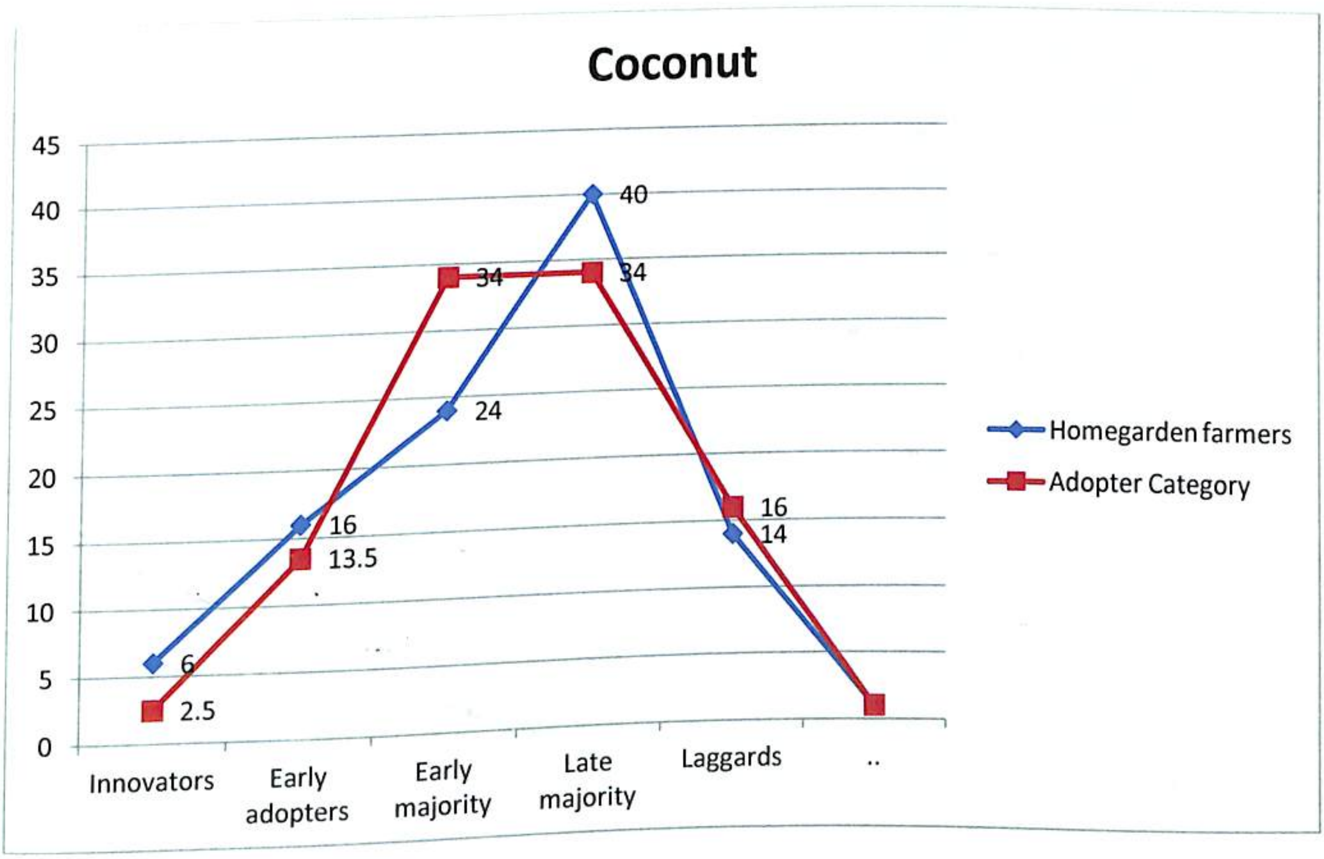


Fig.8. Adopter categorisation of coconut

income throughout the year. Most bananas are planted for sale in local markets or self-consumption and this makes limited use of external inputs and is labour intensive.

Distribution of homegarden respondents based on their extent of adoption of scientific practices in banana and their level of adoption is explained in table 30.

Level of adoption of production practices for banana

Table 30: Distribution of respondents based on the extent of adoption of scientific production practices in homegardens for banana.

N=100

Sl. No	Category	Class limits	No.	%
1	High (Mean + Standard deviation)	>91.02	14	14
2	Medium (Between mean and Standard Deviation)	45.57-91.02	66	66
3	Low (Mean – Standard Deviation)	<45.57	30	30

Mean: 68.29 SD: 22.72

The level of adoption of banana growers indicated that 66 per cent of farmers belonged to medium category of adoption followed by 30 per cent farmers in low category and 14 per cent farmers belonging to high category of adoption.

Thus it can be said that 70 percentage of the total homegarden respondents belongs to medium or high level of adoption when it comes to adoption of scientific production practices in banana. The adoption quotient ranged from 14.29 to 100.

The adopter categorisation of banana growers based on their level of adoption of scientific production practices are shown in table 31 and fig. 9.

Table 31. Adopter categorization of banana farmers based on level of adoption of scientific production practices

N=100

Category	No.	%
Innovators	7	7
Early Adopters	13	13
Early Majority	23	23
Late Majority	43	43
Laggards	14	14
Total	100	100

Banana farmers were then categorized into different adopter categories based on mean and standard deviation. The catgorisation in table 30 and Fig. 9 revealed that percentage of innovators in case of banana (7%) is higher than a standard adopter curve which is a very good sign that the scientific recommendations are followed by farmers in homegardens. Though the percentage farmers falling under early adopter category is almost equal to that of standard curve the early majority farmers are lesser and late majority farmers are more in number which indicates that adoption is comparatively lesser. Laggards or traditionals are 14 per cent in case of homegarden farmers as against 16 per cent in a standard curve. The percentage of farmers falling under the innovators and early adopter category is more than the standard curve indicates higher rate of adoption at the same time the percentage coming under the other three categories indicate lesser adoption. So the extension focus should be to provide adequate support and services to the homegarden farmers so as to improve the percentage farmers under the early adopter and early majority category and to reduce the percentage of late majority and laggards so that overall adoption can be further improved. This is very important as banana is a major economically dominant crop in homegardens. More good and need based technologies suited for homegarden condition need to be generated that may be accepted by the farming community at large as this crop is a decisive crop for homegarden profitability both in terms of economic contribution as well as sustainability of the homegarden environment.

Tapioca

Cassava yields vary with cultivars, season of planting, soil type and fertility. With improved varieties and under good management practices, they can reach 20 to 25 tonnes per hectare. The extent of adoption of scientific production practices in tapioca by homegarden farmers are shown in table 32.

Level of adoption of production practices for tapioca

Distribution of respondents based on the extent of adoption of scientific production practices in homegardens for tapioca is presented in table 32.

Table 32: Distribution of respondents based on the extent of adoption of scientific production practices in homegardens for tapioca N=88

	Category	Class limits	No.	%
1	High (Mean + Standard deviation)	>79.33	18	20
2	Medium (Between mean and Standard Deviation)	32.47-79.33	53	60
3	Low (Mean – Standard Deviation)	<32.47	17	20

Mean: 55.90 SD: 23.43

The level of adoption for production practices for tapioca in table 32 reveals that 20 per cent of farmers had high level of adoption and 60 per cent farmers had medium level of adoption.

Even though tapioca is considered to be a less managed crop the level of adoption revealed that 80 per cent of the total respondents belonged to either high or medium category of adoption which is equivalent to that of the overall adoption percentage and homegarden farmers were giving adequate care to this less managed crop and this might be due to the cost effectiveness of the crop. Adoption quotient of tapioca farmers ranged from 16.63 to 99.98.

Distribution of homegarden farmers based on adoption quotient into different adopter categories are explained in table 33 and figure 10.

Table 33. Adopter categorization of tapioca farmers based on level of adoption of scientific production practices N=88

Category	No.	%
Innovators	0	0
Early Adopters	17	19
Early Majority	28	32
Late Majority	25	28
Laggards	18	21
Total	88	100

The distribution of adopter category reveals that there were no innovators coming under KAU adoption of production practices for tapioca but the percentage of farmers in the early adopter category (19 %) was much higher than the standard distribution. The higher the percentage of early adopters and early majority in a society higher will be chance for adoption.

Here the higher percentage of early adopters (19%) and early majority (32%) and the lesser percentage of late majority (28%) categories are a good indicator that the farmers are adopting the KAU scientific production practices for tapioca.

At the same time the percentage of laggards are higher than the standard Rogers curve and so the focus should be to make these category of farmers understand the importance of adopting the scientific production practices so that the percentage of laggards can be reduced, thus increasing the number of farmers in the early majority, early adopters and innovators.

Pepper

Known as the 'king of spices', pepper is the most precious and valuable spice in the world. Intercropping black pepper provides additional returns, employment opportunities, enables better utilization of resources and sustain livelihoods in the rural households.

Distribution of homegarden respondents based on their extent of adoption of scientific practices in pepper and their level of adoption is explained in table 34.

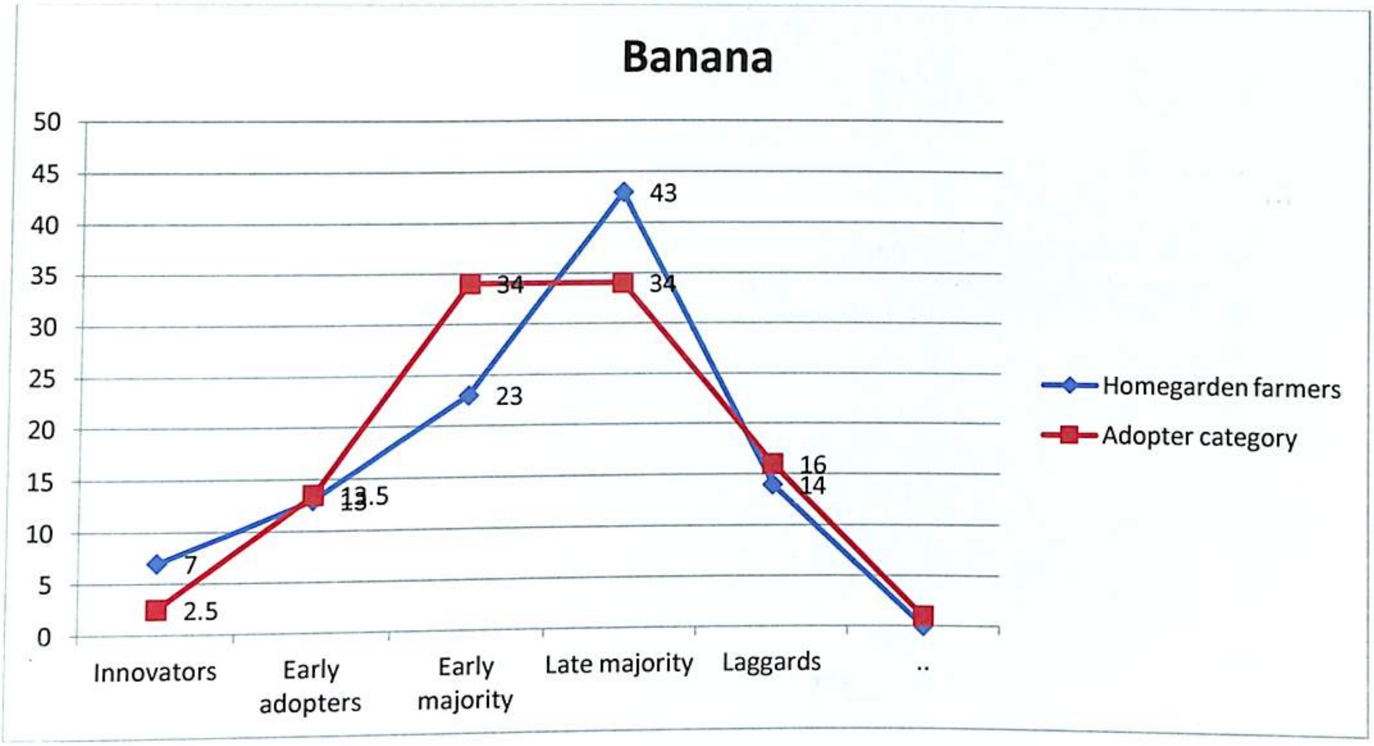


Fig. 9 Adopter categorisation of banana

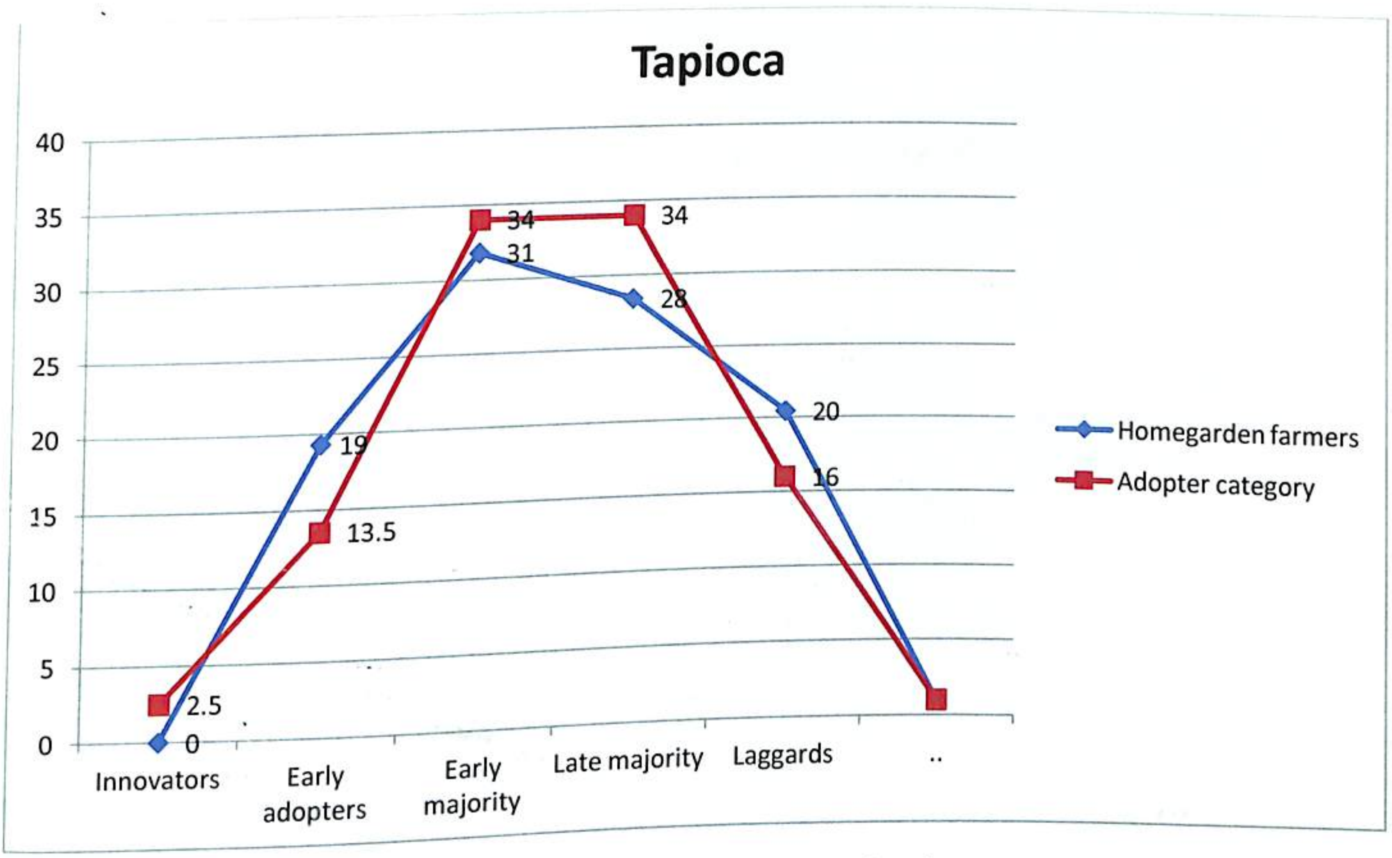


Fig. 10. Adopter categorisation of tapioca

Level of adoption of production practices for pepper

Extend of adoption for the scientific production practices for pepper is shown in table 34 and distribution of homegarden respondents to different adopter categories based on adoption quotient is explained in table 35 and figure 11.

Table 34: Distribution of respondents based on the extent of adoption of scientific production practices in homegardens for pepper

N=70

Sl. No	Category	Class limits	No.	%
1	High (Mean + Standard deviation)	>82.58	14	19.5
2	Medium (Between mean and Standard Deviation)	44.99-82.58	43	62
3	Low (Mean – Standard Deviation)	<44.99	13	18.5

Mean: 63.79 SD: 18.79

On analysis of production practices for pepper shown in table 34 it was seen that 19 per cent of farmers belong to high level and 18.5 per cent farmers belonged to low level of adoption and 62 per cent of farmers are falling under medium category of adoption. Maximum adoption quotient was 93.33 and minimum was 30. Adopter categorisation of pepper growers are shown in figure 11 and Table 35.

Table 35. Adopter categorization of pepper farmers based on level of adoption of scientific production practices N=70

Category	No.	%
Innovators	0	0
Early Adopters	14	20
Early Majority	22	31
Late Majority	21	30
Laggards	13	19
Total	70	100

It is clear from the table 35 and figure 11 that none of the respondents belonged to innovator category in case of pepper but the percentage of farmers belonging to early adopters category (20 %) is much higher than the standard

Rogers curve. The percentage of farmers under early majority category (31%) and that of late majority category (30%) were lesser than the standard Rogers curve. This showed that production practices for pepper were adopted by the homegarden farmers.

This increased adoption trend may be attributed to the wide acceptance of pepper varieties released by KAU. Agricultural production increases through the use of improved varieties of crops in a given area. More number of laggards was also seen (19 %) as against 16 per cent in a standard curve.

Colocasia and yam

Kerala has the premier slot for the maximum number of cultivated tuber crops in India. The tuber crops which is one of the staple food in Kerala after rice is a crop needs less maintenance and high yield, it forms the important component of food and nutritional security of especially poor and marginal farmers. Another relevant characteristic of tubers is their potential to grow and yield under low fertility conditions and the high calorific values. Further with value addition tubers have a bright future in the industrial sector.

Distribution of homegarden respondents based on their extent of adoption of scientific practices in colocasia and yams and their level of adoption is explained in table 36.

Level of adoption of production practices for colocasia and yam

Distribution of homegarden respondents based on level of adoption of production practices for colocasia and yam is shown in table 36 and the adopter categorization is explained in table 37 and figure 12.

Table 36: Distribution of respondents based on the extent of adoption of scientific production practices in homegardens for colocasia and yams.

N=71

Sl. No	Category	Class limits	No.	%
1	High (Mean + Standard deviation)	>91.88	10	14
2	Medium (Between mean and Standard Deviation)	50.66-91.88	49	69
3	Low (Mean – Standard Deviation)	<50.66	12	17

Mean: 71.27 SD: 20.61

Table 36 which shows the level of adoption of production practices for colocasia and yams revealed that majority of farmers had medium level of adoption (69 %), followed by low and medium category with 17 per cent and 14 per cent respectively. Adoption quotient ranged from 13.33 to 100. Distribution of homegarden respondents to different adopter categories are shown in table 37 and Fig.12.

Table 37. Adopter categorization of colocasia and yam farmers based on level of adoption of scientific production practices

N=71

Category	No.	%
Innovators	4	6
Early Adopters	8	11
Early Majority	19	27
Late Majority	30	42
Laggards	10	14
Total	71	100

In case of colocasia and yams the adoption was lesser when compared to the normal Rogers curve. This might be due to the fact that colocasia and yams are coming under crops that requires less management or care. The respondents belonging to innovator category was 6 per cent which is higher than the Rogers curve indicating a fairly good level of adoption among pepper growing farmers. However, early adopters (11%) and early majority (27%) were lesser than standard normal curve. At the same time 42 per cent of farmers fall under late majority category that was higher than normal curve.

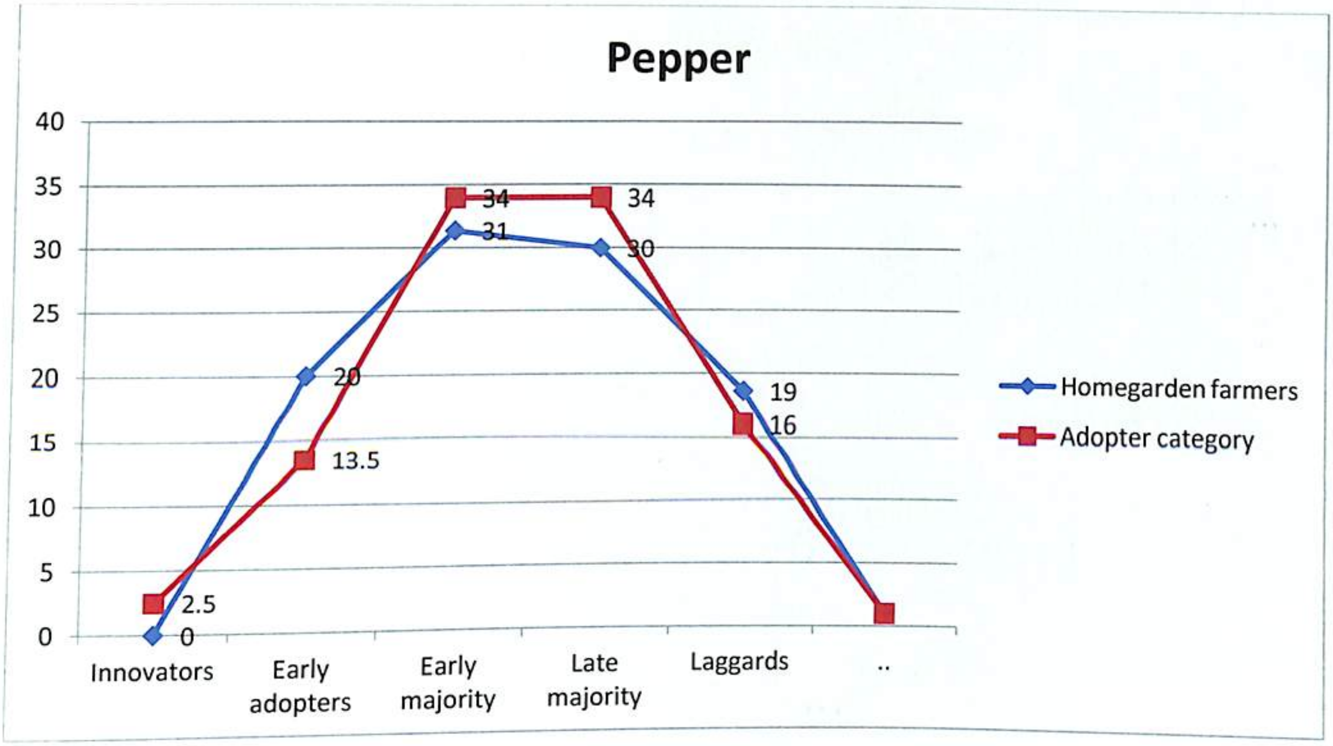


Fig.11. Adopter categorisation of pepper

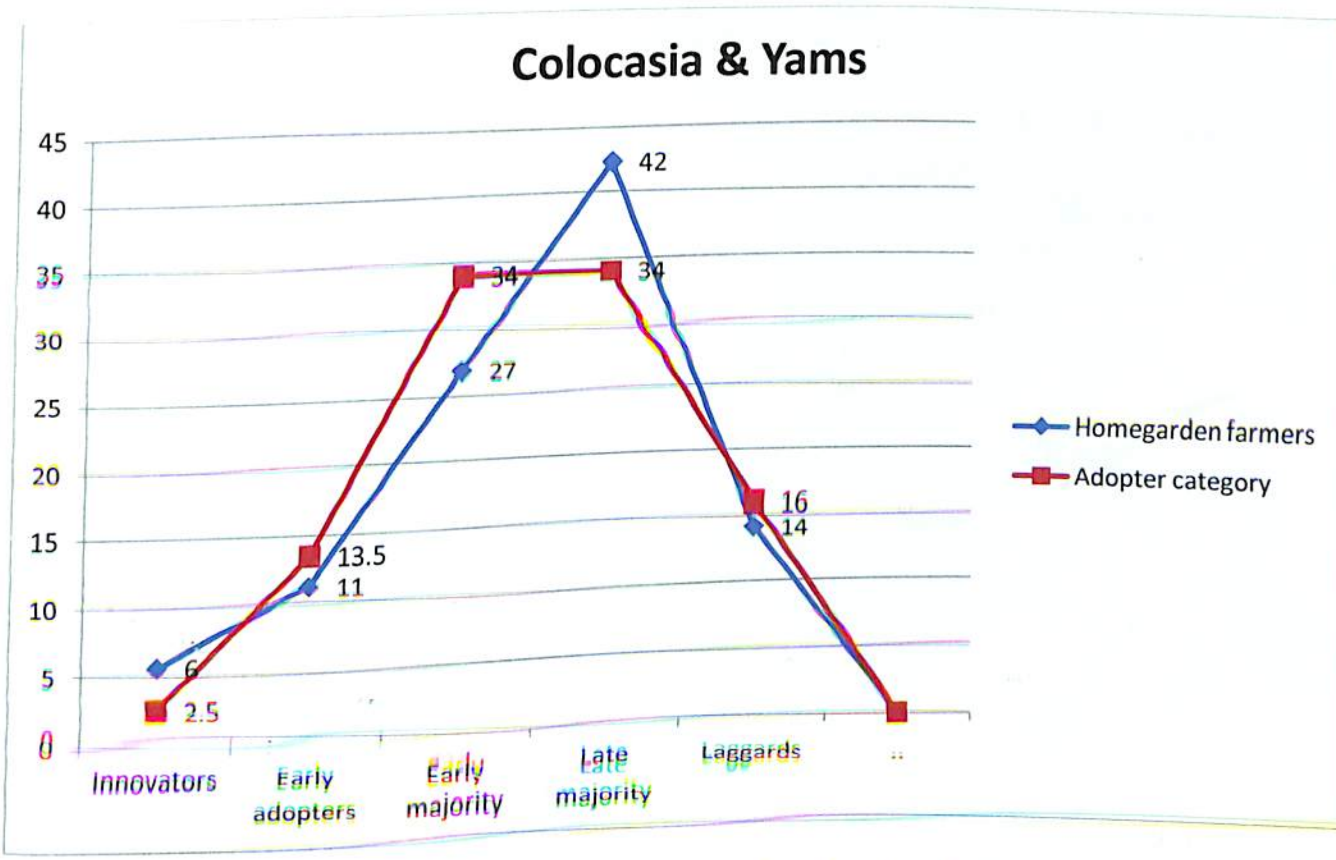


Fig. 12. Adopter categorisation of colocasia and yam

These findings can be linked with the production preference of farmers because the study revealed that farmers cultivated colocasia and yams in their fields because of the less management aspect and to satisfy the family needs. It shows that the economic returns does not play much role in case of tubers and this may be the reason for the lesser adoption of KAU production practices for colocasia and yams.

Cowpea

Cowpea which is can be cultivated throughout the year yields about 1.2 to 1.5 tons of grain per hectare. Cowpea is an important source of nourishment to the urban and rural poor who cannot afford protein rich food such as fish, meat and milk products. The crop also contributes to soil fertility through nitrogen fixation and production of organic matter. Cowpea can be grown in homestead garden throughout the year under Kerala condition both as a floor crop in coconut garden and as intercrop in tapioca.

Distribution of homegarden respondents based on their extent of adoption of scientific practices in cowpea and their level of adoption is explained in table 38.

Level of adoption of production practices for cowpea

Cowpea was identified as the dominant vegetable in homegardens and distribution of homegarden respondents based on level of adoption of scientific production practices and adopter categorization is shown in table 39 and figure 13 respectively.

Table 38: Distribution of respondents based on the extent of adoption of scientific production practices in homegardens for cowpea

N=70

Sl. No	Category	Class limits	No.	%
1	High (Mean + Standard deviation)	>87.06	13	18.5
2	Medium (Between mean and Standard Deviation)	87.06-	44	63
3	Low (Mean – Standard Deviation)	<43.15	13	18.5

Mean: 65.11 SD: 21.95

From table 38 we can find that in case of level of adoption of KAU production practices in cowpea 63 per cent of farmers belonged to medium category of adoption followed by high and medium categories of adoption with 18.5 per cent and 18.5 per cent farmers respectively. Maximum adoption quotient was 99.98 and the minimum adoption quotient was 17.77.

Figure 13 and table 39 shows the distribution of cowpea growers into different adopter categories.

Table 39. Adopter categorization of cowpea farmers based on level of adoption of scientific production practices

N=70

Category	No.	%
Innovators	2	3
Early Adopters	12	17
Early Majority	18	26
Late Majority	26	37
Laggards	12	17
Total	70	100

The distribution of respondents based on adopter category among the cowpea growing farmers indicates that there was almost equal distribution of innovators. Table 39 also revealed that percentage of early adopters (17%) indicating fairly good number of adopters of KAU practices for cowpea and the availability of high yielding varieties and good production practices plays a major role in accepting crop production technology. This could be the reason for high level of adoption of KAU production practices by the cowpea farmers. The lesser percentage of respondents belonging to early majority (26 %) and higher percentage respondents in late majority (37 %) and laggards (17%) points towards lower adoption.

Therefore the extension systems focus should be to identify the practices which are widely accepted by the farmers and the same should be effectively transferred to the farmers belong to the early majority, late majority and laggards so that their percentage can be reduced and the total level of adoption can be increased.

Arecanut

Arecanut which is cultivated as a garden crop in Karnataka is grown in Kerala in almost all tracts of land near paddy fields or as border crop in coconut gardens. Judicious application of fertilizers and organic manures is necessary for arecanut and the tree cannot withstand water logging.

Distribution of homegarden respondents based on their extent of adoption of scientific production practices in arecanut and their level of adoption is explained in table 40.

Level of adoption of production practices for arecanut

Extend of adoption for the scientific production practices for arecanut is shown in table 40 and distribution of homegarden respondents to different adopter categories based on adoption quotient is explained in table 41 and figure 14.

Table 40: Distribution of respondents based on the extent of adoption of scientific production practices in homegardens for arecanut N=79

Sl. No	Category	Class limits	No.	%
1	High (Mean + Standard deviation)	>75.11	17	22
2	Medium (Between mean and Standard Deviation)	37.73-75.11	48	61
3	Low (Mean – Standard Deviation)	<37.73	14	17

Mean: 56.42 SD: 18.69

Level of adoption of production practices for arecanut shown in table 40 indicated that 22 per cent of respondents had high level of adoption and 61 per cent of farmers were having medium level of adoption. Adoption quotient ranges from 18.33 to 91.67.

Adopter categorisation of arecanut growers based on level of adoption is illustrated in table 41 and figure 14.

Table 41. Adopter categorization of arecanut farmers based on level of adoption of scientific production practices

N=79

Category	No.	%
Innovators	2	2
Early Adopters	12	15
Early Majority	28	36
Late Majority	20	25
Laggards	17	22
Total	79	100

Fig. 14 revealed that in case of arecanut there was equal percentage of farmers falling under the innovator category when compared to the standard Rogers curve. Arecanut which was considered to be the least important crop has now made its way to become one of the economically dominant crops in homegardens. This importance is seen in case of level of adoption also. Percentage of early adopters (15 %) and early majority (35 %) were higher in case of homegarden respondents and percentage of late majority farmers (25 %) were lesser that the standard normal distribution and the percentage farmers falling under laggards in 21 per cent which is only 16 per cent in a standard Rogers curve.

Though we consider arecanut to be less cared crop the adoption categorization shows that the homegarden farmers are well adopting the KAU production practices for arecanut

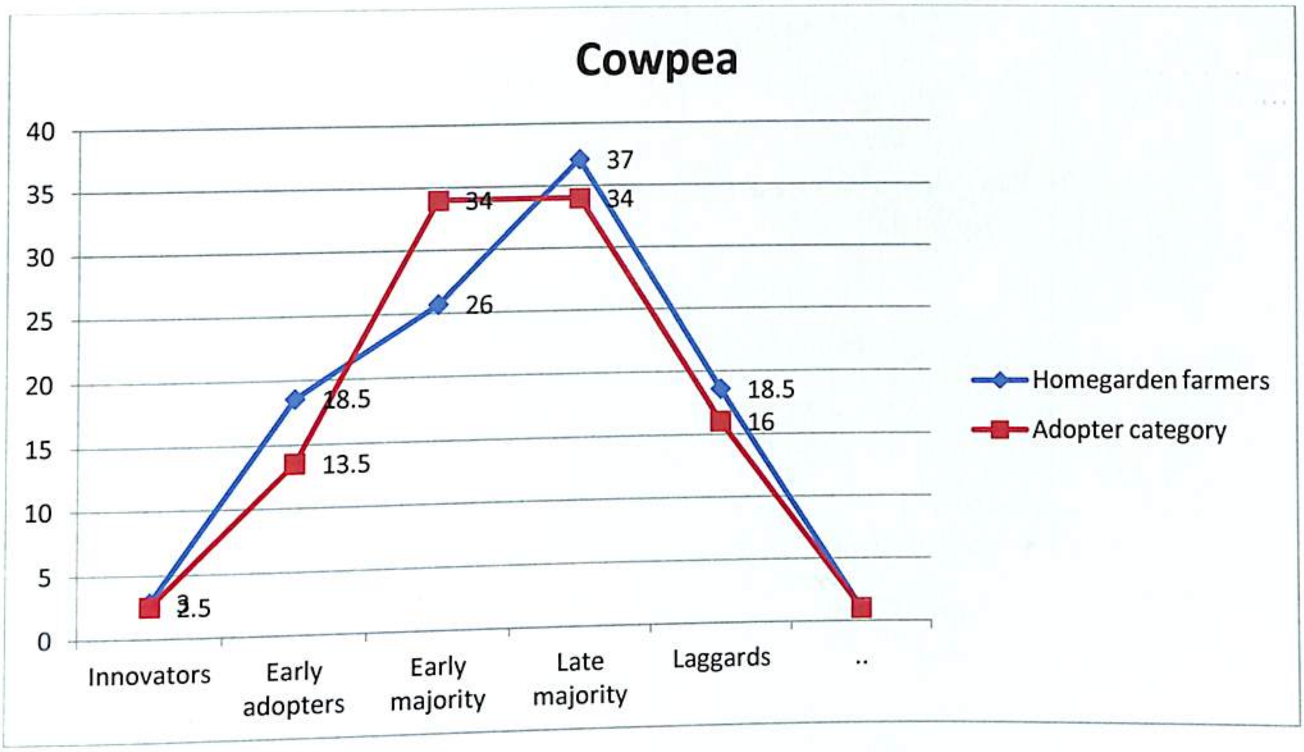


Fig. 13 . Adopter categorisation of cowpea

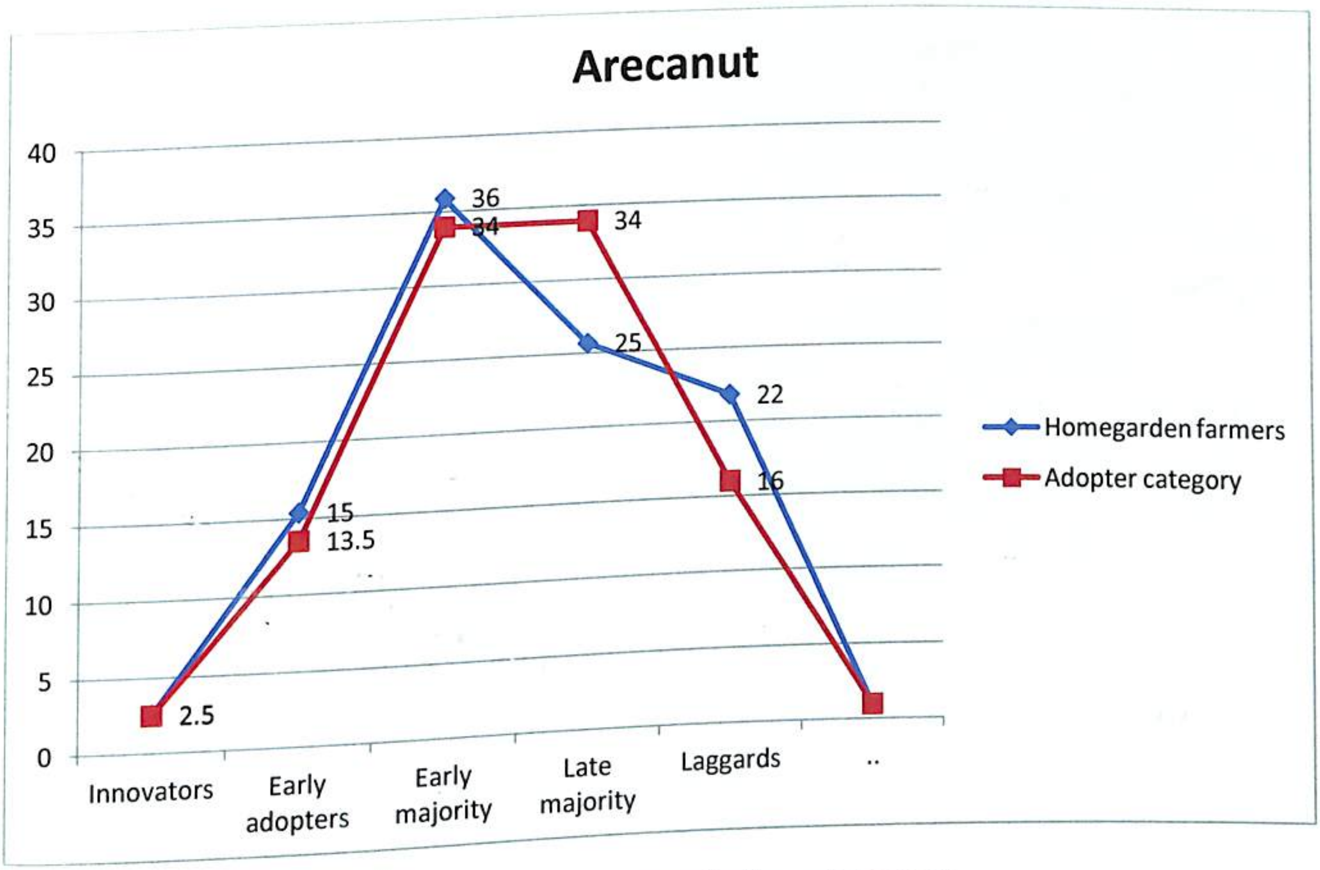


Fig.14. Adopter categorisation of arecanut

4.4.3 ***Extend of adoption of production practices by homegarden respondents and relation with independent variables.***

Inorder to analyse the influence of independent variables on extend of adoption of farmers results of simple correlation analysis was undertaken and the results are presented in table 42.

Table 42: Correlation results between extend of adoption of scientific production practices by homegarden respondents and the independent variables.

Variable	Independent variable	R
X_1	Age	0.271**
X_2	Education	-0.189
X_3	Occupation	0.099
X_4	Effective homegarden area	-0.123
X_5	Family size	-0.035
X_6	Farming experience	0.264**
X_7	Rational orientation	-0.099
X_8	Irrigation potential	0.168
X_9	Knowledge	0.516**
X_{10}	Evaluative perception	0.426**
X_{11}	Mass media contribution	0.295**
X_{12}	Extension contribution	0.210*
X_{13}	Livestock possession	0.284**

** - Significant at 1 per cent level; *- Significant at 5 per cent level

The results of correlation analysis which is presented in table 42 revealed that out of 13 independent variables seven variables showed positive and significant correlation with extent of adoption of scientific production practices. Variables namely age, farming experience, knowledge, evaluative perception, mass media contribution and livestock possession were significantly related to extend of adoption, irrespective of crop or practices at one per cent level of probability and extension contribution was significant at five per cent level of probability.

Age, knowledge and farming experience showed a positive significance to the level of adoption. It can be inferred that as age increases farming experience and hence it directly influences the knowledge level of the farmer. The higher level of education shows the developed educational system in the state and the literacy

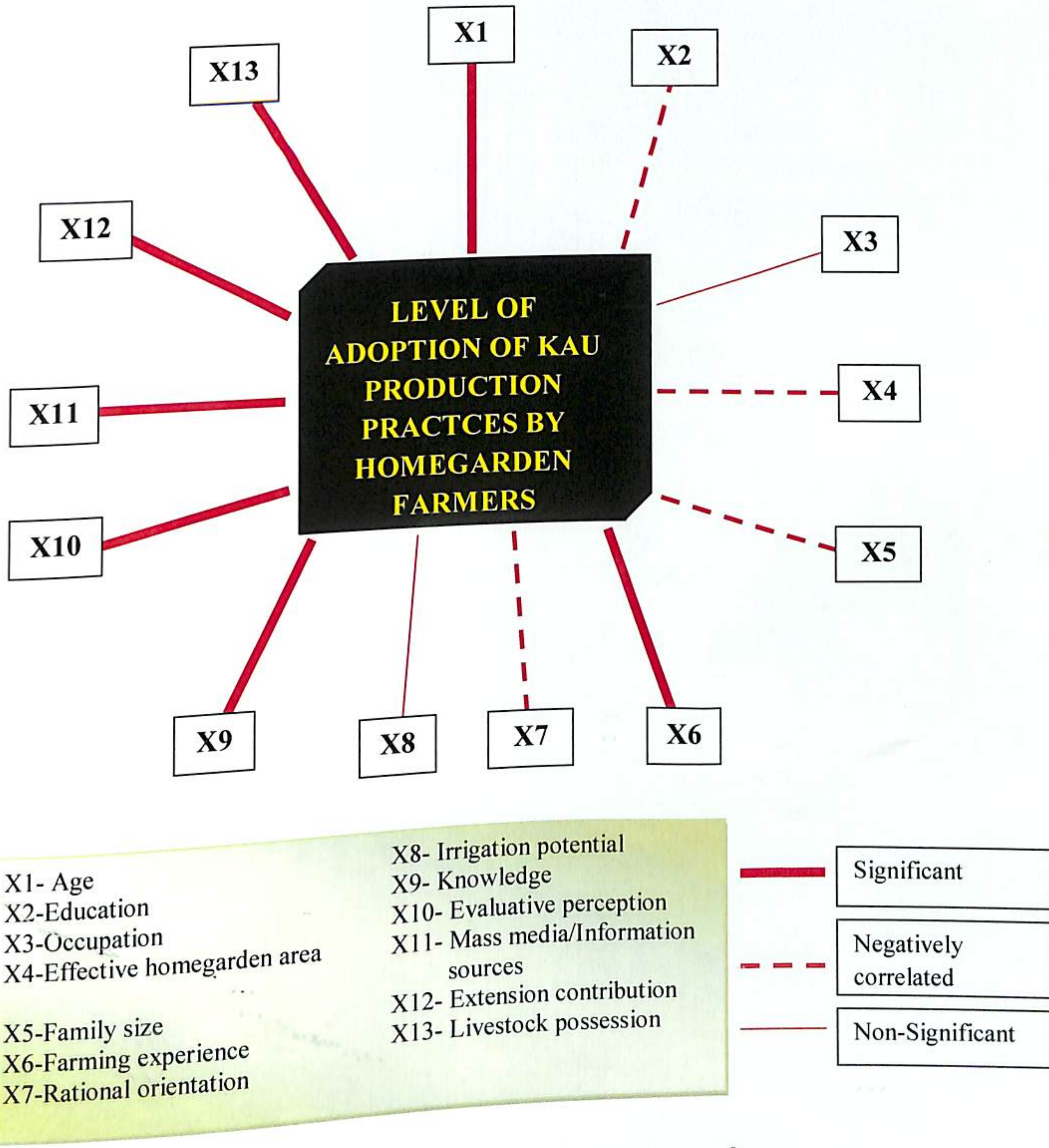


Fig. 15 Schematic representation of correlation results

rate of people in the sample. Majority of the homegarden farmers had high level of evaluative perception which states that farmers are following practices like mulching, resource recycling, judicious use of external inputs, soil and water conservation practices, use of ITK practices, etc., in their farm which aids in maintaining sustainability of homegardens.

Mass media or the information support contribution has positive influence on level of adoption and it means that for easy dissemination of technology to farmers different mass media and information sources should be utilized to the maximum so as to increase the level of adoption. The wide range of technology be it visual or multimedia might have an influence in their adoption and hence the variable mass media or the other information support services had a positive and significant relationship with level of adoption of homegarden farmers.

Homegarden farmers consider homegardening as a source of income in addition to their other vocations. The extension contribution showed a positive significance to the level of adoption and an improvement in the extension services offered to the farmers can increase the level of adoption of scientific production practices.

Hence it is inferred that all the seven variables mentioned above are directly influencing the adoption of scientific production practices or technologies in homegardens.

4.4.3 Indigenous technology knowledge practices in the homegardens

Indigenous technical knowledge can be considered as an accumulated skill and technology of a locality or a community that has been passed on from one generation to another generation. This knowledge system is vital for their factor well being and for sustainable development.

Homegarden farmers developed their own practices based on their farming experience and personal intervention without considering the scientific rationale behind the practices. The results on the number of ITK practices with reference to the different crops/livestock components is given in table 43.

Table 43. Indigenous technology knowledge practices in homegardens.

Sl. No.	Crops	No	%
1	Coconut	6	24
2	Banana	6	24
3	Vegetables	8	32
4	Tubers	2	8
5	Spices	1	4
6	Livestock and poultry	2	8
	Total	25	100

From the 100 homegardens surveyed, 25 ITK practices were identified that was distributed among 6 homegarden components. Eight indigenous practices were recorded for vegetables followed by coconut and banana with 6 practices each, tubers (2), livestock and poultry (2) and spices (1). The details of the different ITK practices under each components are presented in table 44.

Table 44. List of indigenous technology knowledge practices in homegardens.

ITK
a) Coconut 1. Organic matter content of soil can be increased by burying the psudostem of banana in the basin of palm. 2. Coconut husks are arranged inside the planting pit or basins to improve water holding capacity. 3. Tea powder and ash when applied to the coconut basin reduces button shedding. 4. Groundnut cake and rice soup after fermentation if applied to the palm basin rejuvenates palm and increases yield. 5. Toddy tapping increases yield of palm and has a rejuvenating effect. 6. Placing of salt and sand inside the second leaf of crown after mixing both in equal ratio to destroy rhinoceros beetle.

b) Banana

1. Smearing of cowdung and ash solution on banana suckers during storage and before sowing to reduce rhizome weevil attack.
2. Application of tobacco decoction against bunchy top of banana.
3. Placing of neem seed powder and bar soap inside the top leaves of banana to kill pseudostem weevil.
4. Inserting bar soap into the bore holes of pseudostem weevil reduces its attack.
5. Packing of banana bunches with dry banana leaves to enhance size and color.
6. Removal of inflorescence after full emergence.

c) Vegetables

1. Application of tea powder and ash increases yield of chilly, brinjal.
2. Storage pest can be reduced by keeping neem leaves along with stored seeds.
3. Dry the seeds to remove excess moisture content and to reduce storage insect attack.
4. Smoking under trellies of cucurbits to reduce pest incidence, enhance soil fertility and to promote fruit set.
5. Cow's urine is diluted 10 times and sprayed in chilly to reduce pest attack.
6. Use of crow feather as bird scarer.
7. Tobacco decoction emulsified in soap water is used against many pests in vegetables.
8. Spraying of *kanjivellam* and soap solution to remove aphids from vines.

d) Tubers

1. Storage of tapioca in moist soil to increase the shelf life
2. Mulching of planting pit after planting yams to promote growth.

e) Spices 1. Mulching of ginger plots to increase corm size.
f) Livestock and poultry 1. Feeding of azolla to poultry increases the overall quality of egg. 2. Follow a fixed milking time to get good milk yield.

Documentation of different ITK practices from the respondents revealed that the farmers were not fully dependent on the scientific practices but they still considered their beliefs, values and indigenous practices for crop cultivation. ITK practices are cost effective and relevant for a specific locality or a unique culture and these different practices must be considered by researchers for future development.

ITK practices can be considered as the fundamental stepping stone of further researcher for need based chnologies by the farming community. Identification of scientifically sound indigenous practices will be helpful to the scientists in technology blending program and in generation of low-cost, location-specific, and appropriate technology.

4.4.4 Technology need assessment for the production practices as perceived by homegarden farmers.

Different institutions have developed technologies and disseminated the same for various crops. However, farmers have adopted the same in a differential manner owing to multifaceted factors. Therefore technology need assessment as perceived by the farmers was done with special reference to the different agro ecological units and its results as presented as table 45.

Table 45. Technology needs assessment for the production practices in homegardens

Practices	AEU-8	AEU-9	AEU-1	AEU-14	AEU-12	Total
	Score	Score	Score	Score	Score	
Variety	62	71	67	68	78	346
Planting material	52	74	43	55	70	294
Selection of Intercrop	62	79	40	41	68	290
Spacing	74	73	66	62	76	351
Irrigation management	44	60	58	51	61	271
Soil amendment	42	43	42	41	42	210
Nutrient management	41	51	33	44	44	213
Homegarden machinery	32	42	37	45	39	195
Drainage technology	31	44	35	34	35	179

From table 45 it was clear that maximum technology needs was reported for drainage technology (179) followed by non-availability of machineries suited to homegarden (195). Technology availability was high when it comes to spacing (351) and variety (346). The same distribution of the sampled population was observed in all AE units.

Hence, it could be inferred that the highest technology need of homegarden farmers was for drainage technology (179), followed by homegarden machinery (195), soil amendment (210), nutrient management (213), irrigation management (271), selection of intercrop (290), planting material (294), variety (346) and spacing (351).

Drainage technology needs of the farmers were dependent on the topography of each unit. Farmers might have preferred drainage technology needs because the prevailing practices might not be helpful in preventing soil erosion.

The result of technology need with special reference to the need of homegarden suited implements was in line with the findings of Thomas (2004). Majority of the technology available to the farmers are for commercial crops but homegarden farmers are of strong opinion that they require homegarden friendly technologies as it can directly reduce the labour problem experienced and increase economic returns.

Hence it can be inferred that farmers prefer technology with low input, high benefit and high productivity.

4.5 Constraints experienced by the homegarden farmers and suggestions for refinement as perceived by the farmers.

4.5.1 Constraints experienced by the homegarden farmers.

Constraints experienced by the homegarden farmers were identified and tabulated with the help of an open ended list. The identified constraints were then ranked with mean score for each. The constraints experienced by homegarden farmers are presented in table 46.

Table 46: Constraints experienced by the homegarden farmers.

Sl No	Constraints	Rank over class	Mean score over total	Rank over total
A	**Personal constraints**			
1	Lack of extension service and assistance	1	6.75	6
2	Krishi bhavan not active	2	6.07	9
3	Lack of knowledge about technology	3	5.88	10
4	Lack of knowledge in post harvest	4	5.50	11
5	handling	5	5.10	14
6	Lack of motivational factors	6	3.70	19
7	Inadequacy of capital	7	3.20	21
8	Poor economic status of homegardens	8	2.10	22
B	**Physical constraints**			
9	Non availability of labour	1	7.45	2
10	Poor transportation facilities	2	6.17	8
11	Crop produce destroyed by wild animals	3	5.25	12
12	Non availability of supplies and services	4	5.14	13
13	Scarcity of quality irrigation water	5	4.75	15
14	Interrupted power supply	6	1.56	25
15	Uneconomic holdings	7	1.40	26
C	**Economic constraints**			
16	High labour cost	1	7.64	1
17	Cost of inputs	2	6.87	5
18	Less profit	3	6.23	7
19	Non availability of credit	4	4.56	16
D	**Technological constraints**			
20	Lack of homegarden suited implements	1	4.55	17
21	Poor storage facilities	2	4.34	18
22	Lack of technology suited for	3	3.65	20
23	homegardens	4	2.00	23
24	Lack of post harvest implements	5	1.90	24
E	**Marketing constraints**			
25	Low price of produce	1	7.33	3
26	Lack of markets	2	7.22	4
27	Surplus but insufficient for marketing	3	0.98	27
F	**Political constraints**			
28	Trade unionism	1	0.78	28

The table showed that the most important constraints faced by the homegarden respondents were ‘high labour cost’. ‘non-availability of labour’ and ‘low price of produce’. Lack of markets, cost of inputs, lack of extension service and assistance, less profit, poor transportation facilities, less activity of krishi bhavan, lack of knowledge about technology, lack of knowledge about post harvest handling, crop produce destroyed by wild animals, non availability of supplies and services, lack of motivational factors, scarcity of quality irrigation water, non availability of credit, lack of homegarden suited implements, poor storage facilities, poor economic status of homegardens, lack of technology suited for homegardens, inadequacy of capital, lack of time in homegarden activity,lack of post harvest implements, lack of processing implements, interrupted power supply, surplus but insufficient for marketing and trade unionism were the other constraints in the decreasing order of importance.

The results indicated that labour, low price and unavailability of market were the major constraints for the homegarden farmers. Though there is involvement of family members in farming activity the nucleotide structure of families maybe a reason for labour constraint in homegardens. Absence of skilled labour for crops like coconut and arecanut and the high labour cost for these skilled labours are constraints faced widely by farmers.

Involvement of extension agencies and officials were less in homegardens. This in turn resulted in neglected homegardens, The lack of meaningful extension service can be rectified through frequent visits to the different homegardens as per a fixed schedule or fixed time interval. This will increase the homegarden productivity and the acceptance of extension services by the farmers.

4.5.2 Suggestion for refinement as perceived by the homegarden farmers.

Suggestions for refinement of the available technology and the need for new technology was delineated as perceived by the farmers and the same are presented in table 47.

Table 47. Suggestions for refinement as perceived by the homegarden farmers.

N=100

Sl. No	Suggestions	No.	%
1	Development of homegarden suited implements.	40	40
2	Farmer friendly implements so as to reduce the labour problem	45	45
3	Market clusters to obtain profit and reduce the market uncertainity	53	53
4	Frequent field visit by krishi bhavan officials and extension agents	35	35
5	Package of Practice recommendation for homegardens	21	21
	Total	194*	194

*>100 because of multiple responses

Table 47 indicated that majority of the respondents (53%) perceived 'Market clusters to obtain profit and reduce market uncertainity' as the major aspect for refinement followed by 'Farmer friendly implements so as to reduce labour problem (45%); 'Development of homegarden suited implements' (40%); 'Frequent field visit by krishi bhavan officials and extension agents' (35%) and package of practice recommendation specific for homegardens (21%).

Majority of the farmers (53%) opined that market clusters should be formed so that they can obtain more profit and at the same time reduce the market uncertainity. Labour availability and labour cost were identified as the major constraints by farmers. Hence, if more farmer friendly implements are developed and disseminated it will reduce the labour problem, both availability and high cost of labour. This might be the reason for farmers (45% and 40%) suggesting farmer friendly and homegarden suited implements respectively as a refinement suggestive. and the refinement 45 per cent farmers suggested was to get more farmer friendly Frequent field visit by krishi bhavan officials and extension agents (30%) and finally a POP recommendation for homegardens (21%) were also suggested by the farmers.

Summary

5. SUMMARY

Homegardens are specialized sustainable agro-eco systems with or without an extended garden where there is constant interaction and interrelation among the various components. Increased population pressure, emerging nucleotide family structure and decreased area under agriculture has resulted in fragmentation of land area which makes homegarden the ‘next generation farming system’ that is unique. The increasing population, massive industrialization, agricultural transformation, under development, tradition cum cultural erosion etc. are major crucial factors that have resulted in massive exploitation of natural resources that are necessarily the components of agriculture which aids in the development of a family, society, state and the nation. Homegarden is generally accepted to be an economically efficient, ecologically sound and biologically sustainable agro forestry system (Fernandez and Nair, 1986). Different components of homegarden interacts in various manner and work towards attaining sustainability. Based on intensity of components added to homegardens they develop their own structure and function. From unplanned structure, homegardens became structured by replacing food crops to cash crops and commercial crops. The type of structure would define the functions of homegardens and together it contributes to the sustainability of the system. Technology intervention in homegardens is relevant in Kerala scenario because Kerala is dominated by homegarden agro ecosystem. Research and technology needs should be satisfied in homgardens so as to aid Kerala’s growth and development. The present study was undertaken with the following objectives:

- To analyse the personal and social characteristics of homegarden farmers.
- To identify economically dominant crops in the homegardens.
- To identify the production preferences, perceived usefulness and effectiveness of selected KAU production technologies for selected crops in homegardens.
- To assess the level of adoption of selected KAU production technologies for the economically dominant crops in the homegardens.

- To analyse the relationship between personal and social characteristics of homegarden farmers and their level of adoption.
- To document the Indigenous Technology Knowledge (ITK) practices on production aspects of the crops in homegardens.
- To identify the technology need/gaps for the selected production practices as perceived by the homegarden farmers.
- To delineate constraints experienced by homegarden farmers with suggestions for refinement as perceived by the homegarden farmers.

The study was conducted during the year 2014 in the southern part of Kerala; Thiruvananthapuram covering a sample size of 100 homegarden farmers representing the 5 Agro Ecological Units as identified by Kerala Agricultural University and State Planning Board. Level of adoption of different production practices in homegardens was selected as the dependent variable and the independent variables were age, education, occupation, family size, irrigation potential, effective homegarden area, farming experience, rational orientation, extension contributuion, evaluative perception of farmers on the sustainability of production practices, knowledge on scientific production practices, mass media comtribution and livestock possession.

The data were collected through personal interview with farmers using a well-structured and pre-tested data enumeration cum interview schedule which was developed. Collected data were further subjected to statistical analysis.

The salient findings of the study were:

1. Majority of the homegarden farmers (56 %) belonged to old age category.
2. Ninety five per cent of farmers had education level from high school to collegiate level.
3. Fifty three per cent of the sampled farmers had agriculture as their primary occupation wheras 47 per cent farmers had agriculture as their occupation along with other vocations.

4. Large percentage (83 %) of respondents had family size of 2-4 members.
5. Fifty four per cent of homegarden respondents were under the category ‘little or no water scarcity’.
6. Almost half of the sampled population had less than 1 acre as effective homegarden area.
7. Fifty four per cent of total respondents had more than 20 years of experience in farming.
8. Ninety three per cent of homegarden farmers had medium to high level of rational orientation.
9. More than 80 per cent of the extension contribution came to homegarden farmers from Department of Agriculture and KAU.
10. Sixty three per cent of homegarden respondents have high degree of evaluative perception on sustainability of production practices in homegardens. Farmers are not only considering the economic aspect but also the sustainability of household, farm which helps in achieving the overall sustainability of the state.
11. Majority of the respondents had high level of knowledge on scientific production practices in homegardens. This high level of knowledge could be linked with their age and farming experience. As experience in the farming field increased knowledge on the different practices also increased.
12. Television was perceived to be the most useful mass media followed by newspaper and magazine. The decreased access to various technologies like mobile advisory services and kiosk may be due to the unavailability of the gadgets or the reluctant nature of farmers to depend on the same.
13. Poultry and cattle were the major animal husbandry components of homegarden but there was a gradual decrease in the animal husbandry components along with crop components in the agrarian society.
14. Majority of homegarden farmers (58%) do not possess soil health card.
15. Homegarden fencing were made mostly of walls and live fences which helped in improving ecological sustainability and augment biodiversity.

16. Taps were the major source of irrigation in majority of homegadrens and basin irrigation was practiced in majority of homegardens.
17. Family members of 91 per cent of homegarden farmers involved in farming activities which was a good indication that farming was still considered to be a joint activity rather than waged venture.
18. Seven economically dominant crops were identified in the homegardens- coconut, banana, tapioca, pepper, colocasia and yams, cowpea and arecanut.
19. Guaranteed market and cost effectiveness were the major reason for preferring perennial crops like coconut and pepper in homegardens whereas resource utilization and guaranteed market were the reasons for preferring most of the annuals. Livestock components were identified in few homegardens along with crop component and it was mainly due to the remunerativeness and nutrient recycling possible.
20. Majority of homegarden respondents had medium level adoption of scientific practices.
21. Technology assessment revealed that more technology intervention is required for drainage techniques, homegarden suited implements and soil amendments.
22. It was found that a total of 25 indigenous technical knowledge practices were followed in the sampled homegardens. Eight indigenous practices were recorded for vegetables and 6 each for coconut and banana. Two ITK practices each were recorded for tubers and livestock and poultry, and one ITK practice was identified for spices.
23. Level of adoption of scientific production technology was directly influenced by age, farming experience, knowledge, evaluative perception, mass media/ information support contribution, extension contribution and livestock possession.
24. Constraint analysis revealed high labour cost, non-availabilty of labour, low price for produce and lack of extension service, to be the major constraints in homegardens.

In general, it can be concluded that the crops which were found to be economically dominant were preferred by homegarden farmers because of their guaranteed market and cost effectiveness which means that farmers are cultivating crops based on the market trend. The analysis of social and personal characteristics of farmers shows the factors which affect the adoption and utilization of the available technologies. Technology needs assessment points out towards identifying the priority needs of homegarden farmers, with reference to widely adopted cum scalable technologies by the farmers and areas to be included for research for development and dissemination of need based production technologies for homegarden systems.

Suggestions for future research

1. The same study may be repeated in other districts/AEUs.
2. Research on production technology for specific AEUs should be undertaken. Specific POP recommendation for the homegarden farming system for the identified economically dominant crops should be developed.
3. Thrust should be given to horizontal integration with an aim to improve value addition or vertical diversification. Participatory action for standardisation of technology intervention in homegarden farming system for specific AEU.
4. Action research with a view to attract the younger generation into farming activities and promote entrepreneurship in homegarden farming.
5. Research and extension strategies should be tailored majorly for homegarden farming with policy thrust for its sustenance with focus on socio economic development.
6. Research studies on characterisation and documentation of rationalised ITK practices identified in the homegarden farming systems.

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Appendices

APPENDIX I

Farmer's profile analysis

KERALA AGRICULTURAL UNIVERSITY

College of Agriculture, Vellayani

Thiruvananthapuram- 695522

Dr. Allan Thomas
Chairman
t_allan@rediffmail.com

Department of Ag. Extension
Date:

Sir/Madam,

Ms. Reeba Jacob (Ad. No. 2013-11-171), one of my post graduate Scholar in the Department of Extension, College of Agriculture, Vellayani is undertaking a research study entitled "Technology assessment on the production practices of economically dominant crops in homegardens" as part of her research work. Variables supposed to have close association with the study have been identified after extensive review of the available literature and discussion with Extension Scientist's and other Experts,

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

Thanking you.

Yours sincerely

(Allan Thomas)

Appendix I. Continued…

OBJECTIVES OF THE STUDY

1. To analyse the social and personal characteristics of homegarden farmers.
2. To identify the economically dominant crops in homegardens.
3. To identify the production preferences, perceived usefulness and effectiveness of selected KAU production technologies for economically dominant crops in homegardens.
4. To assess the level of adoption of selected KAU production technologies for the economically dominant crops in the homegardens.
5. To establish the relationship of social and personal characteristics of homegarden farmers with the extent of adoption of production practices in homegardens.
6. To identify the technology needs or gaps in homegardens as perceived by the farmer.
7. To identify the constraints experienced as perceived by homegarden respondents and suggestions for refinement.

Sl. No.	Independent variables	Relevancy rating				
		Most R	More R	R	Less R	Least R
1	Age					
2	Education					
3	Occupation					
4	Family size					
5	Mass media /Information support services					
6	Homegarden farming experience					
7	Literacy					
8	Irrigation potential					
9	Availability of homegarden inputs					
10	Effective homegarden area					
11	Economic orientation					
12	Rational orientation					
13	Extension participation					
14	Extension contribution					
15	Innovativeness					
16	Social capital					
17	Labour availability					
18	Scientific rationality					
19	Credit availability					
20	Livestock possession					
21	Risk orientation					
22	Annual total income					
23	Knowledge on scientific practices in homegarden farming.					
24	Evaluative perception on the sustain-ability of cropping and farming systems in homegardens					
25	Others, if any: Please specify					

R-relevant

Thank you

Name & Designation

Appendix I. continued…

The variables with their mean relevancy score

Sl. No.	Independent variables	Mean relevancy score
1	Age	**3.65**
2	Education	**4.05**
3	Occupation	**3.65**
4	Family size	**4.15**
5	Mass media /Information support services	**4.10**
6	Homegarden farming experience	**3.42**
7	Literacy	1.95
8	Irrigation potential	**4.15**
9	Availability of homegarden inputs	2.80
10	Effective homegarden area	**3.85**
11	Economic orientation	2.95
12	Rational orientation	**4.25**
13	Extension participation	2.85
14	Extension contribution	**4.15**
15	Innovativeness	3.15
16	Social capital	2.10
17	Labour availability	3.25
18	Scientific rationality	3.15
19	Credit availability	2.85
20	Livestock possession	**3.95**
21	Risk orientation	2.65
22	Annual total income	2.75
23	Knowledge on scientific practices in homegarden farming.	**4.45**
24	Evaluative perception on the sustainability of production practices in homegardens	**3.85**
	Mean	**3.42**

APPENDIX II

List Of Panchayaths in each AEU

Sl. No.	Panchayath	AEU	Block
1	Anjuthengu	1	Chirayinkeezhu
2	Azhoor	1	Chirayinkeezhu
3	Chirayinkeezhu	1	Chirayinkeezhu
4	Kadakkavoor	1	Chirayinkeezhu
5	Kizhuvalam	1	Chirayinkeezhu
6	Vakkom	1	Chirayinkeezhu
7	Andoorkonam	1	Kazhakkuttom
8	Kadinamkulam	1	Kazhakkuttom
9	Kazhakkoottam	1	Kazhakkuttom
10	Mangalapuram	1	Kazhakkuttom
11	Cherunniyoor	1	Varkala
12	Edava	1	Varkala
13	Elakamon	1	Varkala
14	Manamboor	1	Varkala
15	Vettoor	1	Varkala
16	Varkala (M)	1	Muncipality
1	Athiyannur	8	Athiyannur
2	Kanjiramkulam	8	Athiyannur
3	Karumkulam	8	Athiyannur
4	Kottukal	8	Athiyannur
5	Venganoor	8	Athiyannur
6	Vizhinjam	8	Athiyannur
7	Balaramapuram	8	Nemom
8	Kalliyoor	8	Nemom
9	Malayinkeezhu	8	Nemom
10	Maranalloor	8	Nemom
11	Pallichal	8	Nemom
12	Vilappil	8	Nemom
13	Vilavoorkkal	8	Nemom
14	Chenkal	8	Parassala
15	Karode	8	Parassala
16	Kulathoor	8	Parassala
17	Parassala	8	Parassala
18	Poovar	8	Parassala
19	Thirupuram	8	Parassala
20	Aryancode	8	Perumkadavila
21	Kollayil	8	Perumkadavila
22	Kunnathukal	8	Perumkadavila
23	Perumkadavila	8	Perumkadavila
24	Kattakkada	8	Perumkadavila
25	Neyyattinkara (M)	8	Muncipality

1	Mudakkal	9	Chirayinkeezhu
2	Pothencode	9	Kazhakkuttom
3	Sreekaryam	9	Kazhakkuttom
4	Karavaram	9	Kilimanoor
5	Kilimanoor	9	Kilimanoor
6	Madavoor	9	Kilimanoor
7	Nagaroor	9	Kilimanoor
8	Navaikulam	9	Kilimanoor
9	Pallickal	9	Kilimanoor
10	Pazhayakunnummel	9	Kilimanoor
11	Pulimath	9	Kilimanoor
12	Anad	9	Nedumangad
13	Aruvikkara	9	Nedumangad
14	Karakulam	9	Nedumangad
15	Panavoor	9	Nedumangad
16	Vembayam	9	Nedumangad
17	Kudappanakunnu	9	Tvpm Rural
18	Vattiyoorkavu	9	Tvpm Rural
19	Manikkal	9	Vamanapuram
20	Nellanad	9	Vamanapuram
21	Pullampara	9	Vamanapuram
22	Vamanapuram	9	Vamanapuram
23	Chemmaruthy	9	Varkala
24	Ottoor	9	Varkala
25	Attingal (M)	9	Muncipality
26	Nedumangad (M)	9	Muncipality
1	Amboori	12	Perumkadavila
2	Ottasekharamangalam	12	Perumkadavila
3	Vellarada	12	Perumkadavila
4	Kallara	12	Vamanapuram
5	Nanniyode	12	Vamanapuram
6	Pangode	12	Vamanapuram
7	Poovachal	12	Vellanadu
8	Tholicode	12	Vellanadu
9	Uzhamalackal	12	Vellanadu
10	Vellanad	12	Vellanadu
1	Kallikkad	14	Perumkadavila
2	Peringamala	14	Vamanapuram
3	Aryanad	14	Vellanadu
4	Kuttichal	14	Vellanadu
5	Vithura	14	Vellanadu
6	Thiruvananthapuram (M Corp.)	14	Corporation

APPENDIX III
DATA ENUMERATION SCHEDULE

1. Name: ID. No.

Address:

2. Family Details

Name of Member	Sex	Age	Relationship with head	Education	Occupation		Annual income	
					Primary	Secondary	Daily	Monthly

3. Area (Ha)

Total Area	Total infrastructure area	Effective homegarden area	Rent/ Owned	Leased out land

4. Structure of homegarden : Planned/ Unplanned
5. Tenancy Status: Owner/ Tenant
6. System of farming: Organic/ Inorganic
7. Land status
    a. Type of land

(Area)

i. Wetland:
ii. Garden land:
iii. Hilly :
iv. Valley:
v. Undulating:

b. Topography :

c. Type of Soil:

8. Soil analysis (Yes/No)

How?	When?	Where?	Last date	Result	Copy of result (Y/N)

9. Type of canopy arrangement (Tiers 1 /2 /3 /4 /5 /6 /7)

10. Fencing type: (Live/wall/wire/mesh netting/mud wall)
    Live fencing crops:

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

12. Water resource

Type	Y/ N	No./ Area
Well		
Pond		
Pipe		

13. Water accessibility in well

Type of well	Diameter	Depth	Year of digging	Perennial	Non perennial	Drought period

14. Farm machineries/ implements

Production practices	No.	Protection practices	No.	Value addition practices	No.

15. Labour requirement
    a. Family labour/ Wage labour:
    b. Wage:
    c. No. of labourers (yearly):

1. Loan details:

(Y/N)	Agency	Type of loan (ST/MT/LT)	Purpose	Amt. Repaid	Amt. Left

2. Constraints

Production	Protection	Value addition

3. Livestock details

Item	Breed	Number	Age	Yield	Method of sale	Price/ Unit

Item	Feed	Protection	Consumption		Outlet
			Family	Economic	

Are you satisfied with livestock: Yes/ No

19.Other component:

Component	No.	Site CY/ BY	MR	OR	Source of information

CY-courtyard BY-Backyard MR-Mid Region OR- Outer region

19. ITK

No.	ITK	Probable reason	Effectiveness		
			E	NE	VE

20. Mass media contribution

	Frequency			Usefullness		
	VO	O	NO	VU	U	NU
Newspaper						
Television						
Magazines						
Friends/relatives						
Mobile advisory services						
Kiosk						

21. Rational orientation

What are the factors that improved your life through homegarden?

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

22. Extend of knowledge on scientific production practices

Questions	score
1) Name a green manure crop supplying nitrogen. 2) Name a culinary variety of banana? 3) Name a variety of cowpea? 4) Name a potassic fertilizer. 5) Spacing of banana? 6) Name a suitable standard for growing pepper? 7) Name a crop used for live fencing. 8) It is important to feed collustrum to infants (T/F) 9) Milk production of cow is high during which period. 10) Morphological difference between *Paniyoor* and *Karimunda* varieties. 11) Irrigate palm during summer at an interval of 5 to 6 days (T/F) 12) Which are the important nutrients present in organic manures. 13) Application of fertilizers based on soil recommendation is always advisable (Y/N) 14) Are you aware of PGPR mix from KAU? (Y/N) 15) Production ration should be fixed on milk yield (Y/N)	

24. Sustainability of Homegardens

Indicate the extent of evaluative perception on sustainability of production practices in homegardens

Sl. No.	Statements	Evaluative perception			
		VM	M	L	VL
1	Homestead farming reduces soil, water and atmospheric pollution				
2	Woody perennials crop play an important role in the productivity and sustainability				
3	INM can be effectively utilised in homestead agriculture that will be Eco-friendly practices in the homegarden				
4	Interaction between the crop system and livestock system of a homestead facilitates high degree of organic recycling that maintains soil health and sustainability				
5	Home garden tree crops provides cooling effect for home				
6	Homegarden products are much reliable and can be considered as safe products				
7	Catch cropping is more beneficial to the residual soil moisture and nutrients after the major crops				
8	Multi-storied cropping helps to exploit resources effectively				
9	Livestock components in a homestead helps to improve the quality of agricultural produce				
10	Insitu input generation and utilisation are possible in homegardens				
11	Woody perennials of homestead will dominate the arable crops and will compete for resources				
12	Live stock components in a homegarden helps minimising the manuring cost of the homesteads				
13	Integrated farming practices make homestead an economically viable unit				
14	Homestead farming provides employment opportunities for labourer etc.				

VM: **VERY MUCH** M: **MUCH** L: **LESS** VL: **VERY LESS**

25. CONSTRAINT ANALYSIS

Constraints and solutions as perceived by the farmers in homegardens.

Sl. No	Constraints	MI	I	LI	Li	Perceived solutions
1	Input costs					
2	Non availability of labour					
3	High labour cost					
4	Inadequate capital					
5	Low price for produce					
6	Uneconomic holding					
7	Lack of technology					
8	Lack of knowledge about technology					
9	Scarce water resource					
10	Non avail of credit					
11	Poor storage facility					
12	Interupted power supply					
13	Lack of knowledge on PHT					
14	Non avail implements					
15	Lack of PH imp					
16	Lack of processong imp					
17	Lack of HG suited imp					
18	Poor transportation					
19	Lack of extension service					
20	Lack of time					
21	Lack of motivation					
22	Poor economic status					
23	Lack of markets					
24	Surplus but insufficient					
25	Trade unions					
26	Wild animals destroy produce					
27	Less profit					
28	KB not active					

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

CROP DETAILS

No.	Crop	Variety	Source of seed	No./Area		Total	Spacing	Irrigated/ Rainfed	Frequency of irrigation	Type of irrigation
				Bearing	Non. Bearing					

Crop	Yield	Family consumption	Economic Consumption	Marketing channel	Market	Price	Transport cost	Middleman (Y/N)	Labour

Crop	Previous crop	Next crop	Organic/ inorganic	Fertilizers	Quantity	Purchased from?	Source of information	Price	Labour (including harvest)

Crop	Organic/ inorganic	Pest/ Disease/ Weeds	PPC used	Quantity	Source of purchase	Source of recommendation	Price of PPC	Labour	Farmer's practice

TECHNOLOGY ASSESSMENT ON THE PRODUCTION PRACTICES OF ECONOMICALLY DOMINANT CROPS IN HOMEGARDENS

by

REEBA JACOB

(2013-11-171)

ABSTRACT

of the thesis submitted in partial fulfillment

of the requirement for the degree of

Master of Science in Agriculture

Faculty of Agriculture

Kerala Agricultural University, Thrissur

DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF AGRICULTURE

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KERALA, INDIA

2015

ABSTRACT

The study entitled 'Technology assessment on the production practices of economically dominant crops in homegardens' conducted in Thiruvananthapuram district covered 100 homegardens with 20 each from 5 AEU's during 2014-2015. Study identifies the economically dominant crops in homegardens, level of adoption of selected KAU production practices, technology needs or gaps and constraints perceived by homegarden farmers.

Coconut (1.59), banana (1.68), tapioca (2.94), pepper (3.33), vegetables (3.47), yams and colocasia (4.22) and arecanut (4.56) were identified as economically dominant crops. Production preferences of homegarden farmers revealed that perennial crops like coconut and pepper were preferred for their guaranteed market and cost effectiveness whereas annual crops like tapioca, colocasia and yams were preferred by farmers due to less management and profitable returns. Remunerativeness, nutrient recycling and resource utilization were the major criteria for preference of livestock along with crop components.

Thirteen independent variables *viz.,* age, education, occupation, effective homegarden area, family size, farming experience, rational orientation, irrigation potential, knowledge, evaluative perception, mass media contribution, extension contribution and livestock possession were selected through judges rating. An additional five variables *viz.*, soil health card possession, fencing, irrigation source, labour involved and type of irrigation were purposively included. Adoption of technology was significantly and directly influenced by the independent variables *viz.*, age, farming experience, knowledge, evaluative perception, mass media contribution, livestock possession (at 1% sig.) and extension contribution (at 5% sig).

Technology assessment revealed that 63 per cent of homegarden farmers belonged to medium category of adoption. An attempt was made to categorise the homegarden respondents to different adopter categories as explained by Rogers (1982). The results showed that the major portion of respondents belonged to

early adopters and early majority which is a clear indication that KAU production practices are adopted by the farmers. Though the number of innovators in the overall adoption curve was zero, the innovators in the adoption curve for the selected crops viz, coconut and banana where higher than the standard Rogers curve (Rogers, 1982).

ITK practices documented showed that the number of ITK practices were highest for vegetables followed by coconut, banana, tubers, livestock, poultry and spices as practiced by the homegarden farmers. Technology needs assessment as perceived by homegarden farmers revealed that maximum technology need was reported for drainage technology, homegarden suited machineries and soil amendment technology. The three major constraints experienced by farmers were high labour cost, non availability of labour and low price of product.

സംഗ്രഹം

"സാമ്പത്തിക മേന്മയുള്ള പുരയിട കൃഷി വിളകളുടെ കൃഷിമുറകളുടെ സാങ്കേതിക അവലോകനം" *എന്ന പഠനം 2014-2016 വർഷങ്ങളിൽ തിരുവനന്തപുരം മേഖലയിലെ 5 അഗ്രൊ ഇക്കോളജിക്കൽ യൂണിറ്റുകളിലായി 100 പുരയിടകർഷകരിൽ നടത്തുകയുണ്ടായി. ഓരൊ യൂണിറ്റിൽ നിന്നും 20 കർഷകരെ തിരഞ്ഞെടുത്താണ് പഠനം നടത്തിയത്. പുരയിടകൃഷിയിലെ സാമ്പത്തിക മേന്മയുള്ള പ്രധാന വിളകൾ, കേരള കാർഷിക സർവകലാശാലയുടെ കൃഷിമുറകളുടെ സ്വീകാര്യത, സാങ്കേതികമായ കുറവുകൾ, കർഷകർ നേരിടുന്ന പ്രശ്നങ്ങൾ എന്നിവയാണ് പഠനത്തിൽ നിന്ന് ശേഖരിച്ച വിവരങ്ങൾ.*

തെങ്ങ്, വാഴ, മരച്ചീനി, കുരുമുളക്, പച്ചക്കറികൾ, കിഴങ്ങുവർഗ്ഗങ്ങൾ, കമുക് എന്നിവയാണ് പ്രധാനവിളകൾ എന്ന് കണ്ടെത്തി. പുരയിട കർഷകർ വിളകൾ നിശ്ചയിച്ചിരുന്നത് അവയുടെ ഉറപ്പുള്ള വരുമാനവും, കമ്പോള നിലവാരവും അനുസരിച്ചാണ്. തെങ്ങ്, കുരുമുളക് എന്നീ ദീർഘകാല വിളകൾക്ക് പുറമെ വാഴ, മരച്ചീനി, കിഴങ്ങുവർഗ്ഗങ്ങൾ എന്നിവ കൃഷി നടത്തിയത് അവയുടെ എളുപ്പത്തിൽ ഉള്ള പരിപാലനവും, ലാഭവുമാണ്. ചെടികൾക്ക് പുറമെ കന്നുകാലികളേയും കർഷകർ വളർത്തുന്നു.

വയസ്സ്, വിദ്യാഭ്യാസം, ജോലി, കൃഷിസ്ഥലത്തിന്റെ വിസ്തീർണം, കുടുംബാംഗങ്ങളുടെ എണ്ണം, കൃഷി പരിചയം, യുക്തിചിന്ത, ജലസേചന നിലവാരം, ജ്ഞാനം, ഇവാല്യുവേറ്റിവ് പേർസെപ്ഷൻ, ആധുനിക വിവരസാങ്കേതിക മാർഗ്ഗങ്ങളുടെ ഉപയോഗം, വിജ്ഞാനവ്യാപന മേഖലയുടെ സഹകരണം, കന്നുകാലി ഉടമസ്ഥാവകാശം എന്നിവ 'ജഡ്ജ്ജസ് റേറ്റിംഗ്' വഴി സ്വതന്ത്ര വേരിയബിളുകൾ ആയി തിരഞ്ഞെടുത്തു. ഇതിന് പുറമെ മണ്ണിന്റെ ആരോഗ്യം സൂചിപ്പിക്കുന്ന കാർഡ്, ജൈവ വേലി, ജലസേചന സ്രോതസ്സ്, തൊഴിലാളികൾ, ജലസേചന മാർഗ്ഗം എന്നിവയെയും അധികമായി തിരഞ്ഞെടുത്തു. ഇവയിൽ വയസ്സ്, കൃഷി പരിചയം, ജ്ഞാനം, ആധുനിക വിവരസാങ്കേതിക മാർഗ്ഗങ്ങളുടെ ഉപയോഗം,ഇവാല്യുവേറ്റിവ് പേർസെപ്ഷൻ, വിജ്ഞാനവ്യാപന മേഖലയുടെ സഹകരണം, കന്നുകാലി ഉടമസ്ഥാവകാശം എന്നിവ കൃഷിമുറകളുടെ സ്വീകാര്യതയെ നേരിട്ട് സ്വാധീനിക്കുന്നവയാണ്.

സാങ്കേതിക അവലോകനത്തിൽ 63% പുരയിടകർഷകർ കേരള കാർഷിക സർവകലാശാലയുടെ കൃഷിമുറകൾ സ്വീകരിക്കുന്നതിൽ മീഡിയം നിലവാരം പുലർത്തിയവർ ആയിരുന്നു. പുരയിടകർഷകരെ "Rogers curve" പ്രകാരം വിവിധ അടോപ്റ്റർ വിഭാഗത്തിൽ തരം തിരിക്കുവാൻ നടത്തിയ ശ്രമത്തിൽ നിന്ന് ഭൂരിഭാഗം കർഷകരും ഏർളി അടോപ്റ്റേർസ്, ഏർളി മെജോറിറ്റി വിഭാഗങ്ങളിൽ ഉൾപെടുന്നവർ ആണ്. ഇതു സൂചിപ്പിക്കുന്നത് കർഷകർ KAU കൃഷിമുറകൾ സ്വീകരിക്കുന്നു എന്നാണ്. ഇന്നൊവേറ്റേഴ്സ് വിഭാഗത്തിൽ വരുന്ന കർഷകർ കുറവാണെങ്കിലും തെങ്ങ്, വാഴ എന്നീ വിളകളിൽ ഇന്നൊവേറ്റേഴ്സ് കൂടുതൽ കാണാൻ കഴിയുന്നു.

പരമ്പരാഗത കൃഷിമുറകൾ പച്ചക്കറികൾ, തെങ്ങ്, വാഴ, കിഴങ്ങ്, കന്നുകാലി, കോഴി, സുഗന്ധ വിളകൾ എന്നിവയ്ക്ക് രേഖപ്പെടുത്തി. പുരയിടകർഷകർ സാങ്കേതിക ആവശ്യങ്ങൾ വേണം എന്ന് ആവശ്യപ്പെട്ട മേഖലകൾ ജല നിർഗ്ഗമന സംവിധാനം, പുരയിട കൃഷിക്ക് വേണ്ടിയുള്ള ഉപകരണങ്ങൾ, മണ്ണിന്റെ ഗുണമേന്മ വർദ്ധിപ്പിക്കുന്ന മാർഗ്ഗങ്ങൾ എന്നിവയാണ്. മൂന്ന് പ്രധാന പ്രശ്നങ്ങൾ കർഷകർ നേരിടുന്നത് ഉയർന്ന തൊഴിലാളി വേതനം, തൊഴിലാളികളുടെ ദൌർലഭ്യത, കാർഷിക ഉൽപന്നങ്ങൾക്ക് ലഭിക്കുന്ന വില എന്നിവയാണ്.