

**TECHNO-SOCIO ECONOMIC ANALYSIS OF HOUSE TERRACE
CULTIVATION IN THIRUVANANTHAPURAM CORPORATION**

by

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(2015-11-066)

THESIS

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

MASTER OF SCIENCE IN AGRICULTURE

Faculty of Agriculture

Kerala Agricultural University



DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF AGRICULTURE

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KERALA, INDIA

2017

DECLARATION

I, hereby declare that this thesis entitled “**TECHNO-SOCIO ECONOMIC ANALYSIS OF HOUSE TERRACE CULTIVATION IN THIRUVANANTHAPURAM CORPORATION**” is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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Acknowledgement

First and foremost, praises and thanks to the Almighty, for everything that happens to me

With immense pleasure, I would like to express my sincere gratitude to Dr. G. S. Sreedaya, Assistant Professor, Department of Agricultural Extension for the constructive guidance, constant inspiration, critical scrutiny of the manuscript and valuable suggestions which render me to accomplish the research work successfully. I extend my sincere gratitude for providing a stress free situation by the open minded approach and for the care and affection bestowed on me throughout the study period.

I convey my heartfelt thanks to Dr. B. Seema, Professor and Head, Department of Agricultural Extension for the unceasing encouragement, valuable advices and whole hearted approach right from the beginning of the thesis work,

I express my sincere thanks to Dr. A. Anilkumar, Professor and Dean i/c, Department of Agricultural Extension for his valuable guidance, timely help and support.

I am extremely thankful to Dr. Vijayaraghavakumar, Professor and Head, Department of Agricultural Statistics for the unstinting support, suggestions and passionate approach rendered during the period of research work,

I gratefully acknowledge with thanks Dr. N. Kishore Kumar, Professor, Department of Agricultural Extension for his constructive comments, valuable suggestions and incessant motivation at all the stages of research work,

I extend my sincere gratefulness to Dr. Allan Thomas, Asst. Professor (Sr. Scale) Department of Agricultural Extension for the constructive comments, creative suggestions and support throughout the research work,

I express my sincere thanks to Dr. V. B. Padmanabhan, Retired Professor, Department of Agricultural Extension for the timely help and support.

I am also thankful to Dr. Elsamma Job, Professor, Department of Agricultural Economics for the valuable suggestions to carry out the work,

I greatly acknowledge the advice rendered by Dr. Jacob John, Professor and Head, Integrated Farming Research Station, Karamana during my study period.

I express my sincere thanks to the teaching and non-teaching staff of Department of Agricultural Extension for their sincere cooperation and kindly approach during the study period.

My loving and wholehearted thanks to my batch mates' for their help, love, encouragement and support throughout my P.G programme. It's my pleasure to express my special thanks to my seniors Suma chechi, Namitha chechi, Anju chechi, Vishnu chettan, and Modem Ravi Kishore bhaiyya for their valuable advices and support throughout the study period. I thankfully acknowledge the help and support of all my juniors during my research work. A very special thanks to Preethu, Dhanusha, Athira, Namitha, Thouseem, Reshma, Asoontha, Gayathri and Rakhi for their sincere help and support rendered during my research work.

I am most indebted to my Pappa, Amma, Hyma and HariTha for their unconditional love, sacrifices, blessings, constant encouragement and support bestowed on me during my study.



Greeshma Udayan

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LIST OF SYMBOLS AND ABBREVIATIONS USED

SYMBOLS	ABBREVIATIONS
%	Per cent
F	Frequency
Q	Quartiles
μ	Mean
SD	Standard deviation
₹	Rupees
@	At
NS	Non-significant
<i>et al.</i>	Co-workers
BCR	Benefit Cost Ratio
KAU	Kerala Agricultural University
VFPCK	Vegetable and Fruit Promotion Council-Keralam
KVK	Krishi Vigyan Kendra
IFSRS	Integrated Farming System Research Station

Introduction

1. INTRODUCTION

India, the second most populated country had witnessed a population growth rate of 17.64 per cent from 2001 to 2011 (Census, 2011). Though the population rate had an exponential rise, the measures taken to meet the demand for food are meagre. Urbanization, fragmentation of land, changing lifestyles, and patterns of consumption had resulted in the dependency of food on other nations.

India with a population of more than 1.23 billion has its 50 per cent of the population residing in urban areas (UNDESA, 2016). Poor urban dwellers being, largely net food buyers and depending mostly on markets for their food supplies are particularly vulnerable to adverse food prices. In order to confront the growing demand for food, the development of diverse agricultural production system in and around cities should be activated by exploring the vacant places in cities like house or flat terraces and balconies. At the household level, these agricultural activities can be a source of income, can provide access to nutritionally rich and varied diet and can reduce the household food consumption expenditure.

House terrace cultivation existed since the days of Babylon in 2300 BC; today the concept had gained momentum in India due to population explosion and shrinkage of cultivable land. According to FAO (2010), apart from its prime role in supplying fresh, safe and hygienic food, house or flat terrace cultivation also generates employment, recycles urban wastes through composting and strengthens cities to cope up with climate change. In India house terrace cultivation is being carried out in many cities including Mumbai, Delhi, Kolkata, Hyderabad, Bengaluru and Chennai under the leadership of Government, private agencies or even individuals (Sahasranaman, 2016).

The indiscriminate use of pesticides and the increased dependence on imported vegetables from neighbouring states having a junk of synthetic chemicals, resulted in the increase of cancer patients in Kerala (Krishnakumar, 2016). Despite having good rain and sunlight, the state produces

only 30-40 per cent of its vegetable requirement. In order to tackle this issue, Kerala must produce safe vegetables here itself which also adds to self-sufficiency. Since the available land for cultivation is limited, Keralities have already started cultivating vegetables on house terraces. A study conducted by Nair (2015) in Ernakulam district revealed that 69 per cent of the urban households were engaged in house terrace cultivation.

Vegetables can be cultivated in plastic sacks on house terraces. Integration of vegetable cultivation on house terraces with vermi composting, azolla cultivation and poultry rearing tops the potentialities of symbiotic and synergistic relationship among them (Padmanabhan and Swadija, 2015). The innovative scientific farming techniques like hydroponics, vertical gardening and low cost irrigation help to produce high yield and high quality of fresh organic food through these practices.

According to Sundaraj *et al.* (1989), house terrace cultivation of vegetables is considered as one of the effective methods for horticultural therapy which helps people to overcome physical and mental stress by involving in vegetable cultivation. It also increases the social life, social network and relationship with neighbours.

This holds the key to changing production and resource use by decreasing waste production, increasing recycling and transforming citizens to a more sustainable life style. These green spaces in or near cities had delivered services such as air purification and temperature regulation by reducing the urban island heat effect, ground water recharge, cultural services including aesthetics and recreation and conserves the bio-diversity, all leading to healthier life styles.

In view of its benefits and potential to contribute food and nutrition security, income generation and poverty alleviation, house terrace cultivation have been actively promoted and publicized by local governments and other agencies.

With this in view, a research study was framed with the following specific objectives

1. To study the extent of awareness and adoption of the recommended practices for house terrace cultivation.
2. To examine the health consciousness of urban households and to find out the benefit cost ratio of house terrace cultivation.
3. To document farming practices adopted by the urban households involved in house terrace cultivation.
4. To inventorise various agencies promoting house terrace cultivation.

Scope of the study

The present study seeks to identify the extent of awareness and adoption of urban farmers involved in house terrace cultivation. As this study also aims at inventorisation of various agencies promoting house terrace cultivation and in documentation of practices followed by the urban households, this study thus can be used as a reference material by the researchers, policy makers and farmers.

Limitation of the study

The present study was undertaken as a part of the requirements of P. G. programme and hence the limitation of time and resources restricted the exploitation of the house terrace cultivation in greater depth and in a more comprehensive manner. Consequently the researcher was unable to operate the study in all parts of the State. There could be some distortion in the interpretation of the responses of the respondents since the study was based on the expressed opinion of the respondents, it may not be free from their individual bias and prejudices. However, sincere efforts have been made to achieve the objectives and utmost care has been taken to make the study as systematic as possible.

Presentation of the thesis

Besides, the present introduction chapter, the second chapter *viz.*, review of literature covers relevant works related to research and evaluates the previous research on the techno-socio-economic aspects of house terrace cultivation. The third chapter presents the methodology which describes methodology of proposed research. The fourth chapter contains results of the study and discussion on the results. The last chapter, summary and conclusion compiles all the key points of the research study and includes implications for future researchers in the area of house terrace cultivation. Apart from these chapters, references, appendices and abstract of the thesis are given at the end.

Review of literature

2. REVIEW OF LITERATURE

Advocating ideas from different sources of information provides a proper framework for the research study. Review of literature is an evaluative report of studies found in the relevant works related to research. It enables the researcher to learn from previous theory on the subject and helps to illustrate how the subject has been studied previously.

Different literature review supports the objectives of the study are discussed under following themes.

2.1 Urban agriculture

2.2 House terrace cultivation of vegetables

2.3 Profile characteristics of urban households involved in house terrace cultivation

2.4 Extent of awareness of farming on house terrace cultivation

2.5 Extent of adoption of farming on house terrace cultivation

2.6 Health consciousness of urban households involved in house terrace cultivation

2.7 Benefit Cost ratio of house terrace cultivation

2.8 Inventorisation of agencies promoting house terrace cultivation

2.9 Documentation of farming practices adopted by urban households involved in house terrace cultivation

2.1 URBAN AGRICULTURE

Mougeot (2000) defined urban agriculture as an industry located within a town, a city or metropolis, which helps in the widening of the processes and distribution of diversity of food and non-food products.

Huq *et al.* (2007) stated that urban agriculture is an application of an integrated approach that considers the use of a combination of techno-socio ecological measures to the risks of climate change by building resilient urban green spaces.

World Bank (2008) reported that growth originating from agriculture is known to be twice as operative in reducing poverty than the growth originating from fields other than agriculture.

Agriculture came up less than 10,000 years ago and it gave surplus food which further led to the birth of civilizations and cities. For humans, it is a prerequisite for survival which results in the growth of population and industries (Barker, 2009).

Paneerselvam *et al.* (2014) summarizes that urban agriculture is the practice of cultivating, processing and distributing food in or around a town or city.

According to UNDESA (2014), the percentage of urban population of India during 1990 was about 26 % and increased to 32 % by 2014. They also projected that by 2050, India's urban population will reach to 60 %. Since India being an agrarian country, urban agricultural practices are traditionally being practiced in outskirts of urban households.

Wareen *et al.* (2015) considered urban agriculture as an important phenomenon that has the potential to improve livelihood by attaining food and

nutritional security through a variety of mechanisms including direct access and availability of food to increase the income from the sale of food products.

FAO (2016) defined urban agriculture as the method carried out within and around the city which contributes to household food security, food consumption and diet composition, dietary diversity and nutritional status by providing direct access to locally produced foods, increasing freshness and variety of available foods and offering employment opportunities.

More number of people resides in urban areas than in rural areas, with 54.5 per cent of the world's population dwelling in urban areas (UNDESA, 2016). Rise in global food prices, their impact on poverty and nutrition and the associated risk of social and political tensions creates an urgent need for action in agriculture.

2.2 HOUSE TERRACE CULTIVATION OF VEGETABLES

Rooftop gardening can be an effective method in ensuring food supply and satisfying nutritional needs of the population. (Helen Keller International Institute of Public Health and Nutrition, 1985).

Padmanabhan and Swadija (2003) reported that urban families can depend on house terrace cultivation of vegetables through which fresh and clean vegetables can be produced at low cost utilizing household bio-wastes and family labour.

The Department of Horticulture in Karnataka established Horticultural Producers' Co-operative Marketing and Processing Society Limited [HOPCOMS] in five districts of Bengaluru Urban, Bengaluru Rural, Kolar, Ramanagara and Chikkaballapura to collect and process the fruits and vegetables produced in terraces of urban areas. They procure ceiling price for the small scale farmers who make up 77 % of those who supply to HOPCOMS (Kolady *et al.*, 2007).

There is a tremendous growth in the percentage of urban population in Kerala (Census, 2011). In urban Kerala, people spend 34 per cent of their income for household food expenditure. The stress on food safety and nutritional security led urban households to uphold a paradigm shift in the consumption pattern by producing their own food in the available vacant places. So they prefer to choose their house terraces for the production.

Mumbai, the city having largest slums has open up space for urban farming by transforming terraces, balconies and common areas into vegetable gardens. Even the Indian Railways has leased its land along railway tracks to farmers to keep the land clean and useful by means of farming. In the city of Cuttack, slum dwellers depend on organic farming to cultivate the vegetables needed to satisfy their dietary requirements, and are even able to sell the surplus to their local markets (Ward, 2013).

The Government of Tamil Nadu introduced “Do-it-Yourself” kit under the Urban Horticulture Development Scheme in 2014 to enable city dwellers to grow vegetables on terraces of individual houses and apartment buildings by providing the essential requirements for farming. The scheme has been effective in increasing the access to nutrition among the poor people and in reducing their monthly food expenses. (Government of Tamil Nadu, 2014).

According to GOK (2016), vegetable production in 2013-14 was 11.90 lakh metric tonnes and it increased to 15.32 lakh tonnes in 2014-15.

Since land is limited in homesteads of Kerala, vegetables can be cultivated in plastic sacks on house terraces. Integration of vegetable cultivation on house terraces with vermi composting, azolla cultivation and poultry rearing tops the potentialities of symbiotic and synergistic relationship among them. (Padmanabhan and Swadija, 2015).

2.3 PROFILE CHARACTERISTICS OF URBAN HOUSEHOLDS INVOLVED IN HOUSE TERRACE CULTIVATION

2.3.1 Age

Sl. No.	Author	Respondents	Statements/relationships
1	Fayas (2003)	Vegetable growers of Kerala	Middle aged category of 35-45 age
2	Jaganathan (2004)	Vegetable growers of Kerala	Majority (48%) of the farmers belonged to old age category
3	Atibioke <i>et al.</i> (2012)	African Urban farmers	75 per cent engaged in farming were within the age range of 30-50 years
4	Krishnan (2013)	Home garden farmers of Kerala	Majority of the home garden farmers belonged to middle aged and old aged category
5	Van den Berg (2013)	Small scale farmers of South Africa	No significant relationship between farmer's age and adoption of technology at the irrigation scheme
6	Paneerselvam <i>et al.</i> (2014)	Urban farmers of Coimbatore	Average age of urban farmers were 50 years
7	Sebastian (2015)	Home garden farmers of Kerala	Majority of farmers were retired personnel from government and non-government sectors

2.3.2 Educational status

Sl. No.	Author	Respondents	Statements/relationships
1	Jaganathan (2004)	Vegetable growers of Kerala	52 per cent had secondary school education
2	Atibioke <i>et al.</i> (2012)	African Urban farmers	70 per cent had formal education showed significant relationship between level of education and extent of adoption of farming practices
3	Mohapatra (2012)	Tribal farmers of Odisha	20 per cent were educated up to primary school whereas 15 per cent had middle school education, 11.25 per cent had education up to high school level and 10 per cent had college education
4	Krishnan (2013)	Home garden farmers of Kerala	More than 70 per cent had education level from high school to collegiate level of education
5	Paneerselvam <i>et al.</i> (2014)	Urban farmers of Coimbatore	More than 50 per cent of them had University degree
6	Sebastian (2015)	Home garden farmers of Coimbatore	Majority had high school education

2.3.3 Annual income

Sl. No.	Author	Respondents	Statements/relationships
1	Sreedaya (2004)	Urban house wives of Thiruvananthapuram	Low annual income
2	Achale (2007)	Cotton growers of Madhya Pradesh	Had significant relationship with extent of awareness regarding indigenous technical knowledge
3	Rawat (2010)	Cotton growers of Madhya Pradesh	Majority were in middle income category
4	Mohapatra (2012)	Tribal farmers of Odisha	Majority (35%) were in low (up to Rs. 11,000/-) income category
5	Tulsiram (2012)	Sweet orange growers of Maharashtra	Medium annual income group

2.3.4 Innovation proneness

Sl. No.	Author	Respondents	Statements/relationships
1	Jaganathan (2004)	Vegetable growers of Kerala	55 per cent had medium innovativeness
2	Sreedaya (2004)	Urban house	Majority of them belonged to

		wives of Kerala	lower innovation category
3	Bandole (2011)	Farm women of Madhya Pradesh	Majority (43.50%) of them belonged to medium innovativeness
4	Shankaraiah and Swamy (2012).	Farmers in dry land area	Majority belonged to medium level of innovation proneness to increase their farm income
5	Dohare (2014)	Tomato growers of Madhya Pradesh	Majority (37.50%) of them belonged to medium innovativeness
6	Reghunath (2016).	Farmers of Kannur district	65.83 per cent had medium level of innovation proneness

2.3.5 Risk orientation

Sl. No.	Author	Respondents	Statements/relationships
1	Manjusha (1999)	Bitter gourd growers of Kerala	Majority of them (47.02%) belonged to medium level of risk orientation
2	Jaganathan (2004)	Vegetable growers of Kerala	Three fourth (75%) had medium level risk orientation
3	Sreedaya (2004)	Urban house wives of Kerala	Respondents were equally disbursed among low and high risk orientation category
4	Yadav (2010)	Farm women in Madhya Pradesh	Majority (42.37%) of them belonged to medium to high risk orientation

5	Naik (2012)	Onion growers of Karnataka	More than half of the respondents had high risk orientation
6	Dohare (2014)	Tomato growers of Madhya Pradesh	Majority (39.50%) of them belonged to medium to high risk orientation.

2.3.6 Economic motivation

Sl. No.	Author	Respondents	Statements/relationships
1	Jaganathan (2004)	Vegetable growers of Kerala	Seventy one per cent had medium level of economic motivation
2	Sreedaya (2004)	Urban house wives of Kerala	Majority(52.20%) had high economic motivation
3	Oladele (2005)	African farmers	Positive relationship with adoption of technology
4	Singha and Baruah (2011)	Assam Rice farmers	Positive relationship with adoption behaviour of farmers regarding rice technology in different farming system
5	Mohapatra (2012)	Tribals of Odhisha	Majority had (52.50%) medium economic motivation
6	Naik (2012)	Onion growers of Karnataka	Majority had (39.50%) high economic motivation
7	Basher (2016)	Bitter gourd farmers of Kerala	Majority of them (49.06%) belonged to medium economic motivation

2.3.7 Extension agency contact

Sl. No.	Author	Respondents	Statements/relationships
1	Jaganathan (2004)	Vegetable growers of Kerala	Seventy three per cent of respondents had medium level of extension agency contact
2	Sreedaya (2004)	Urban house wives of Kerala	Had high extension agency contact
3	Okoedo and Onemolease (2009)	Yam farmers of Nigeria	Influence on farmers' adoption of improved yam storage technology
4	Krishnan (2013)	Home garden farmers of Kerala	Fifty per cent of the extension contribution came from agricultural department and KAU

2.3.8 Family labour utilization

Manjusha (1999) reported that family labour income provides idea on how much family is involved in cultivation.

Sindhu (2002) found that family labour utilization of vegetable growers of Kerala had negative and significant relationship with annual income of the vegetable growers.

Sreedaya (2004) reported that family labour was highly utilized among 80 per cent of the urban farmers involved in terrace cultivation of Thiruvananthapuram district.

Mohapatra (2015) reported that 46 per cent of farmers of Puri district of Odisha depend on family labour for the agricultural activities like weed management, ploughing the land, irrigation, inter cropping and harvesting.

2.3.9 Knowledge regarding house terrace cultivation

Sl. No.	Author	Respondents	Statements/relationships
1	Agbamu (1993)	African Vegetable growers	Knowledge is significantly related to adoption of technology
2	Gandhi (2002)	Vegetable growers of Karnataka	High knowledge level on integrated pest management of tomato
3	Jaganathan (2004)	Vegetable growers of Kerala	50.83 per cent had medium level knowledge regarding organic farming practices
4	Naik (2012)	Onion growers of Karnataka	Half of the respondents had medium level of knowledge on agricultural practices regarding onion
5	Tulsiram (2012)	Sweet orange growers of Maharashtra	Medium level of knowledge for adoption of recommended cultivation practices

2.4 EXTENT OF AWARENESS OF FARMING ON HOUSE TERRACE CULTIVATION

Waghmare *et al.* (1988) reported that 60 percent of the vegetable growers of Maharashtra had medium awareness on horticultural development programmes followed by high and low level of awareness with 21.67 per cent and 18.33 percent respectively.

Rawat (2010) reported that majority of the cotton growers of Madhya Pradesh had medium level of awareness regarding fertilizer application practices on cotton.

Yadav (2010) reported that awareness on agricultural activities positively influenced the farm women in Madhya Pradesh to achieve good yield in production of vegetables.

Bandole (2011) reported that most of the farm women had medium awareness regarding post-harvest management practices in maize cultivation of Madhya Pradesh followed by high and low level of awareness.

Dohare (2014) reported that majority of the tomato growers of the Madhya Pradesh had medium awareness due to the lack of skill training and non-supervision of practices by the extension agencies.

Prasad (2014) found that farmers of Raigarh district of Chhattisgarh state had medium level of awareness on recommended groundnut production technology.

Simtowe *et al.* (2016) reported that awareness on at least one improved pigeon pea variety was higher among young farmers of Malawi although adoption propensity was high among older farmers and women.

2.5 EXTENT OF ADOPTION OF FARMING ON HOUSE TERRACE CULTIVATION

Sreedaya (2000) revealed that majority of the vegetable growers of the self-help groups of Kerala belonged to medium category with respect to extent of adoption of recommended practices.

According to Truong and Ryuichi (2002), the extent of adoption of technologies in farming system in Mekong delta had positive and significant association on age, annual income, education and economic motivation.

Jaganathan (2004) reported that the extent of adoption of organic farming practices was influenced by knowledge, awareness and risk orientation of vegetable growers of Kerala

Kurihara *et al.* (2014) revealed that there was high adoption rates in case of technologies which decreases the use of pesticides and artificial fertilizers in the study of role of risk-related latent factors in the adoption of new production technology in the case of Japanese greenhouse vegetable farmers.

Sreedaya (2004) reported that 60 per cent of the urban house wives of Thiruvananthapuram district involved in house terrace cultivation had high adoption of cultivation practices of vegetables.

Paneerselvam *et al.* (2014) on the study of urban farmers of Coimbatore revealed that 93 per cent respondents had high adoption on terrace gardening.

Williams (2014) found that adoption of agricultural innovation in Delta State of Nigeria relies on age, annual income, education and extension agency contact.

Simtowe *et al.* (2016) found that there were significant relationship between the awareness regarding improved pigeon pea varieties and their adoption by farmers in Malawi.

2.6 HEALTH CONSCIOUSNESS OF URBAN HOUSEHOLDS INVOLVED IN HOUSE TERRACE CULTIVATION

Sundaraj *et al.* (1989) reported that house terrace cultivation of vegetables was considered as one of the effective method for horticultural therapy which helps people to overcome physical and mental strain by involving in ornamental gardening and cultivation practices of vegetables.

Sreedaya (2004) found that 70 per cent of the urban housewives in Thiruvananthapuram district involved in house terrace cultivation had high health consciousness in order to consume the fresh and safe vegetables.

Corrigan (2011) stated that urban agriculture has been a fruitful strategy for enhancing food access to food insecure areas.

Park *et al.* (2011) reported that there were high rate of consumption of fruits and vegetables from the farmers markets, since they were supplemented with no pesticides and chemicals.

Botchway *et al.* (2015) reported that health consciousness and education had positive and significant relationship among the non-medical students of Ghana.

Costa (2016) reported that rise in income enabled individuals to consume better food, housing, sanitation and medical care which led to improvement in health status.

2.7 BENEFIT-COST RATIO OF HOUSE TERRACE CULTIVATION

Cooley and Lass (1998) found that community garden farmers benefited from a savings of up to 150 per cent of share prices compared to equivalent amounts of organic and conventional produce at local market. This services helped the urban market had more affordable and quality produce than neighbourhood stores which depends on rural market.

Sreedaya (2004) found that 91 per cent of the urban house wives of Thiruvananthapuram involved in house terrace cultivation of vegetables fell under the benefit cost ratio category of more than one with the involvement of family labour.

Zaman *et al.* (2010) opined that since the surplus garden produce can sell in local markets provide an additional source of income to households involving

in farming activities. Along with it takes back the seasonal availability of produce and promoting household self-sustainability.

Nurmi *et al.* (2013) found that the implementation of green roof adds up private and public benefits and surpass costs and provide good investment for the society.

Vadlapatla (2013) found that households in Hyderabad produce vegetables, saved 20 per cent of their total food expenditure by holding a small portion of the produce for household consumption.

Paneerselvam *et al.* (2014) found that majority of the urban farmers in Coimbatore saved their household food expenditure entirely on purchase of vegetables by adopting urban farming.

Nair (2015) opined that 45 per cent of the house terrace farmers of Ernakulam district had earned Rs. 15,000-20,000 as monthly income from their vegetable cultivation and 76 per cent of them had improved their savings to Rs. 10,000-15,000 after doing house terrace cultivation activities.

2.8 INVENTORISATION OF AGENCIES PROMOTING HOUSE TERRACE CULTIVATION

KIIDC (2013) reported that Urban Environment Improvement Project proposed by Department of Climate Change and Environment is an initiative established for the creating self-sustained ecosystem in every household of Thiruvananthapuram Corporation. The key concepts of this project were making environment friendly with vegetable cultivation on roof supported with micro irrigation and organic inputs and nutritional security through the production of safe and fresh vegetables.

GOK (2016) reported that Krishi Bhavan achieved progress in house terrace cultivation from an area of 489 hectares and production 4.56 lakh metric

tonnes in 2012-13 to 1,289 hectares and production 15.01 lakh metric tonnes in 2014-15.

John (2017) reported that Integrated Farming System Research Station at Karamana developed model terrace garden for a three cent house which produce 250 kg of pesticide free vegetables every year.

Nandakumar (2017) reported that Kerala Agricultural University is imparting the technology for wick irrigation to farmers, urban house wives and self-help groups.

Babu (2017) reported that Integrated Farming System Research Station at Karamana came up with several low cost structures like vertical farming models and those with detachable rain shelters and micro irrigation systems to grow all types of vegetables for homestead cultivation.

2.9 DOCUMENTATION OF FARMING PRACTICES ADOPTED BY URBAN HOUSEHOLDS INVOLVED IN HOUSE TERRACE CULTIVATION

Sreedaya (2004) reported that in a house terrace of an area 1000 square feet can be used to grow 65-70 sacks of vegetables like leafy vegetables, tomato, bhindi, chilli, coccinea, brinjal, snake gourd, bitter gourd, cowpea, curry leaf, pumpkin, cucumber, tuber crops and cauliflower.

Jacob *et al.* (2012) found that the best containers to grow crops like cowpea, bhindi, chilli, brinjal, amaranthus and cabbage is plastic sack with 60 cm height and 45 cm diameter of holding 20-24 kg potting media.

IFSRS (2014) reported that majority of the urban households of Thiruvananthapuram district (49%) utilized 50-75 percent of the terrace area for cultivation of vegetables such as amaranthus, cowpea, bhindi, chilli, tomato and cucurbits using organic manures like cowdung, vermicompost, ground nut cake,

home waste and poultry manure for growing crops and organic preparations like neem solution, neem oil, chilli-garlic solution etc., to control pest and diseases.

GoK (2015) reported that low cost drip irrigation facilities like four in drip kit can be used to irrigate in 10 square feet area and provides one litre of water per hour for 60 crop containers.

Joyce (2017) reported that in a house terrace at Ernakulam district of an area 1800 square feet contains 23 varieties of grafted mango trees planted in 200 L plastic barrel and other vegetables were grown in aquaponics. In these plastic barrels contains top soil, coir pith and cowdung as potting mixture in 1:1:1 ratio respectively.

Sudhakaran (2017) reported that the kitchen waste is used as manure for tomato and amaranthus in house terrace cultivation.

Methodology

3. METHODOLOGY

This chapter deals with the methods and procedures for data collection in conducting the present research study. The methodological details followed in the study are furnished under the following sub-titles.

3.1. Locale of the study

3.2. Selection of respondents

3.3. Research design

3.4. Operationalization and measurement of independent variables

3.5. Operationalization and measurement of dependent variables

3.6. Documentation of farming practices of house terrace cultivation adopted by respondents

3.7. Inventorisation of agencies promoting house terrace cultivation

3.8. Methods used for data collection

3.9. Statistical tools used for the study

3.1. LOCALE OF THE STUDY

The study was conducted in Thiruvananthapuram Corporation of Kerala (Fig. 1) where house terrace cultivation is very popular. Hike in vegetable prices and increasing incidence of diseases resulting from consumption of vegetables due to pesticide residues continue to be major threat for city dwellers. This adds significance to cultivation on house terraces as available land for cultivation is less in urban areas. Many government initiatives are successfully running in Thiruvananthapuram Corporation which can be scaled up to other corporations with suitable modification.

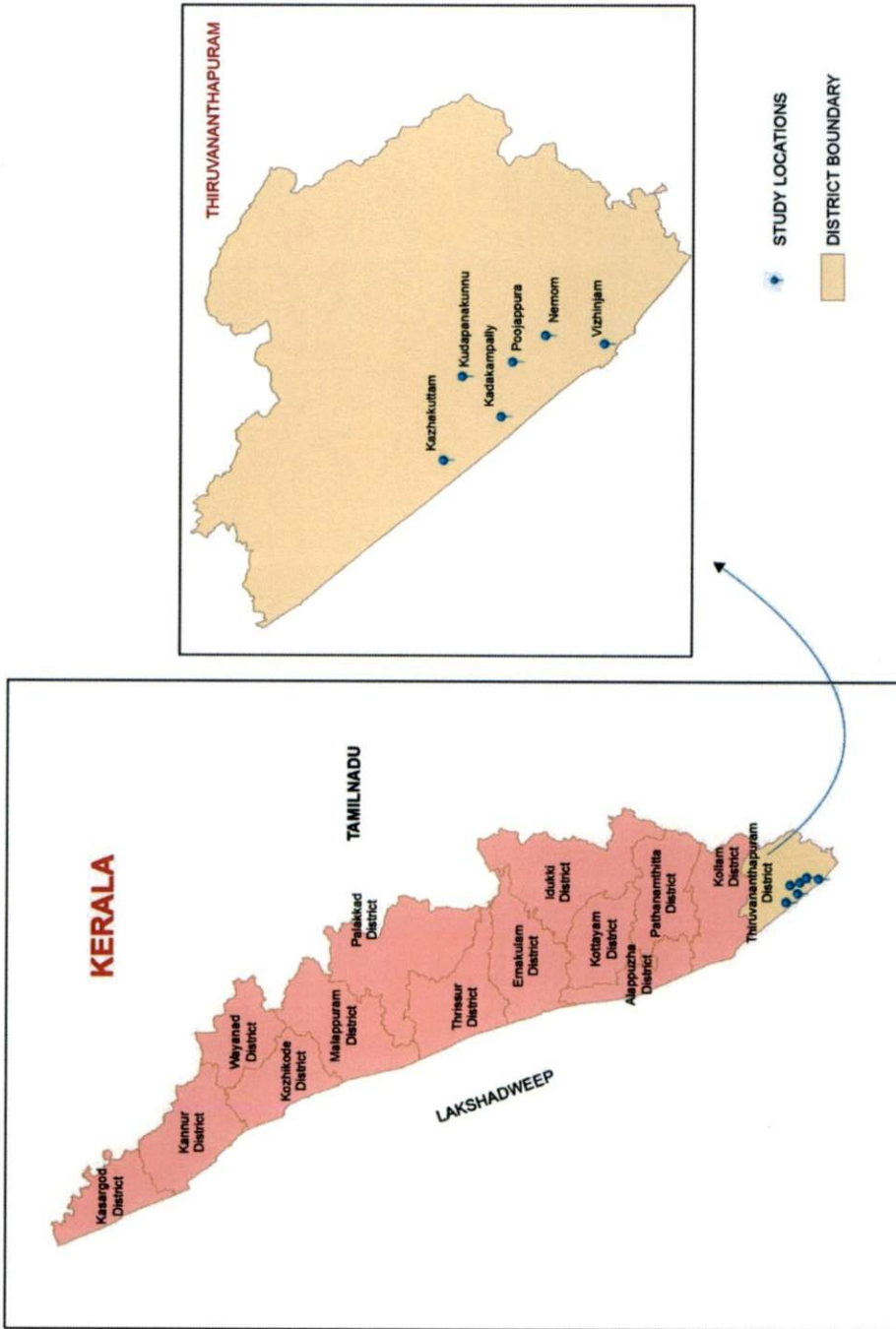


Fig. 1 Locale of the study

3.2. SELECTION OF RESPONDENTS

The respondents of the study were the members of urban households involved in house terrace cultivation.

By random sampling, six wards of Thiruvananthapuram Corporation where house terrace cultivation was practiced were selected. From each of these selected wards, 20 respondents were randomly selected having a total of 120 respondents.

3.2.1 Selection of wards

By random sampling, six wards namely Kazhakuttom, Kudappanakunnu, Nemom, Vizhinjam, Kadakampally and Poojappura from Thiruvananthapuram Corporation were selected.

3.3. RESEARCH DESIGN

The research design adopted for this study was ex –post facto technique, since the phenomenon has already occurred and is on-going. In this research design, the researcher does not have control over independent variables as their manifestations had already occurred and had no scope for manipulation.

3.4. OPERATIONALIZATION AND MEASUREMENT OF INDEPENDENT VARIABLES

Based on the objectives and discussion with experts, a list of 26 independent variables which are related to the study were framed along with their operational definitions (Appendix I) and sent to 30 judges in the field of extension and other related fields for eliciting their relevancy rating by the researcher in five point continuums ranging from ‘most relevant’, ‘more relevant’, ‘relevant’, ‘less relevant’ and ‘least relevant’ with scores 5, 4, 3, 2 and 1 respectively.

The final variables were selected based on mean relevancy score, obtained by summing up the weightages obtained and dividing it by number of judges responded.

Those variables that scored more than the mean score were selected for the study (Appendix II). The variables thus selected are described below.

3.4.1 Age

It was defined as the number of calendar years completed by the respondent at the time of enquiry. This was measured by directly asking the respondent, the number of years he/she had completed at the time of interview. The age wise distribution of respondents is given below.

Age wise distribution of respondents

Sl. No.	Age category	Years
1	Young	< 35
2	Middle aged	35-55
3	Aged	> 55

3.4.2 Educational status

It was operationally defined as the highest academic qualification possessed by the respondent through formal and informal education. It was measured using the scoring pattern developed by Trivedi (1963).

Education wise distribution of respondents

Sl. No.	Category	Score
1	Illiterate	1
2	Can read and write	2
3	Primary school	3
4	Middle school	4
5	High school	5
6	College	6
7	Professional degree	7

3.4.3 Annual income

It was operationally defined as the total earning of all members of the family of the respondent for a period of one year under study. In the present study, it was measured by directly asking the respondent.

3.4.4 Family labour utilization

It was operationally defined as the extent of utilization of family members by the respondent in various operations on house terrace. It was measured by the procedure developed by Sindhu (2002).

In order to quantify the farmer's perception on family labour utilization in house terrace cultivation, respondents were asked at what extent they feel family labour had to be utilized in various operations on house terrace. The responses were taken on a four point continuum as 'to the full extent', 'as far as possible', 'to the least extent' and 'never' with scores 4, 3, 2, and 1 respectively.

3.4.5 Knowledge on house terrace cultivation

It was operationally defined as the quantum of technical know-how possessed by the urban households on house terrace cultivation.

It was measured by Teacher made test developed by the researcher for the purpose. Based on review of literature and discussion with experts, a list of 10 questions were formulated to which respondent had to answer. A score of 'one' was given for correct answer and 'zero' for incorrect answer. The sum of scores obtained for the 10 questions indicated the knowledge regarding house terrace cultivation.

3.4.6 Innovation proneness

It was operationally defined as the behaviour pattern of respondents who have interest and desire to bring in sustainability in house terrace cultivation by introducing new techniques in crop selection and management.

The scale used by Gurubalan (2007) was used which consists of 5 statements. The responses were obtained on a five point continuum ranging from strongly agree to strongly disagree with scores 5, 4, 3, 2 and 1 respectively. The scoring procedure was reversed for negative statements.

The scores obtained on each statement were summated to arrive at individual score on innovation proneness. The possible score range was from 5 to 25.

3.4.7 Risk orientation

It was operationalized as the degree to which the urban households involved in house terrace cultivation were oriented towards encountering risks and uncertainty in adopting new ideas in house terrace cultivation.

It was measured using the scale developed by Supe (1969) on a five point continuum as 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with scores 5, 4, 3, 2 and 1 for positive statements and was reverse in the case of negative statements.

The scores obtained on each statement were summated and arrive at individual score on risk orientation. The possible score range was from 6 to 30.

3.4.8 Economic motivation

Economic motivation was operationally defined as the extent to which urban households involved in house terrace cultivation were oriented towards profit maximization and relative value he/she places on monetary gain.

It was measured using the procedure of Fayas (2003) on a five point continuum "strongly agree", 'agree', 'undecided', 'disagree' and 'strongly disagree with scores 5, 4, 3, 2 and 1 respectively for positive statements and reverse in the case of negative statements.

The scores obtained on each statement were summated to get the individual score on economic motivation. The possible score range was 6 to 30.

3.4.9 Extension agency contact

Extension agency contact was operationally defined as the degree of contact of respondent with various extension agencies for acquiring information on house terrace cultivation.

The scoring procedure developed by Krishnamoorthy (1988) was used to measure the extent of extension agency contact by the urban households involved in house terrace cultivation. It was measured on a three point continuum 'regularly', 'occasionally' and never with scores 3, 2 and 1 respectively. The total score obtained

by each respondent was taken as his score for the extent of contact with extension agencies.

3.5. OPERATIONALIZATION AND MEASUREMENT OF DEPENDENT VARIABLES

3.5.1. Extent of awareness on house terrace cultivation

It is defined as the extent of first-hand information possessed by the respondent on house terrace cultivation in the 'package of practices recommendations (*ad hoc*) for organic farming: crops'.

A teacher made test was used in this study to measure the extent of awareness on house terrace cultivation about recommended practices.

A set of 25 statements reflecting awareness on house terrace cultivation was prepared. Based on discussion with experts, sixteen statements about recommended practices on house terrace cultivation were finally selected for the test. The respondents were asked to indicate the degree of awareness about the selected sixteen practices on a three point continuum of not aware, partially aware and fully aware and scores of 1, 2 and 3 were given respectively. Using the following formula awareness index of each respondent was calculated.

$$\text{Awareness index} = \frac{\text{Respondent's total score}}{\text{Total possible score}} \times 100$$

where,

Respondent's total score = Total number of practices adopted by respondent multiplied by the respective practice weightage and summated.

Total possible score = Total number of practices recommended multiplied by the respective practice weightage and summated.

3.5.2 Extent of adoption of farming practices on house terrace cultivation

It refers to the degree to which the respondent had actually adopted the practices recommended for house terrace cultivation in the 'package of practices recommendations (*ad hoc*) for organic farming: crops'.

In this study, extent of adoption of farming on house terrace was measured using an adoption index developed by Jaganathan (2004). A list of practices recommended for house terrace cultivation in the 'package of practices recommendations (*ad hoc*) for organic farming: crops' were given to the experts. Based on their perception, sixteen practices having higher scores were selected for determining adoption index. Since the practices were similar in their contribution to its benefits, equal value was provided for all practices. The respondents were asked to indicate their responses on the selected sixteen practices recommended for house terrace cultivation on a three point continuum of 'not adopted', 'partially adopted' and 'fully adopted' and scores of 1, 2 and 3 were assigned respectively. The adoption index of each respondent was calculated by the following formula.

$$\text{Adoption index} = \frac{\text{Respondent's total score}}{\text{Total possible score}} \times 100$$

where,

Respondent's total score = Sum of the total number of practices adopted by respondent.

Total possible score = Sum of the total number of recommended practices on house terrace cultivation.

3.5.3 Health consciousness of respondents

It refers to the extent of consciousness of the respondent in dietary requirement, personal hygiene and environmental sanitation. It is measured using the procedure developed by Sreedaya (2004).

A five point continuum was used with the following scale strongly agree, agree, undecided, disagree and strongly disagree with scores 5, 4, 3, 2 and 1 for positive statements and reverse in the case of negative statements.

3.5.4 Benefit cost ratio of house terrace cultivation

It was measured by the procedure developed by Sreedaya (2004). Benefit cost ratio was measured using the following formula.

$$\text{Benefit cost ratio} = \frac{\text{Total cost of cultivation}}{\text{Net returns}}$$

where

$$\text{Net returns} = \text{Total returns} - \text{Total cost of cultivation}$$

Total cost of house terrace cultivation for two seasons were worked out and summated to get the total cost of cultivation of the respondents.

Total returns of house terrace cultivation for two seasons was measured from the yield of the vegetables in kilograms and their corresponding price value

3.6. DOCUMENTATION OF FARMING PRACTICES OF HOUSE TERRACE CULTIVATION ADOPTED BY RESPONDENTS

For documenting various practices adopted by the respondents, an open ended questionnaire (Appendix IV) was developed. It involves the crops cultivated, the different containers used and the method of planting, manuring and pest and disease management practices adopted by the respondents. Frequency distribution percentage was also worked out.

3.7. INVENTORISATION OF AGENCIES PROMOTING HOUSE TERRACE CULTIVATION

An open ended questionnaire was developed for the inventorisation of various agencies promoting house terrace cultivation among the respondents.

3.8. METHODS USED FOR DATA COLLECTION

A structured pretested interview schedule (Appendix III) was developed to measure the dependent and independent variables selected for the study. Moreover, an open ended questionnaire (Appendix IV) was also prepared to document the various practices followed by the respondents.

3.9. STATISTICAL TOOLS USED FOR THE STUDY

The data collected from the respondents were scored, tabulated and analysed using statistical methods. Correlation analysis was worked out to find out the relationship between independent and dependent variables. Besides, mean, standard deviation, quartiles and simple percentage analysis were used for the analysis of data.

Results and Discussions

4. RESULTS AND DISCUSSIONS

Keeping the objectives of the study in view, the results of the study are presented under the following heads.

4.1 Profile characteristics of the respondents

4.2 Extent of awareness of recommended practices for house terrace cultivation

4.3 Extent of adoption of recommended practices for house terrace cultivation

4.4 Health consciousness of urban households involved in house terrace cultivation

4.5 Benefit cost ratio of house terrace cultivation

4.6 Relationship between independent variables and dependent variables

4.7 Documentation of farming practices of house terrace cultivation adopted by respondents

4.8 Inventorisation of agencies promoting house terrace cultivation

4.1 PROFILE CHARACTERISTICS OF THE RESPONDENTS

4.1.1 Age

Table 1. Distribution of respondents according to their age

(n=120)

Sl. No.	Age category	Frequency	Percentage
1	Young (< 35 years)	22	18.33
2	Middle aged (35-55 years)	68	56.67
3	Old (> 55 years)	30	25.00
Total		120	100

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It is clear from the Table 1 that more than half of the respondents (56.67 per cent) were middle aged and 25 per cent belonged to old category and 18.33 per cent of respondents were young (Fig. 2).

Majority of the respondents belonged to middle aged category. This may be due to the fact that at their age they become more conscious about their own family's health. This finding is in confirmation with the findings of this study where only 12.50 per cent of them belonged to the low health consciousness and remaining respondents belonged to medium and high category.

4.1.2 Educational status

Table 2. Distribution of respondents according to their educational status

Sl. No.	Category	Frequency	Percentage
1	High school	18	15.00
2	College	79	65.83
3	Professional degree	23	19.17
Total		120	100

The Table 2 reveals that 65.83 per cent of the respondents had received an education up to college level, 19.17 per cent had professional degree and 15 per cent had high school education (Fig. 3). None of the respondents were belonged to illiterate, can read and write, primary school and middle school as educational status. Most of the respondents who were practicing house terrace cultivation were highly educated which might have increased their knowledge on importance of vegetable consumption, safe food and environmental benefits of involving in urban agricultural activities. This finding is in confirmation with Paneerselvam *et al.* (2014) and Legesse *et al.* (2016) about urban farmers of Coimbatore district and Mekelle city in Northern Ethiopia respectively.

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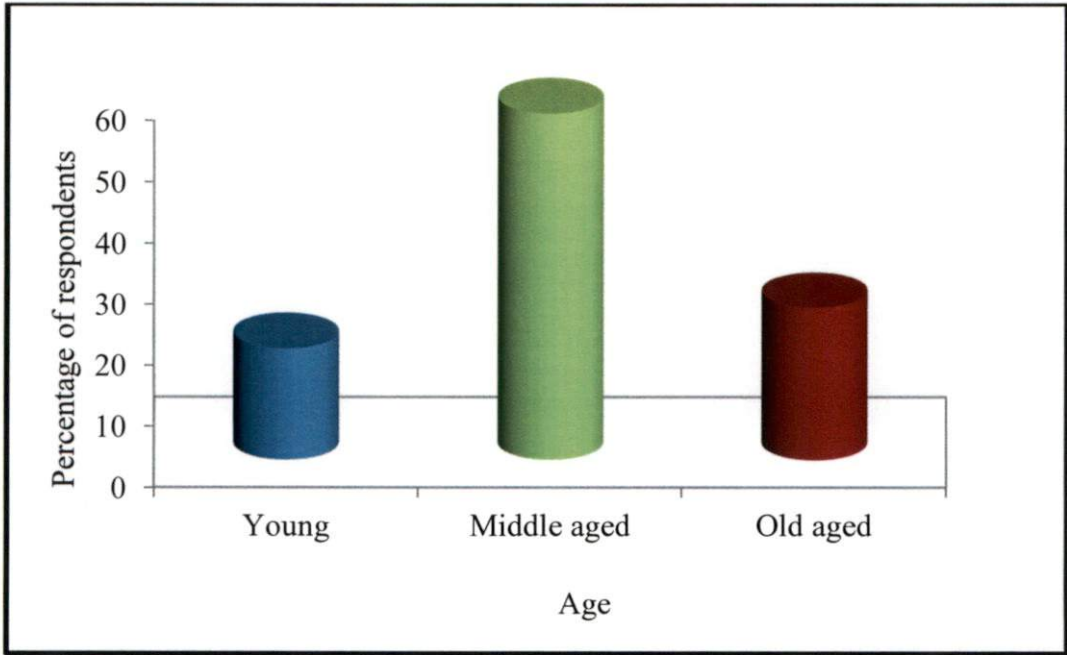


Fig. 2. Distribution of respondents according to their age

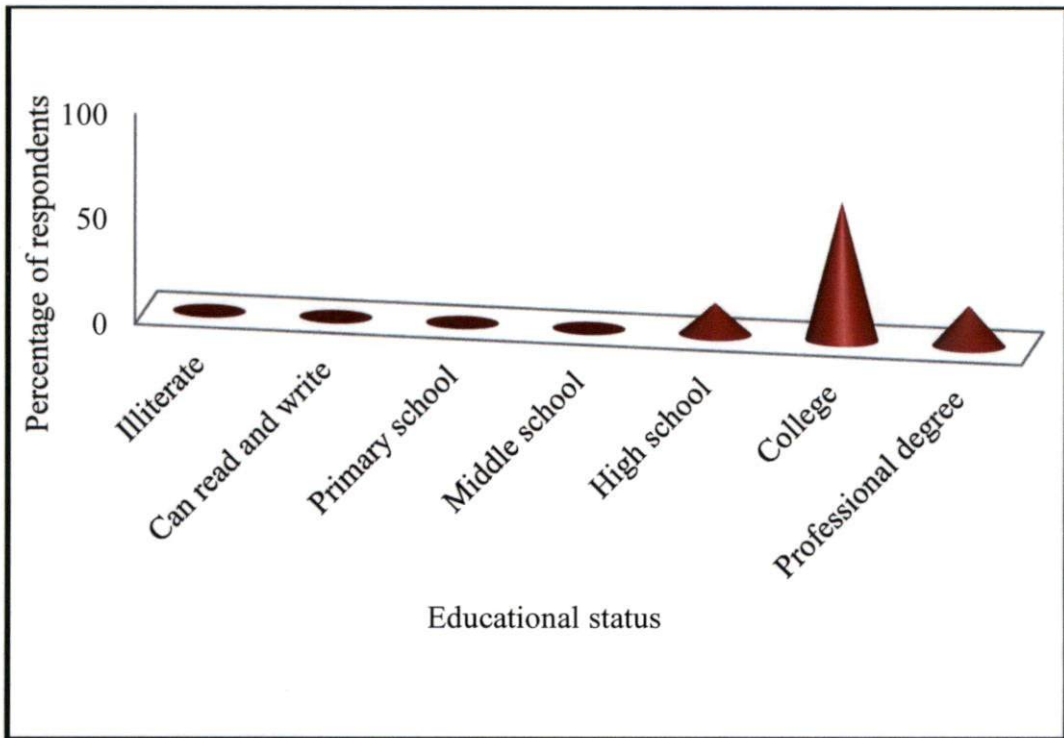


Fig. 3 Distribution of respondents according to their educational status

4.1.3 Annual income

Table 3. Distribution of respondents according to their annual income

(n=120)

Sl.No.	Annual Income (₹)	Frequency	Percentage
1	< 2,00,000	18	15.00
2	2,00,000 to 3,00,000	23	19.17
3	3,00,000 to 4,00,000	32	26.67
4	> 4,00,000	47	39.17
Total		120	100.00
Range : ₹ 1,50,000 – ₹ 6,00,00			

The annual income is operationally defined as to the earnings of respondent per annum. From the Table 3, it is clear that 39.17 per cent of the respondents were having an annual income of more than 4 lakh rupees, 26.67 per cent were having an annual income between 3 to 4 lakhs, 19.17 per cent had 2 to 3 lakhs and 15 per cent had less than 2 lakhs as annual income (Fig. 4).

Average annual income of urban families was comparatively higher than that of rural families. So it is no doubt that, they had the purchasing power for the inputs required for house terrace cultivation.

4.1.4 Innovation proneness

Table 4. Distribution of respondents according to their innovation proneness

(n=120)

Sl. No.	Category	Frequency	Percentage
1	Low (<Q1)	22	18.33
2	Medium (Q1 – Q3)	63	52.50
3	High (>Q3)	35	29.17
Total		120	100.00
Q1= 15		Q3 = 19.5	Range = 14 - 20

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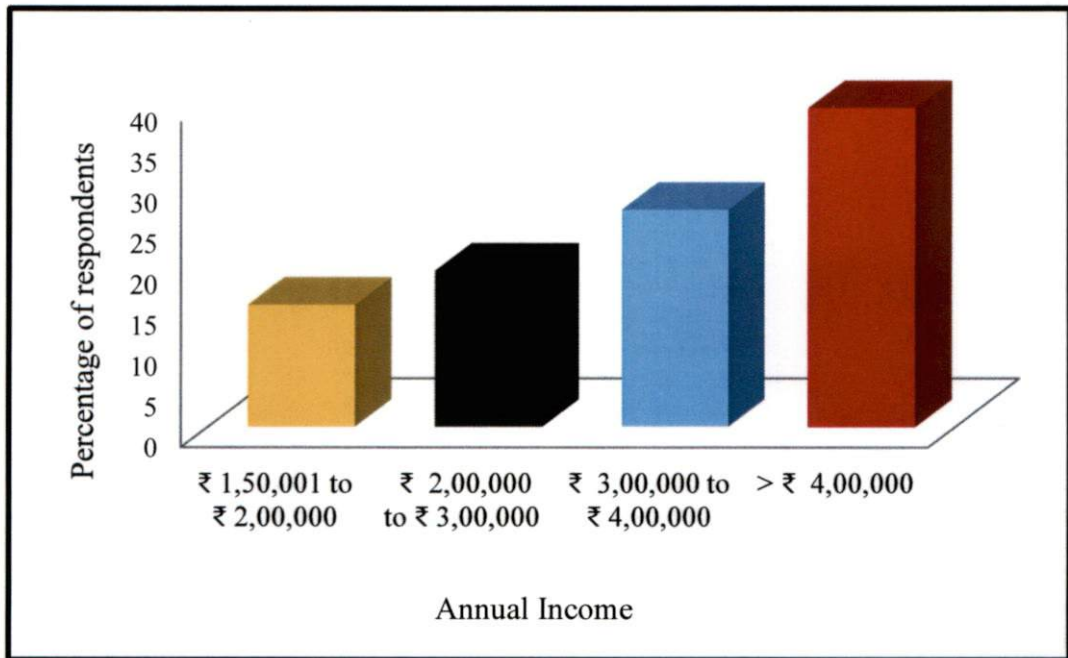


Fig. 4 Distribution of respondents according to their annual income (₹).

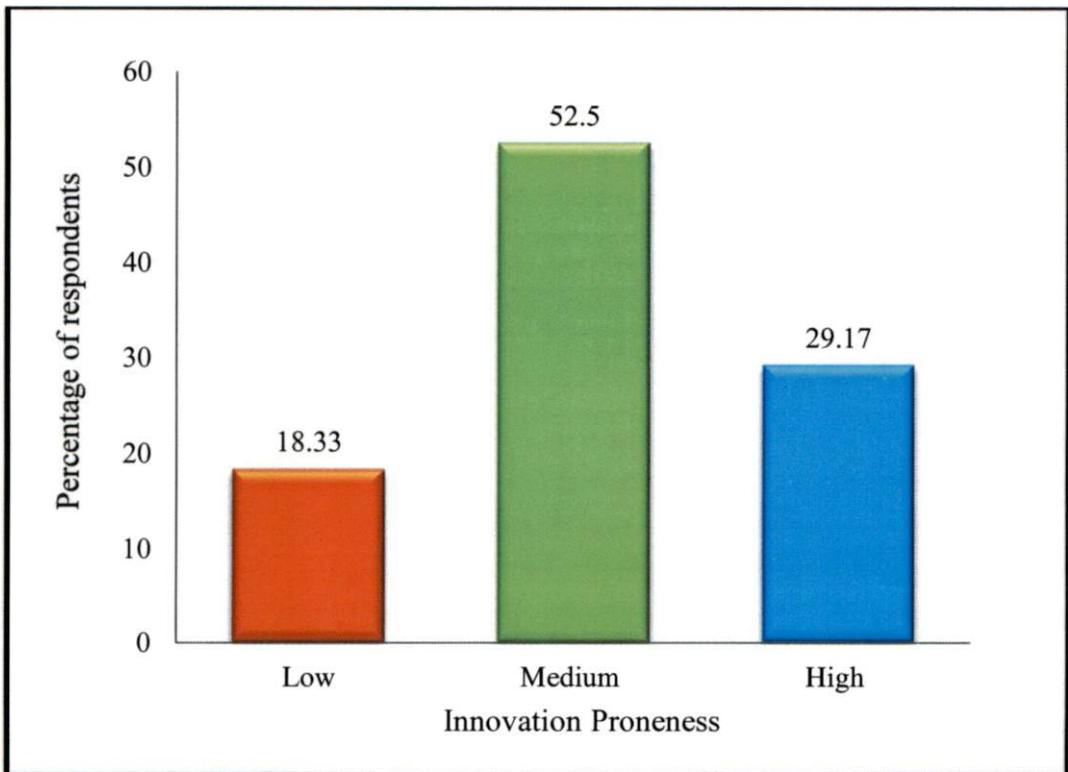


Fig. 5 Distribution of respondents according to their innovation proneness

The Table 4 shows that majority of the respondents fell under medium innovation proneness category with 52.50 per cent. It was followed by high and low category with 29.17 and 18.33 per cent respectively (Fig. 5).

4.1.5 Risk orientation

Table 5. Distribution of respondents according to their risk orientation

(n=120)			
Sl. No.	Category	Frequency	Percentage
1	Low (<Q1)	27	22.50
2	Medium(Q1- Q3)	61	50.83
3	High (>Q3)	32	26.67
Total		120	100.00
Q1 =20		Q3= 22	Range = 18 - 24

It is evident from the Table 5 that half of the respondents belonged to medium category of risk orientation. It was followed by high and low category with 26.67 and 22.50 per cent respectively (Fig. 6).

4.1.6 Economic motivation

Table 6. Distribution of respondents according to their economic motivation

(n=120)			
Sl. No.	Category	Frequency	Percentage
1	Low (<Q1)	22	18.33
2	Medium (Q1- Q3)	66	55.00
3	High (>Q3)	32	26.67
Total		120	100.00
Q1 = 17		Q3 = 25	Range = 16 - 26

The perusal of Table 6 reveals that majority of the respondents (55 per cent) had medium economic motivation followed by high and low economic motivation with 26.67 and 18.33 per cent respectively (Fig. 7).

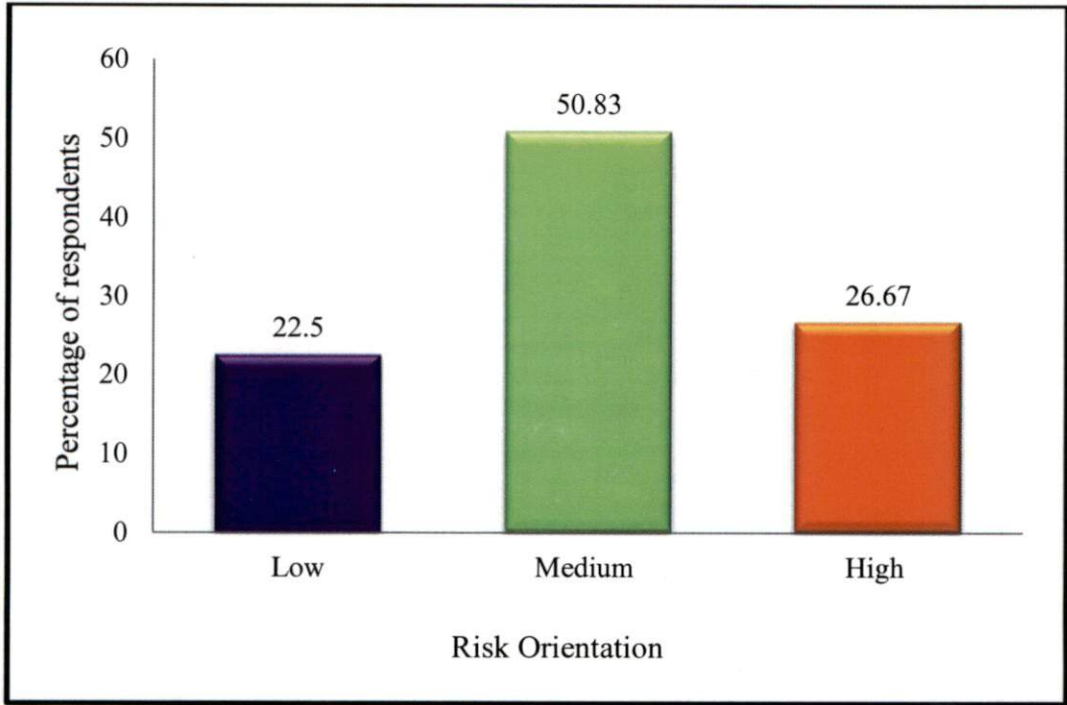


Fig. 6. Distribution of respondents according to their risk orientation

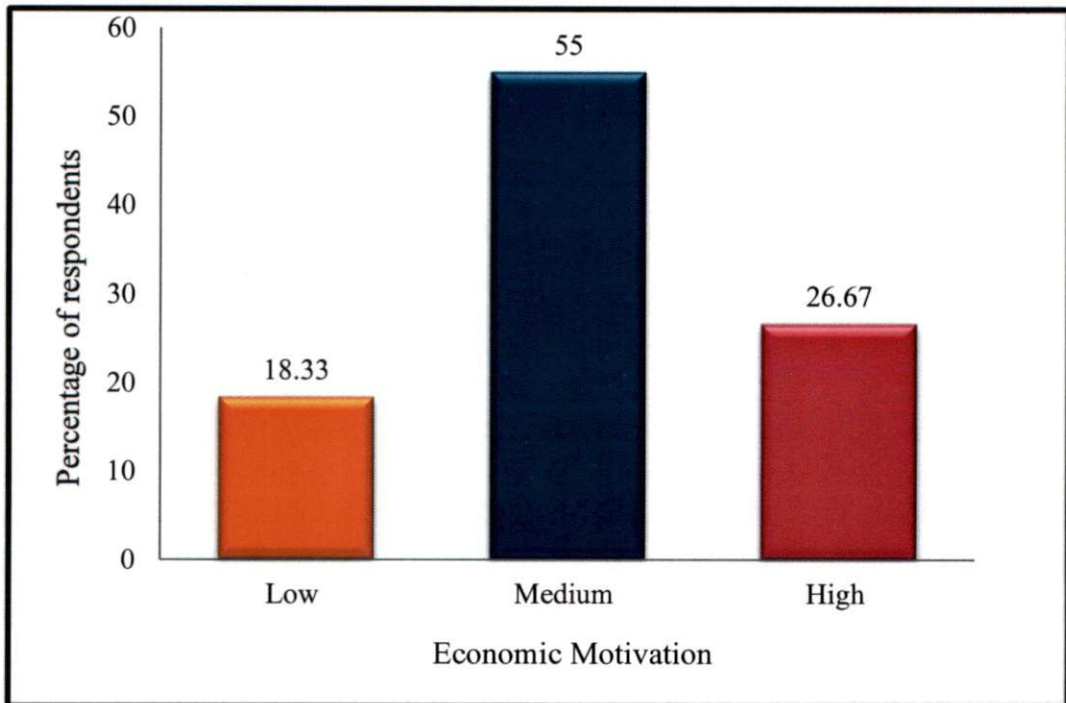


Fig.7. Distribution of respondents according to their economic motivation

4.1.7 Extension agency contact

Table 7(a). Distribution of respondents based on their extension agency contact
(n=120)

Sl. No.	Category	Frequency	Percentage
1	Low (<Q1)	12	10.00
2	Medium (Q1- Q3)	63	52.50
3	High (>Q3)	45	37.50
Total		120	100.00
Q1= 8		Q3 = 10	Range = 6 - 12

It is clear from the Table 7 (a) that half per cent of the respondents (52.50 per cent) had medium extension agency contact and 37.50 per cent fell in high and 10 per cent in low extension agency contact. This might be due to their positive nature to health consciousness and their quest in knowledge of new practices and technologies in house terrace cultivation. .

Table 7(b). Distribution of respondents based on their frequency of extension agency contact

Sl. No.	Institutions	Regularly		Occasionally		Never	
		F	%	F	%	F	%
1	Krishi Bhavan	67	55.83	37	30.83	16	13.33
2	KVK	0	0.00	30	25.00	90	75.00
3	KAU	32	26.67	67	55.83	21	17.50
4	VFPCCK	28	22.33	53	60.83	39	32.50
5	Others	30	25.00	57	47.50	33	27.50

The perusal of Table 7 (b) shows that the 55.83 per cent of the respondents had regular contact with Krishi Bhavan followed by Kerala Agricultural University and other institutions like Kerala Irrigation Infrastructure Corporation Limited and State Horticulture Mission and VFPCCK (Vegetable Fruit Promotion

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Council Kerala) with 26.67, 25 and 22.33 per cent respectively. None of the respondents had regular contact with KVK (Krishi Vigyan Kendra).

4.1.8 Family labour utilization

Table 8. Distribution of respondents according to their family labour utilization (n=120)

Sl. No.	Category	Frequency	Percentage
1	Low (<Q1)	24	20.00
2	Medium (Q1-Q3)	67	55.83
3	High (>Q3)	29	24.17
Total		120	100.00
Q1 = 28		Q3 = 38	Range = 25 - 40

From the Table 8, it is clear that majority of the respondents (55.83 per cent) had medium utilization of family labour. The utilization of family labour helped in the success of house terrace cultivation, which resulted in good benefit cost ratio. Involvement in house terrace cultivation by the members of family increases the bonding between family members and the findings are in confirmation with the findings of Nair (2015) who reported that all the respondents were happy.

4.1.9 Knowledge on house terrace cultivation

Table 9. Distribution of respondents based on their knowledge on house terrace cultivation

Sl. No.	Category	Frequency	Percentage
1	Low(< μ)	25	20.83
2	High($\geq\mu$)	95	79.17
Total		120	100.00
Mean(μ) = 16.96		Range = 10 - 20	

55

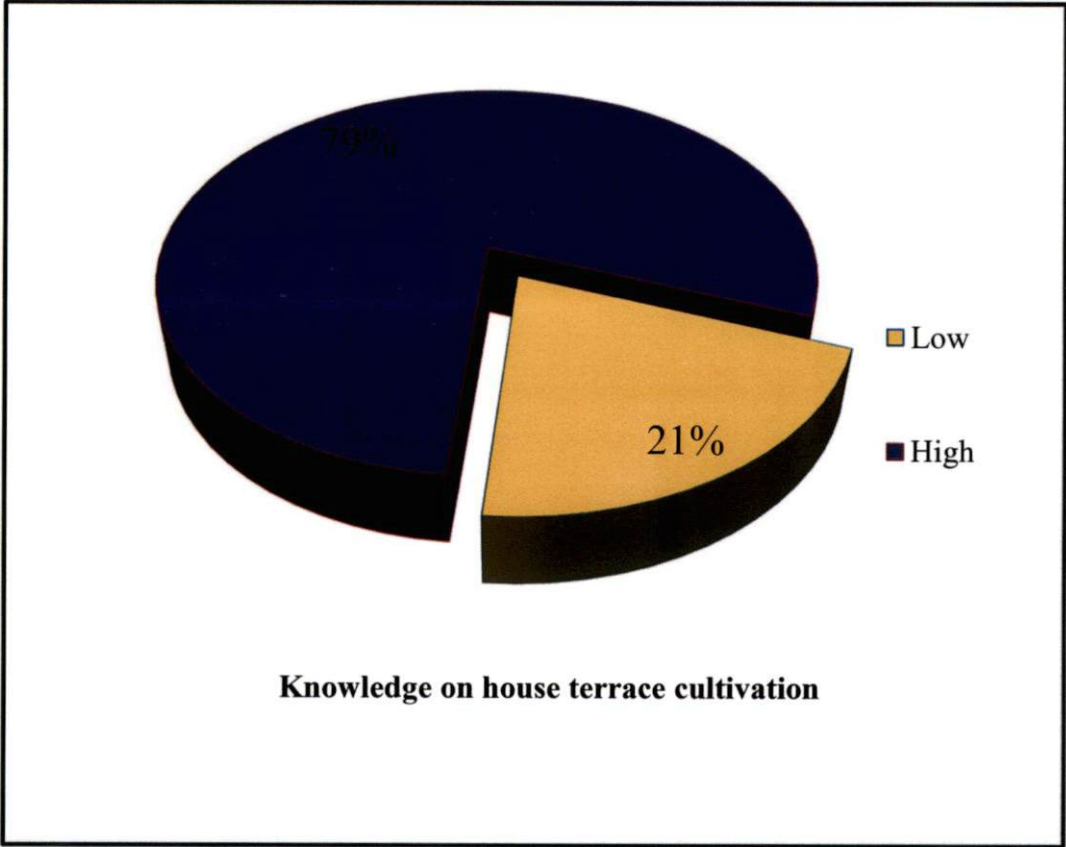


Fig. 8. Distribution of respondents based on their knowledge on house terrace cultivation

From the Table 9, it is clearly seen that 79.17 per cent of the respondents had high knowledge and only 20.83 per cent had low knowledge on house terrace cultivation (Fig. 8).

4.2 EXTENT OF AWARENESS OF RECOMMENDED PRACTICES FOR HOUSE TERRACE CULTIVATION

Table 10. Distribution of respondents based on their extent of awareness regarding house terrace cultivation

Sl. No.	Category	Frequency	Percentage
1	Low (<Q1)	22	18.33
2	Medium(Q1 – Q3)	58	48.33
3	High(> Q3)	40	33.34
Total		120	100.00
Q1 = 68.75		Q3 = 75.00	Range = 64 - 82

From the Table 10 and Fig. 9, it is clear that 48.33 per cent of the respondents belonged to medium category followed by 33.34 per cent in the high category and 18.33 per cent in the low category of extent of awareness regarding house terrace cultivation. Majority of the respondents belonged to medium category of awareness. It might be due to local government interventions which played a proactive and coordinating role in the urban development by integrating the agricultural activities into it. The results are in confirmation with reports of Waghmare *et al.* (1998) and Bandole (2011).

From the Table 11, it is clear that all the recommended practices regarding house terrace cultivation in the 'package of practices recommendations (*ad hoc*) for organic farming: crops' were known by the respondents. 'Potting mixture with soil, sand and cowdung in the ratio of 2:1:1', 'collection and destruction of pest (eggs, larvae, pupae) and disease affected plants to decrease the pest and disease incidence' and 'use of kitchen wastes as manures helps in household waste utilization' were ranked 1, 2 and 3 respectively. The respondents were least aware

Table 11. Awareness on farming practices in house terrace cultivation

Sl. No.	Practices	F	%	Rank
1	Potting mixture with soil, sand and cowdung in 2:1:1 ratio	117	97.50	1
2	Collection and destruction of pest (eggs, larvae, pupae) and disease affected plants to decrease the pest and disease incidence.	113	94.17	2
3	Use of kitchen waste as manure helps in household waste utilization	112	93.33	3
4	Use of botanical pesticides reduces the pest incidence	110	91.67	5
5	Drip irrigation has high water use efficiency	90	75.00	4
6	Changing the position of bricks and sacks after cultivation for preventing leakage of the building	89	74.17	6
7	Placement of sacks on bricks reduces the water leakage of the building	86	71.67	7
8	Use of hand sprayer ensures the plant protection and crop growth	61	50.83	8
9	Application of bio-control agents reduces the pest incidence	59	49.17	9
10	Use of coirpith as growing media improves the water holding capacity	50	41.67	10
11	Crop rotation with pulse crop in each sack improves the soil productivity	30	25.00	11
12	Hydroponics is a novel technique for growing crops	26	21.67	12
13	Vertical garden structures helps in space utilization	25	20.83	13
14	Azolla cultivation can be incorporated with terrace cultivation	24	20.00	14
15	Application of PGPR (Plant Growth Promoting Rhizobacteria) mix I enhances the nutrient in growing media	23	19.17	15
16	Poultry rearing in terrace creates additional income to the family	22	18.33	16

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on 'application of PGPR (Plant Growth Promoting Rhizobacteria) mix I' and 'poultry rearing on house terraces' which were ranked 15 and 16 respectively.

4.3 EXTENT OF ADOPTION OF RECOMMENDED PRACTICES FOR HOUSE TERRACE CULTIVATION

Table 12. Distribution of respondents based on the extent of adoption of farming practices in house terrace cultivation

(n=120)			
Sl. No.	Category	Frequency	Percentage
1	Low (<Q1)	22	18.33
2	Medium (Q1 - Q3)	65	54.17
3	High (>Q3)	33	27.50
Total		120	100.00
Q1 = 60.41 Q3= 70.31			

It is clear from the Table 12 that 54.17 per cent of the respondents belonged to medium category, 27.50 per cent in the high category and 18.33 per cent in the low category of extent of adoption of practices recommended for house terrace cultivation (Fig. 10). Majority of the respondents came under medium category and this may be due to their access to knowledge and emerging technology. The outcome of the technology transfer is the respondent's adoption and bringing that into practice. The results are similar to the findings of Bandole (2011).

From the Table 13, it is clear that the practices –'use of potting mixture with soil, sand and cowdung in the ratio of 2:1:1', 'use of kitchen wastes as manures' and 'application of botanical pesticides to reduce the pest incidence' were ranked 1, 2 and 3 respectively by the respondents. It is interesting to note that, 'azolla cultivation' and 'application of PGPR (Plant Growth Promoting Rhizobacteria) mix I' were not adopted by the respondents. It might be due to the fact that the extension agencies gave less orientation to respondents towards these

Table 13. Adoption of farming practices in house terrace cultivation

Sl. No.	Practices	F	%	Rank
1	Potting mixture is soil, sand and cowdung in 2:1:1 ratio	115	95.83	1
2	Use of Kitchen waste is used as manures	81	67.50	2
3	To reduce the pest incidence, botanical pesticides are used	80	66.67	3
4	Pest and disease incidence are reduced by collecting and destructing the pest (eggs, larvae, pupae) and disease affected plants	70	58.33	4
5	Drip irrigation is used to increase the water use efficiency	57	47.5	8
6	The position of bricks and sacks, after each cultivation are changed	68	56.67	5
7	To prevent water leakage on the building, sacks are placed on bricks	66	55.00	6
8	Hand sprayer is used for spraying	61	50.83	7
9	Bio-control agents are used to reduce the pest incidence	51	42.50	9
10	To improve the water holding capacity, coirpith is used as growing medium	29	24.17	10
11	Crop rotation with pulse crop in each sack	23	19.17	11
12	Poultry rearing	10	8.33	12
13	Crops are raised in hydroponics method	6	5.00	13
14	For proper limited space utilization, vertical garden structures are used	5	4.17	14
15	Azolla cultivation	0	0.00	15
16	To enrich the nutrients in growing media, PGPR (Plant Growth Promoting Rhizobacteria) mix I is applied	0	0.00	15

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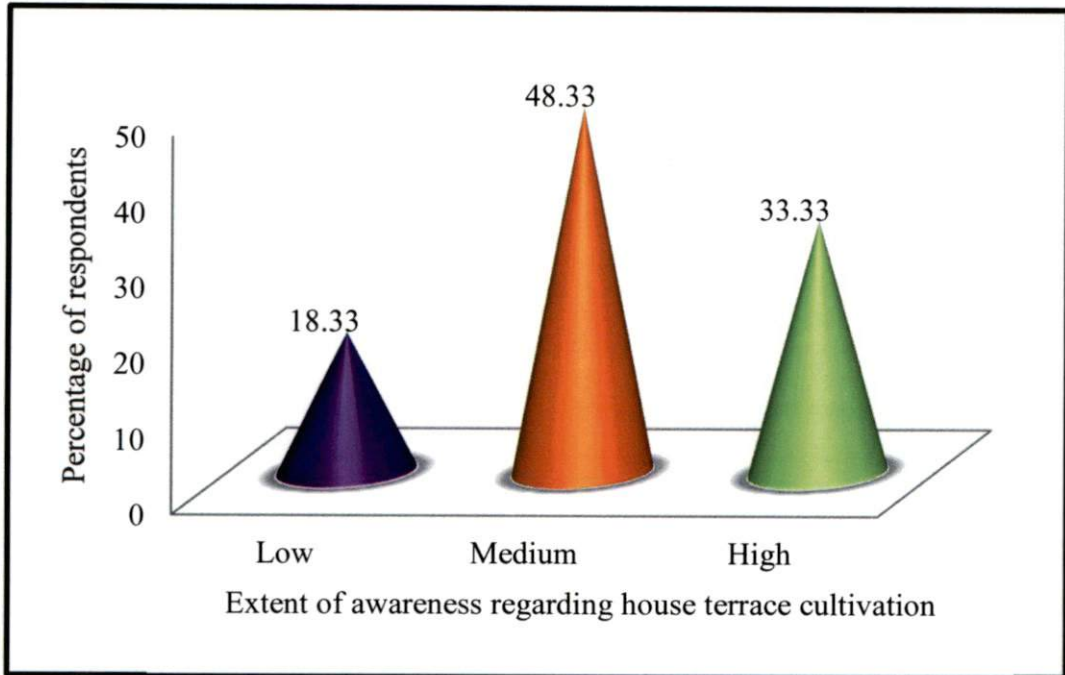


Fig 9. Distribution of respondents based on their extent of awareness regarding house terrace cultivation

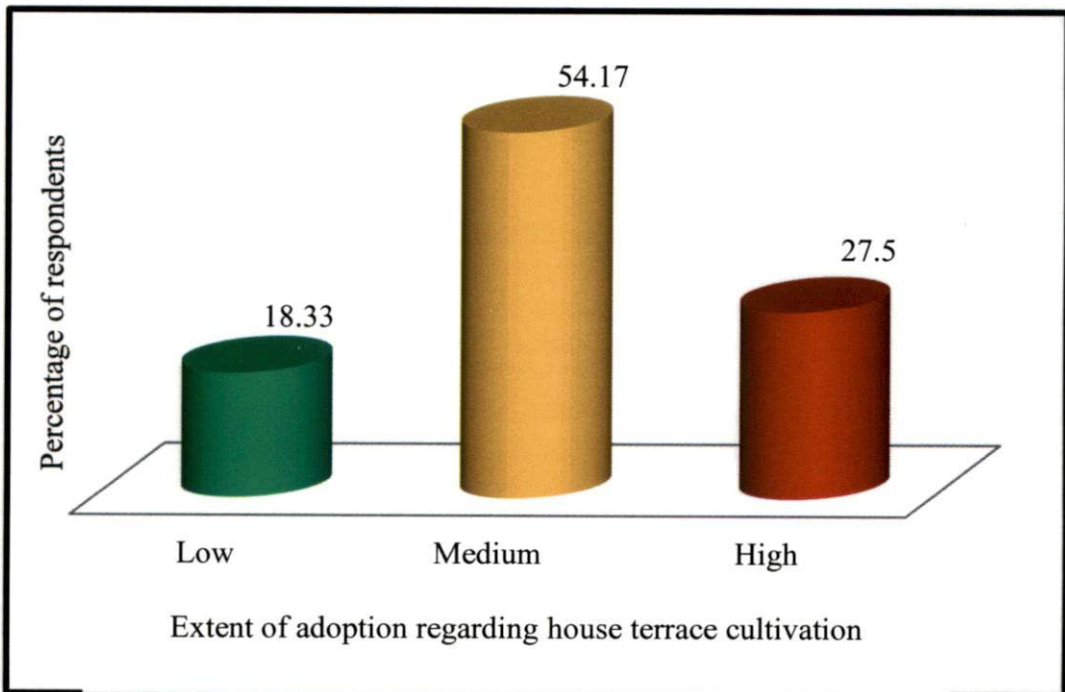


Fig. 10. Distribution of respondents based on the extent of adoption of farming practices in house terrace cultivation

practices and naturally they were unaware about the possibility and benefit of using these practices.

4.3.1 Categorisation of respondents based on adoption of recommended practices on house terrace cultivation

The respondents were categorised into different adopter categories based on the adoption of recommended practices on house terrace cultivation as explained by Rogers (1983) namely, innovators, early adopters, early majority, late majority and laggards.

Table 14. Categorisation of respondents based on adoption of recommended practices on house terrace cultivation

(n=120)

Category	Score range	Frequency	Percentage of respondents	Rogers's standard curve (%)
Innovators	<48.91	2	1.67	2.50
Early adopters	48.91-56.72	26	21.67	13.50
Early majority	56.73-64.54	41	34.16	34.00
Late majority	64.55-72.35	34	28.33	34.00
Laggards	>72.35	17	14.17	16.00
Total		120	100	

Table 14 depicts the categorisation of respondents based on adoption of recommended practices on house terrace cultivation with respect to Roger's adoption curve. It is clear that the percentage of innovators was 1.67 per cent which was less than 2.5 per cent of standard Rogers curve. Early adopters were 21.67 per cent which is greater than 13.5 per cent of the Rogers curve. Early majority were 34.16 per cent which is in conformation with 34 per cent of the standard Rogers curve. Late majority were 28.33 per cent which was less than 34 per cent of the Rogers curve. Laggards constituted 14.17 per cent which was less than 16 per cent of standard Rogers curve (Fig. 11). The high percentage of

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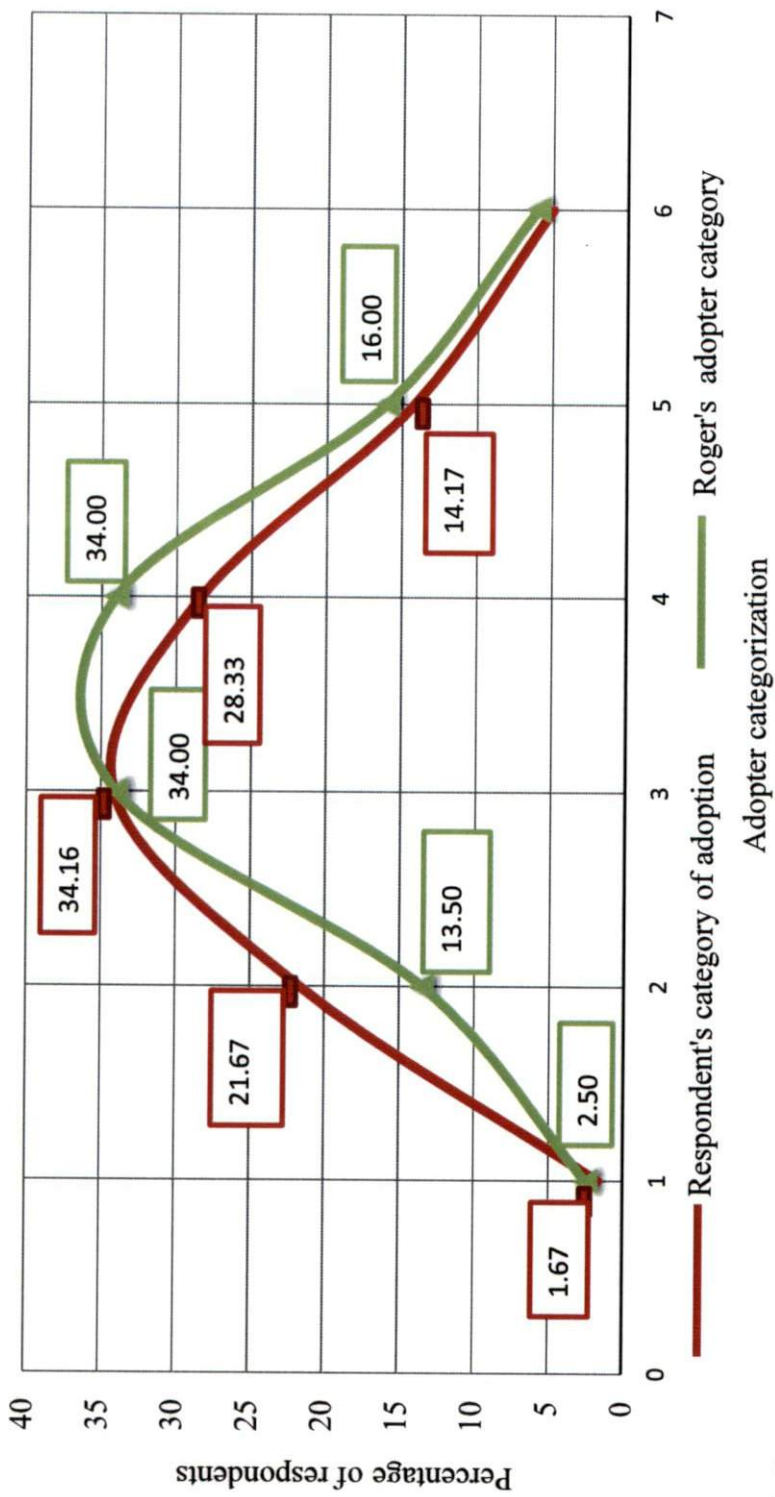


Fig. 11 Categorisation of respondents based on adoption of recommended practices on house terrace cultivation with respect to Roger's adoption curve.

1 - Innovators, 2 - Early adopters, 3 - Early majority, 4 - Late majority, 5 - Laggards

respondents in early adopters and low percentage in late majority is a good indicator of adoption.

4.4 HEALTH CONSCIOUSNESS OF URBAN HOUSEHOLDS INVOLVED IN HOUSE TERRACE CULTIVATION

Table 15. Distribution of respondents based on their health consciousness

Sl. No.	Category	Frequency	Percentage
1	Low (<Q1)	15	12.50
2	Medium (Q1 – Q3)	73	60.83
3	High (>Q3)	32	26.67
Total		120	100.00
Q1 = 24		Q3 = 28	Range = 20 - 30

From the Table 15, it was inferred that 60.83 per cent of the respondents belonged to medium category followed by 26.67 per cent in the high category and 12.50 per cent in the low category of health consciousness (Fig. 12). This might be due to the fact that, the respondents were aware about the pesticide residual effect leading to higher level of health consciousness.

4.5 BENEFIT COST RATIO OF HOUSE TERRACE CULTIVATION

Table 16. Distribution of respondents according to benefit cost ratio of farming on house terrace

Sl.No	BCR category	Frequency	Percentage
1	Low (<1.40)	18	15.00
2	Medium(1.40-2.37)	69	57.50
3	High(>2.37)	33	27.50
Total		120	100.00
Q1 = 1.40		Q3 = 2.37	Range = 1.37 – 2.46

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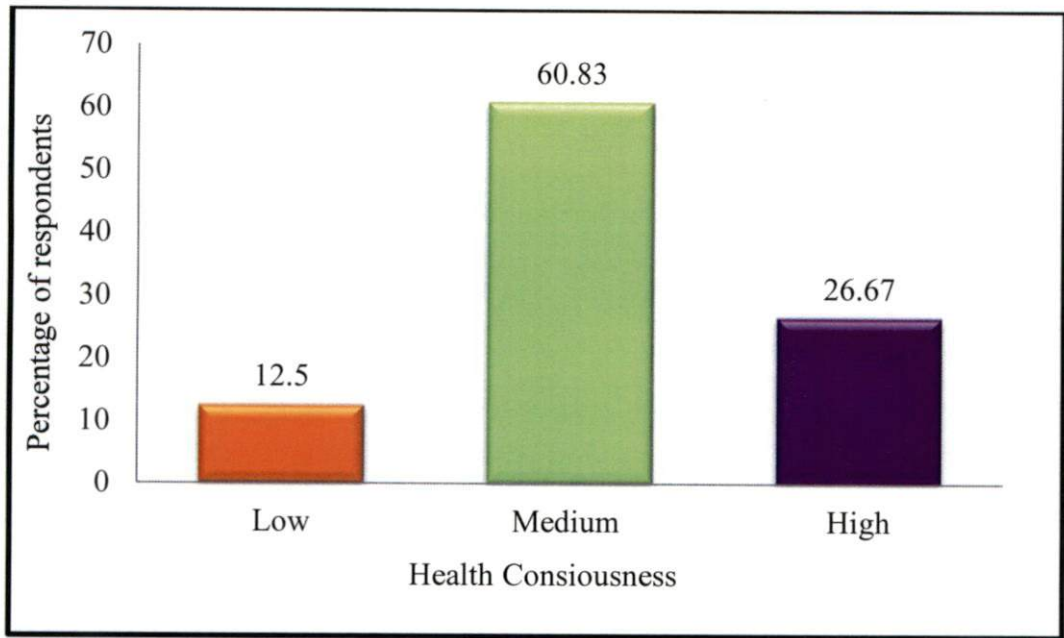


Fig. 12 Distribution of respondents involved in house terrace cultivation based on their health consciousness

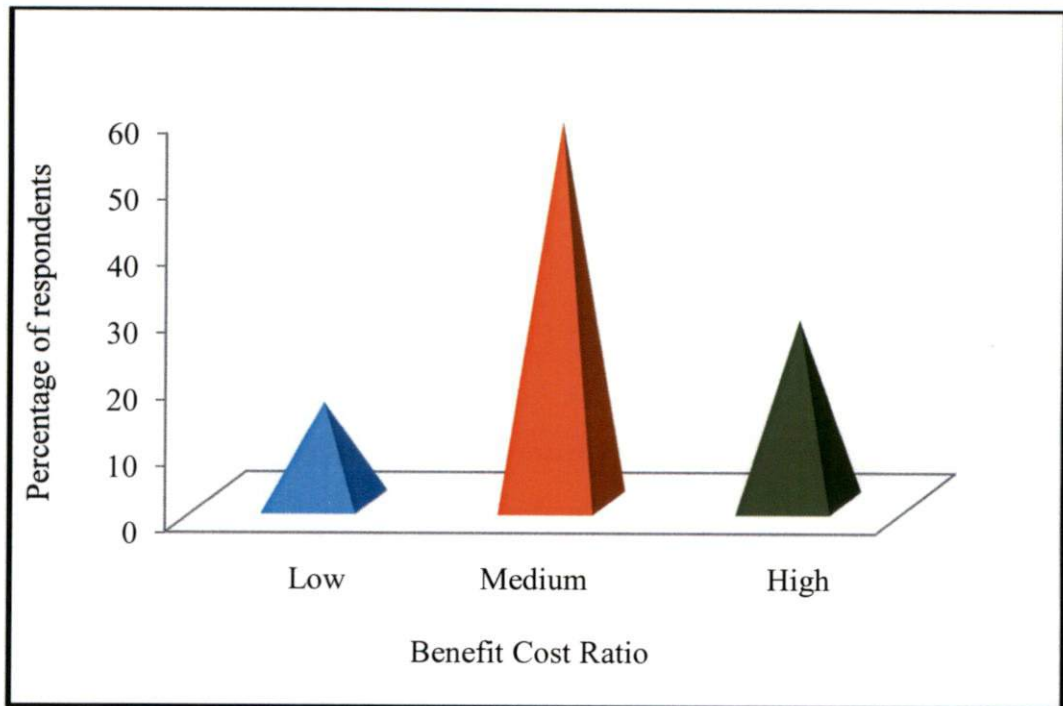


Fig. 13 Distribution of respondents according to benefit cost ratio

It is clear from the Table 16 that majority of the respondents (57.50 per cent) came under the BCR category of 1.40 - 2.37, 27.50 per cent of the respondents were having higher BCR greater than 2.37 and 15 per cent possessed BCR less than 1.40 (Fig. 13).

Benefit cost ratio was clear indication of respondent's profit and indirect satisfaction they gained from house terrace cultivation. All the respondents had BCR more than one. It can be inferred that they prefer the technology with low input but high benefit, and ensure high productivity. This finding is in confirmation with Truong and Ryuichi (2002).

4.6 RELATIONSHIP BETWEEN INDEPENDENT VARIABLES AND DEPENDENT VARIABLES

4.6.1 Relationship between profile characteristics of the respondents and awareness on house terrace cultivation

Table 17. Relationship between profile characteristics of the respondents and awareness on house terrace cultivation

Variable No.	Profile characteristics	Correlation coefficient
X ₁	Age	0.153 NS
X ₂	Educational status	0.344**
X ₃	Annual income	0.193 NS
X ₄	Innovation proneness	0.351**
X ₅	Risk orientation	0.222*
X ₆	Family labour utilization	0.227*
X ₇	Extension agency contact	0.284**
X ₈	Economic motivation	0.224*

(* - Significant @ 5% level ** - Significant @ 1% level NS –Non Significant)

On computing the correlation between extent of awareness regarding house terrace cultivation and profile characteristics, it was found that extent of awareness had positive and significant correlation with the variables like educational status, knowledge on house terrace cultivation, innovation proneness, family labour utilization, risk orientation, economic motivation and extension agency contact.

In the case of educational status, with the increase in education of the respondents the level of extent of awareness was found to increase. This might be due to the fact that the higher education enabled the respondents to have an increased exposure to the various awareness programmes shown through the mass media.

With increase in innovation proneness the extent of awareness would increase. This might be due to the fact that the eagerness of the respondents to accept new innovations.

Risks are always associated with any innovations. Only when the respondents are highly aware about the risks associated with the cultivation they can seldom reduce the same, hence it was seen that the extent of awareness was highly correlated with the risk orientation.

Family labour engaged in house terrace cultivation was found to be in medium level. It implies that the awareness regarding the house terrace cultivation practices engaged other members in the urban household to contribute their performance in producing the crop yield.

Awareness and extension agency contact had positive and significant relationship. Initiatives of government and other extension agencies in promoting house terrace farming have created awareness among respondents and also informed about government subsidies, technology transfers and schemes.

Individual with awareness on house terrace cultivation would possess economic motivation. When the respondents are aware about the house terrace cultivation, they would possess a good view with respect to the expenditure on food.

4.6.2 Relationship between profile characteristics of the respondents and adoption of house terrace cultivation

The correlation between the profile characteristics of the respondents and adoption of house terrace cultivation were analysed using correlation analysis and the results were presented in the Table 18.

Table 18. Relationship between profile characteristics of the respondents and adoption of house terrace cultivation

Variable No.	Profile characteristics	Correlation coefficient
X ₁	Age	0.231*
X ₂	Educational status	0.290**
X ₃	Annual income	0.268**
X ₄	Knowledge on house terrace cultivation	0.288**
X ₅	Innovation proneness	0.241**
X ₆	Risk orientation	0.331**
X ₇	Family labour utilization	0.285**
X ₈	Extension agency contact	0.311**
X ₉	Economic motivation	0.282**

(* - Significant at 5% level

** - Significant at 1% level)

It is seen from the Table 18 that all the independent variables were found to have significant and positive relationship with the extent of adoption of house terrace cultivation.

In the case of age, it was found that with the increase in age, the extent of adoption was found to increase. This might be due to the fact that, as the age increases the respondents become mature and interact with others which leads to better confidence and adoption. This finding is in confirmation with Solanki (2014) in farmers of Surat district in Gujarat.

Education had a significant and positive relationship with the extent of adoption of farming on house terrace. Education might have helped the urban people to get more exposure to the outside social system which enabled them to adopt recommended practices on house terrace cultivation. Due to their increased knowledge on consumption of safe and fresh vegetables, the adoption might increase.

As annual income increases, the opportunity of getting information also increases. In other words, it increases the purchasing power of the individual for the sources of information like publications, attending the seminars, trainings etc. It is in confirmation with the findings of Truong and Ryuichi (2002) who reported that farmers having stable annual income believed in technologies.

With increase in the innovation proneness of the respondents, extent of adoption was found to increase. When a farmer becomes more innovative, he is more inclined towards the modern technologies. It is in confirmation with the findings of Reghunath (2016).

Risk orientation is the willingness of a respondent to take risks. A person who is willing to take risk is sure to adopt innovative agricultural practices on house terraces. This might be the reason for the positive correlation of risk orientation with extent of adoption of recommended practices of house terrace cultivation.

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Knowledge on house terrace cultivation refers to how to cultivate crop successfully in house terraces. This involves the knowledge of applying manures, control pests and diseases etc. A higher level of knowledge makes farmers to evaluate the practices more logically and makes them to take positive decisions on adoption of practices as is evident from observed significant relation between knowledge on house terrace cultivation and adoption of recommended practices. It is in confirmation with the findings of Manjusha (1999).

Involvement of family labour in house terrace cultivation reduces the cost of cultivation and also helps them to spend their time together. Obviously, this attitude reflected in every aspects of cultivation. This may be the reason for greater adoption by the respondents having more family labour utilization. It is in confirmation with the findings of Sreedaya (2004).

Extension agency contact is the most important factor for adoption of technology. Extension agents, by interacting with respondents, were able to convince them to adopt recommended innovations. This is in confirmation with the findings of Okoedo and Onemolease. (2009).

Respondents who invest their money in house terrace cultivation might take into account the relative advantage that occurs when he/she adopts the practices by saving the expenditure for the purchase of vegetables.

4.6.3 Relationship between profile characteristics of the respondents and health consciousness

Health consciousness is operationally defined as extent of consciousness of the respondent in dietary requirement, personal hygiene and environmental sanitation. The relationship between the profile characteristics of the respondents and health consciousness were analysed using correlation analysis and the results are presented in the Table 19

Table 19. Relationship between profile characteristics of the respondents and health consciousness

Variable No.	Profile characteristics	Correlation coefficient
X ₁	Age	0.228*
X ₂	Educational status	0.413**
X ₃	Annual income	0.229*
X ₄	Knowledge on house terrace cultivation	0.366**
X ₅	Innovation proneness	0.146 NS
X ₆	Risk orientation	0.247*
X ₇	Family labour utilization	0.192 NS
X ₈	Extension agency contact	0.323**
X ₉	Economic motivation	0.311**

(* - Significant at 5% level ** - Significant at 1% level NS- Not Significant)

It can be seen that the independent variables age, educational status, annual income, knowledge on house terrace cultivation, innovation proneness, risk orientation, extension agency contact and economic motivation were found to have significant and positive relationship with the health consciousness of the respondents.

It is obvious that as the age and education increases people become more conscious regarding their health. Better education might have helped them to get more exposure on pesticide residue and health hazards which might have motivated them to be more cautious about their health.

The knowledge regarding house terrace cultivation helps the respondents to be more aware about the practices for the production of fresh and safe vegetables which are completely organic. So, the knowledge regarding the house

terrace cultivation prompted them to produce healthy dietary preferences in their food menu and this may be the reason for positive and significant correlation

When people become health conscious, they resort to organic farming in quest of safe to eat foods. Since, organic farming is not profitable to an extent to raise crops with much yield, it is often considered as a risky venture by most of the respondents. Since they had medium level of risk orientation, they rely on organic farming to satisfy their health consciousness in their house terraces.

The economic foundation of health is confirmed to Maslow's hierarchy of needs that placed meeting basic physiological needs ahead of the pursuit of higher level health needs. The income gets reflected in their lives, diet, consumption level and access to health care resources. Thus the economic motivation and health consciousness were related. Urban people paid more attention to health and health care and have the economic capacity to develop their own way of life actively by accepting health care approaches like following a balanced diet.

Exposure to extension agency contact persuades the respondents to follow organic practices so that they will get vegetables devoid of pesticides. The respondents' preferred fresh, healthy and organic diet. This is a clear indication of relationship between extension agency contact and health consciousness of respondents.

4.6.4 Relationship between profile characteristics of the respondents and benefit cost ratio on house terrace cultivation

Benefit cost ratio is a clear indication of respondent's profit and indirect satisfaction they gained from house terrace cultivation. The relationship between the profile characteristics of the respondents and benefit cost ratio on house terrace cultivation were analysed using correlation analysis and the results are presented in the Table 20.

Table 20 Relationship between profile characteristics of the respondents and benefit cost ratio on house terrace cultivation

Variable No.	Profile characteristics	Correlation coefficient
X ₁	Age	0.138 NS
X ₂	Educational status	0.213*
X ₃	Annual income	0.253**
X ₄	Knowledge on house terrace cultivation	0.169 NS
X ₅	Innovation proneness	0.346**
X ₆	Risk orientation	0.337**
X ₇	Family labour utilization	0.132 NS
X ₈	Extension agency contact	0.313**
X ₉	Economic motivation	0.341**

(** -Significant @1 % level * - Significant @5% level NS- Non-Significant)

From the Table 20, it was found that benefit cost ratio of house terrace cultivation had positive and significant relationship with annual income, educational status, innovation proneness, risk orientation, economic motivation and extension agency contact.

The annual income facilitates people to invest their money on different agricultural activities and adopt more technologies that can enhance the yield obtained from house terrace cultivation. So it may result in higher benefit cost ratio.

It is obvious that persons with higher innovation proneness tend to adopt rain shelters, vertical farming structures and wick irrigation which are cost effective and produces good yield in limited area. So it might result in high benefit cost ratio.

Extension agency contact increase their knowledge and awareness level regarding new practices and technologies in house terrace cultivation. The adoption of such technologies might have led to the increase in returns which in turn would have led in high benefit cost ratio.

Respondents with high economic motivation might adopt technologies that can result in increased yield and might led to increase in higher benefit cost ratio. It is in confirmation with the findings of Zaman *et al.* (2010)

4.7 DOCUMENTATION OF FARMING PRACTICES IN HOUSE TERRACE CULTIVATION ADOPTED BY RESPONDENTS

The different practices adopted by the respondents are discussed under 11 subheadings and their percentages of adoption of improved practices are presented in Table 21.

4.1.1 Utilization of terrace area

Majority of the respondents were utilizing 50 – 75 per cent of area of the house terrace for the cultivation of crops. But 8.33 per cent of respondents were using house terrace for the poultry rearing along with crop cultivation.

4.1.2 Measures adopted to protect house terrace

Twenty five per cent of respondents had laid out *terracotta* tiles whereas 45 per cent used water proofing material 'Dr. Fixit' with 3 coating on the terrace floor. The respondents were cautious about containers that it does not come in direct contact with the terrace floor and hence they place them in bricks or in coconut shells.



4.1.3 Source of seeds

The different source of seeds for the cultivation were Krishi Bhavan, Kerala Agricultural University, VFPCCK, Horti Corp, exhibition stalls and from their previous crops.

4.1.4 Major crops cultivated on house terrace

The commonly cultivated crop was Amaranthus. It was followed by Bhindi, Cowpea, Chilli, Cabbage, Cauliflower, Brinjal, Tomato, Bitter gourd, Snake gourd etc. Banana, Tapioca, Ginger, Turmeric, Ash Gourd, Curry Leaf and Papaya were also cultivated.

4.1.5 Methods of planting crops on house terrace

The different methods of planting adopted by respondents included planting of crops on containers (100 %), planting directly on roof floors (12.50 %) (Plate 1) and 4.20 per cent of respondents were also constructed special structures for planting (Plate 2).

In specially constructed structures, at first, a silpaulin sheet was spread on the floor, above which arrays of bricks were arranged. Along its borders, coconut fronds with its concave side facing the bricks were placed. Inside the cavities so formed, a potting mixture with soil, sand and cowdung was filled and then crops were planted. Usually banana and papaya were planted in these structures (Plate 2).

4.1.6 Types of containers used

The different types of containers used by respondents for house terrace cultivation were white polybag size of 16'' x 10'' 500 gauge (Plate 3), Black poly bag size of 14'' x 10'' 200 gauge (Plate 4), clay pot (Plate 3), plastic sack, buckets (Plate 5) and other plastic containers (5 %) (Plate 6 and 7).

Table 21 (a) Adoption of farming practices by urban households involved in house terrace cultivation

(n = 120)

Sl. No.	Practices		F	%
1	Measures adopted to protect house terrace			
	a)	Laid out terracotta tiles	30	25.00
	b)	Coating of terrace with Dr. Fixit (3 Coat)	54	45.00
2	Methods of planting crops on house terrace			
	a)	On containers	120	100.00
	b)	Directly on roof floors	15	12.50
	c)	Specially constructed structures	5	4.20
3	Types of containers used			
	a)	White polybag size 16'' x 10'' 500 gauge	120	100.00
	b)	Clay pot	56	46.67
	c)	Black poly bag size 14'' x 10'' 200 gauge	40	33.33
	d)	Plastic sack	36	30.00
	e)	Buckets	28	23.33
	f)	Other Plastic containers	30	25.00
4	Methods of placing containers			
	a)	Containers placed on bricks	68	56.67
	b)	Containers placed on coconut shell	14	11.67
	c)	Containers placed on roof floor	32	26.67
	d)	Containers placed over the area of beam without bricks	6	5.00
5	Methods of irrigation in house terrace cultivation			
	a)	Irrigation using hoses, buckets and rose cans	59	49.11
	b)	Drip irrigation	57	47.50
	c)	Wick irrigation	4	3.33



Plate 1. Crops are planted directly on roof floors



Plate 2. Crops are planted on specially constructed structures



Plate 3. White poly bag size of 16'' x 10'' 500 gauge and clay pot used as containers



Plate 4. Black poly bag size of 14'' x 10'' 200 gauge used as containers



Plate 5. Plastic sacks and buckets used as containers



Plate 6. Plastic containers used for growing crops



Plate 7. Other container used for growing crops

4.1.7 Methods of placing containers

The different methods of placing containers were, keeping containers on bricks (56.67 %) (Plate 8), on coconut shell (11.67 %), directly on roof floor (26.67 %) and over the area of beam without any bricks.

4.1.8 Types of medium used for raising crops

The different types of medium used for raising crops were soil: sand: cowdung in 2:1:1 ratio, soil: cowdung in 2:1 ratio and coir pith alone as growing media by the respondents.

4.1.9 Methods of irrigation in house terrace cultivation

The different methods of irrigation followed by respondents on house terrace cultivation were watering their crops using hoses, buckets and rose can (49.11 %) (Plate 9), by means of drip irrigation (47.50 %) (Plate 10) and wick irrigation (3.33 %) (Plate 11).

4.1.10 Types of manures used in house terrace cultivation

Majority (90 %) of the respondents used organic manure for house terrace cultivation. Different types of manures used by the respondents which were prepared at home viz., kitchen waste (75 %) (Plate 12), Panchagavya (50 %) (Plate 13), Jeevamruthum (25 %), Pipe compost (25%), Fish amino acid (20.83 %) and fermented plant juice extract (16.67 %) (Plate 14). The purchased manures include cow dung (100 %), neem cake (74.17 %), lime (43.33 %) and poultry manure (54.17 %). Ten per cent of respondents used chemical fertilizer called 'boon' (NPK mixture).

4.1.11 Plant protection measures adopted in house terrace cultivation

The different management practices against pests and diseases in house terrace cultivation include spraying of *Lecanicillium lecanii* (12.50 %) and

Table 21 (b) Adoption of plant nutrient management practices in house terrace cultivation

(n = 120)

Sl. No	Practices	F.	%
6	Types of manures used in house terrace cultivation		
	a) Manures prepared at home		
	1. Panchagavya	60	50.00
	2. Jeevamruthum	30	25.00
	3. Fish amino acid	25	20.83
	4. Fermented plant juice extract	20	16.67
	5. Pipe composting	30	25.00
	6. Vermi composting	32	26.67
	7. Kitchen waste	90	75.00
	b) Manures purchased		
	1. Cowdung	120	100.00
	2. Neem cake	89	74.17
	3. Lime	52	43.33
	4. Poultry manure	65	54.17
	5. Groundnut cake	32	26.67
	c) Chemicals		
	Boon	12	10.00

Table 21 (c). Adoption of plant protection management practices in house terrace cultivation

(n = 120)

Sl. No.	Practices	F	%	
7	Plant protection measures adopted in house terrace cultivation			
	a)	Spraying of Neem-oil garlic emulsion	90	75.00
	b)	Spraying of Neem leaf extract	30	25.00
	c)	Application of rice gruel	110	91.67
	d)	Application of <i>Pseudomonas</i>	72	60.00
	e)	Application of <i>Lecanicillium lecanii</i>	15	12.50
	f)	Application of <i>Beauveria</i>	25	20.83
	g)	Use of Yellow trap	30	25.00
	h)	Use of Cue lure trap	62	51.67
	i)	Application of Nanma	12	10.00
	j)	Application of Oxuron	60	50.00
	h)	Chemical measures		
		1. Application of Guard	16	13.33
		2. Spraying of Thiomethoxam (Actara)	3	2.50



Plate 8. Containers placed on bricks



Plate 9. Irrigation of crops using bucket and rose can



Plate 10. Drip irrigation



Plate11. Wick irrigation



Plate 12. Kitchen waste used as manure

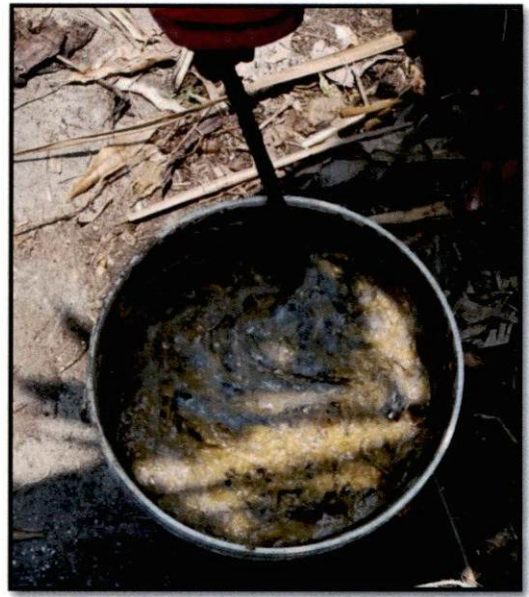


Plate 13. Panchagavya



Plate 14. Fermented plant juice extract used as manure

botanicals like Neem-oil garlic emulsion (75 %) and Neem leaf extract (25 %) against the sucking pests viz., white flies and mealy bugs. Apart from this, majority of the respondents used rice gruel (91.67 %) and *Beauveria* (20.83 %) against aphids. For preventing plant diseases, *Pseudomonas* (60 %) was used as seedling dip and foliar application. Different traps like yellow sticky trap (25 %) and Cue lure trap (51.67 %) (Plate 15) were also used in house terrace cultivation. An organic formulation named Oxuron was sprayed by 50 per cent of respondents at fortnightly intervals. Another organic formulation, Nanma extracted from tapioca was used (10 %) against banana pseudostem weevil. Chemicals such as Guard (insect repellent) and Thiomethoxam (Actara) were used by 13.33 per cent and 2.50 percent of respondents respectively.

4.8 INVENTORISATION OF AGENCIES PROMOTING HOUSE TERRACE CULTIVATION

The different agencies promoting house terrace cultivation in Thiruvananthapuram Corporation are Krishi Bhavan, State Horticultural Mission, Department of Environment and Climate Change, Kerala Irrigation Infrastructure Development Corporation and Integrated Farming System Research Station, Karamana.

4.8.1 Activities of inventorised agencies.

Krishi Bhavan provides 25 poly bags with potting mixture to the corporation residents at a cost of Rs. 500. This provision was implemented by the State Government.

State Horticultural Mission had an initiative which provides support to the house terrace cultivators by providing 30 grow bags with potting mixture and seedlings and a drip irrigation unit . This whole package costs Rs. 6,000 but it is made available to the beneficiaries at a reduced cost of Rs. 2,000. This is mainly implemented through Krishi Bhavan in Thiruvananthapuram Corporation.



Plate 15. Traps used by the respondents (a) Yellow sticky trap (b) Cue lure trap

Another nodal institution was Department of Environment and Climate Change which also provides aids to the house terrace cultivators through Krishi Bhavan by providing 40 grow bags along with potting mixture, seedlings, drip irrigation and other inputs. The other inputs includes *Pseudomonas*, *Beauveria*, organic fertilizers, vermi compost, three litre capacity knapsack sprayer, bio insecticides and bio gas unit with 0.75m³. Grow bags with bush pepper and ginger planted in it was also provided. These are supplied to the stakeholders through karshika karma sena. Along with this, financial support was also provided to the Urban Environmental Improvement Project of the Kerala Irrigation Infrastructure Corporation Limited.

Another agency promoting house terrace cultivation was Kerala Irrigation Infrastructure Development Corporation (KIIDC) Limited located at Kumarapuram which, as a part of Urban Environmental Improvement Project supplies 25 grow bags with seeds and other inputs like *Beauveria*, *Pseudomonas*, pheromone trap, neem oil, spade, hand raker, sprayer and drip irrigation to the cultivators. The cost of basic package was Rs. 10,000 with a Government subsidy of Rs. 7,000 and beneficiary contribution of Rs. 3,000. Apart from the basic package, a supplementary package with components like bio gas, water harvesting and water collection tank, vermi compost unit, mushroom unit, roof top ornamental and back yard fisheries and poultry unit was there with a Government subsidy of seventy percent of the actual cost. The total cost of supplementary package was Rs. 36,000 and beneficiary contribution of Rs. 10,500 for those opting for this package.

The Integrated Farming System Research Station of Kerala Agricultural University at Karamana imparts training on terrace gardening to several residents associations. They also developed an array of vertical farming models for the cultivation of vegetables.

Summary

5. SUMMARY

Urbanization has major impacts through changing life styles, livelihoods and patterns of consumption and generates increasing amounts of waste leading to increased levels of air, water and soil pollution within and outside cities. The enormous demand on urban food supply system result in the emergence of house terrace cultivation, which supplies food and satisfies the nutritional needs of the population. Keeping this in view, a study entitled “Techno-socio-economic analysis of house terrace cultivation in Thiruvananthapuram Corporation” was conducted among the urban households involved in house terrace cultivation with the following specific objectives:

1. To study the extent of awareness and adoption of the recommended practices for house terrace cultivation.
2. To examine the health consciousness of urban households and to find out the benefit cost ratio of house terrace cultivation.
3. To document farming practices adopted by the urban households involved in house terrace cultivation.
4. To inventorise various agencies promoting house terrace cultivation.

The study was conducted in six wards of Thiruvananthapuram Corporation namely, Poojappura, Nemom, Kudappanakunnu, Kazhakuttom, Vizhinjam and Kadakampally. One hundred and twenty members of urban households involved in house terrace cultivation were selected by random sampling.

A well-structured interview schedule was used for data collection from the respondents. Four dependent variables and nine independent variables were studied and analysed with the help of different statistical tools like mean, quartile deviation, frequency, percentage and correlation.

The dependent variables were the extent of awareness and extent of adoption of urban households regarding house terrace cultivation as recommended in the 'package of practices recommendations (*adhoc*) for organic farming: crops', health consciousness of respondents and cost benefit ratio of house terrace cultivation.

The independent variables identified for the study were age, educational status, annual income, knowledge on house terrace cultivation, innovation proneness, family labour utilization, risk orientation, economic motivation and extension agency contact.

The salient findings of the study are summarized and presented below.

1. The frequency distribution of profile characteristics of the urban households involved in house terrace cultivation in Thiruvananthapuram Corporation revealed that majority (56.67%) of the respondents belonged to the middle aged category having degree as educational status (65.83%) with an annual income greater than 4 lakhs (39.17%) and had medium category of innovation proneness (52.50%), family labour utilization (55.83%), risk orientation (50.83%), economic motivation (55%) and extension agency contact (52.50%). Most of the urban households had high knowledge (79.17%) on house terrace cultivation.
2. The extent of awareness on house terrace cultivation as recommended in *adhoc* package of practices for organic farming revealed that majority (48.33%) of the respondents belonged to medium level of awareness.
3. Regarding the extent of adoption on house terrace cultivation as recommended in *adhoc* package of practices for organic farming, 54.17% of respondents belonged to medium category. In the case of adoption of recommended practices, majority (40.83%) of respondents belonged to early majority adoption category followed by early adopters (25.83%), late majority (21.67%), laggards (10.83%) and innovators(1.67%)

4. More than half of the respondents (60.83%) belonged to medium level of health consciousness.
5. It was found that majority of the respondents (57.50%) had benefit cost ratio of 1.40 to 2.37.
6. Correlation studies showed that educational status, knowledge on house terrace cultivation, innovation proneness, family labour utilization, risk orientation, economic motivation and extension agency contact had positive and significant correlation with the extent of awareness on house terrace cultivation as recommended in adhoc package of practices for organic farming.
7. Age, educational status, annual income, knowledge on house terrace cultivation, innovation proneness, family labour utilization, risk orientation, economic motivation and extension agency contact had positive and significant relationship with extent of adoption on house terrace cultivation.
8. Results of the correlation studies on health consciousness of respondents revealed that age, annual income, educational status, knowledge on house terrace cultivation, risk orientation, economic motivation and extension agency contact had positive and significant relationship.
9. In the case of correlation with benefit cost ratio, the independent variables viz., annual income, educational status, innovation proneness, risk orientation, economic motivation and extension agency contact were found to be positively significant.
10. Major agencies promoting house terrace cultivation were Krishi bhavan, Kerala Irrigation Infrastructure Development Corporation, Integrated Farming System Research Station, Karamana, State Horticultural Mission and Department of Environment and climate change.
11. With regard to the various practices followed by the respondents, majority of the respondents were utilizing 50-75 per cent of area of the house terrace for

cultivation. To protect house terrace, they had laid out terracotta tiles, water proofing material 'Dr. Fixit', and avoid direct contact of the containers with the terrace floor. Major crops cultivated in house terrace were amaranthus, bhindi, cowpea, chilli, cabbage, cauliflower, brinjal, tomato, bitter gourd and snake gourd. Most of them planted their crops on their different containers like white polybag size of 16'' x 10'' having thickness 500 gauge, black poly bag size of 14'' x 10'' having thickness 200 gauge, clay pot, plastic sacks, buckets and other plastic containers. They used soil: sand: cowdung in 2:1:1 ratio as potting mixture. The different methods of irrigation employed were watering their crops using hoses, buckets and rose can, drip irrigation and wick irrigation. Different types of manures used were kitchen waste, panchagavya, jeevamruthum, pipe compost, fish amino acid, fermented plant juice extract, cow dung, neem cake, lime and poultry manure. Majority of the respondents used organic manure for house terrace cultivation. The different management practices against pests and diseases included botanical preparation like neem oil garlic emulsion and neem leaf extract, bio-control agents like *Lecanicillium lecanii*, *Beauveria* and *Pseudomonas* and different traps like yellow sticky trap and Cue lure trap.

Future line of research

The following aspects can be investigated in detail in future

1. Develop a package of practices for growing crops on house terraces
2. Validate various organic plant protection measures and indigenous technical knowledge suited to house terrace cultivation
3. Investigate the extent of house terrace cultivation to other corporations of Kerala.

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Appendices

APPENDIX I



KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE
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Date: 18-10-2016

Sir/Madam,

Ms. Greeshma Udayan (Ad. No. 2015-11-066), the post graduate scholar in the Department of Agricultural Extension, College of Agriculture, Vellayani is undertaking a research study entitled “**Techno - socio economic analysis of house terrace cultivation in Thiruvananthapuram Corporation**” as part of her research work. Variables supposed to have close association with the study have been identified after extensive review of literature.

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

Thanking you

Yours faithfully

(G. S. Sreedaya)

OBJECTIVES OF THE STUDY

The objective of the study is to identify the extent of awareness and adoption of house terrace cultivation as recommended in adhoc package of practices for organic farming. Health consciousness of the respondents, inventorisation of agencies promoting house terrace cultivation and documentation of various practices followed by the respondents will also be studied.

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

(1- Most Relevant, 2- More Relevant, 3- Relevant, 4- Less Relevant, 5-Least Relevant)

Sl. No.	Variables and their Operational definition	Relevancy rating				
		1	2	3	4	5
1	Age: Refers to the number of calendar years completed by the respondent at the time of enquiry					
2	Educational status: Refers to the highest academic qualification possessed by the respondent through formal and informal education					
3	Occupation: Defined as the professional status of respondents					
4	Family size: Refers to the number of family members in each respondent's household					
5	Annual income: Refers to the earnings of respondent per annum					
6	Family labour utilization: Refers to the extent of utilization of family members by the respondent in various operations on house terrace					
7	Awareness regarding house terrace cultivation: Defined as the extent of first-hand information possessed by the respondent on house terrace cultivation					

8	Knowledge on house terrace cultivation: Defined as the quantum of technical know-how possessed by the respondent on house terrace cultivation					
9	Attitude towards terrace cultivation of vegetables: Defined as the degree of positive or negative feeling possessed by the respondent on house terrace cultivation					
10	Innovation proneness: Refers to the behaviour pattern of respondent who has interest and desire to bring in sustainability in house terrace cultivation by introducing new techniques in crop selection and management					
11	Scientific orientation: Refers to the degree to which respondent is oriented to the use of scientific techniques for decision making in crop selection and its management					
12	Market orientation: Degree to which the respondent is oriented towards market <i>i.e.</i> , practices for marketing purposes like planning, production etc					
13	Risk orientation: Refers to the degree to which respondent was oriented towards encountering risks and uncertainty in adopting new ideas in vegetable cultivation					
14	Economic motivation: Refers to the extent to which respondent is oriented towards profit maximization and relative value he/she places on monetary gain					
15	Irrigation potential: Extent to which the respondent is able to irrigate his/her crop frequently					
16	Extension contact: Extent of support and services received by the respondent for house terrace cultivation from the various agencies promoting this type of cultivation					
17	Time utilization: Refers to the total amount of time					

	the respondent spends in a single day from bed to bed for various activities in hours					
18	Environmental soundness: Extent to which respondent were interested in environmental sanitation and ecological protection					
19	Social participation: Extent of participation of respondent in various formal social institutions either as a member or as an office bearer					
20	Health consciousness: Extent of consciousness of the respondent in dietary requirement, personal hygiene and environmental sanitation					
21	Diversification of products: Extent to which the products are diversified by the respondent as indigenous medicines, home remedies, alternative fuel source, manure, animal feed etc					
22	Cosmopolitaness: Refers to the degree to which respondent was oriented to his/her surrounding social system					
23	Exposure to mass media: Refers to the extent to which respondent use different media both print and electronic for developing his/her knowledge and skills for the improvement of house terrace cultivation					
24	Entrepreneurial behaviour: Refers to the ability of the respondent to exploit the opportunities and initiate an enterprise of his/her own for income generation					
25	Degree of renewability: Refers to the ability of respondent in using inputs for house terrace cultivation again and again					
26	Degree of simulation: Degree to which respondent is able to reproduce the new techniques learned in his/her own terrace cultivation					

APPENDIX II

The variables with their mean relevancy score

Sl. No.	Variables	Mean relevancy score
1.	Age	4.00*
2.	Educational status	4.00*
3.	Occupation	3.44
4.	Family size	3.22
5.	Annual income	3.71*
6.	Family labour utilization	3.74*
7.	Awareness regarding house terrace cultivation	4.33*
8.	Knowledge on house terrace cultivation	4.33*
9.	Attitude towards terrace cultivation of vegetables	3.33
10.	Innovation proneness	4.00*
11.	Scientific orientation	3.56
12.	Market orientation	3.33
13.	Risk orientation	3.76*
14.	Economic motivation	3.78*
15.	Irrigation potential	3.67
16.	Extension agency contact	4.00*
17.	Time utilization	3.28
18.	Environmental soundness	3.44
19.	Social participation	3.33
20.	Health consciousness	3.79*
21.	Diversification of products	3.33
22.	Cosmopolitaness	3.22
23.	Exposure to mass media	3.49
24.	Entrepreneurial behaviour	3.58
25.	Degree of renewability	3.11
26.	Degree of simulation	3.63
	Mean	3.70*

* - Selected variables for the study

APPENDIX III

TECHNO-SOCIO-ECONOMIC ANALYSIS OF HOUSE TERRACE CULTIVATION IN THIRUVANANTHAPURAM CORPORATION

INTERVIEW SCHEDULE

Date:

Ward:

Respondent No.:

1. Personal details:

Name :

Gender:

Address :

Email id:

Phone no.: –

2. Profile characteristics:

1. Age:

2. Educational status:

Illiterate/ Can read and write/ Primary school/ Middle school/ High school/
College/Professional degree

3. Main occupation:

4. Annual income (Rs):

5. Area of terrace:

6. Total expenditure for establishing house terrace cultivation (Rs.):

7. Expenditure for purchasing vegetables/week before starting house terrace cultivation (Rs.):

8. Reduction in expenditure/week for the purchasing of vegetables after starting terrace cultivation (Rs.):

3. Extent of awareness of farming on house terrace cultivation:

(Please indicate your extent of awareness and adoption with each of the following practices)

[FA- Fully Aware, PA- Partially Aware, NA- Not Aware]

[A- Adopted, PA- Partially Adopted, NA- Not Adopted]

Sl. No.	Practices	Are you aware?			Have you adopted?		
		FA	PA	NA	A	PA	NA
1	Potting mixture preparation with soil, sand and cowdung in 2:1:1 ratio						
2	Collection and destruction of pest (eggs, larvae, pupae) and disease affected plants						
3	Kitchen waste as manure						
4	Use of botanical pesticides						
5	Drip irrigation						
6	Changing the position of bricks and sacks after cultivation						
7	Placing sacks on bricks						
8	Use of hand sprayer						
9	Use of bio-control agents						
10	Use of coirpith as growing medium						
11	Crop rotation with pulse crop in each sack						
12	Raising of crops in hydroponics method						
13	Use of vertical garden structures						
14	Azolla cultivation						
15	Application of PGPR (Plant Growth Promoting Rhizobacteria) mix I						
16	Poultry rearing						

4. Health consciousness:

(Please indicate your agreement or disagreement to the following statement

SA –Strongly Agree, A – Agree, UD – Undecided, DA- Disagree, SDA - Strongly Disagree)

Sl. No	Statements	SDA	DA	UD	A	SA
1	Involvement in minor activities of terrace garden eliminates the life style diseases					
2	Activities in terrace garden enhances the mental health					
3	Safe and fresh vegetables improves health					
4	The children who are brought up in a cleanliness and dirty atmosphere will physically as well as mentally ill					
5	One should throw away household waste outside, concerning about only himself and his family					
6	One should be more concerned about the economic profits rather than personal and environmental hygiene and balanced diet					

6. Knowledge on house terrace cultivation:

1. The suitable position for placing sacks in terrace is

(Corners only, anywhere, in areas having supporting walls below)

2. The frequency of watering in terrace cultivation of vegetables

(Once in a day, once in two days, twice a day)

3. Compared to the land cultivation, the incidence of pest and disease in terrace cultivation is (More, less, difficult to say)

4. Baby is a variety of (Tomato, Pumpkin, Snake gourd)

5. Arun is a variety of (Amaranthus, Chilli, Bitter gourd)
6. Ratio of soil: sand: cowdung in potting mixture. (1: 1: 1, 3: 2: 1, 2: 1: 1)
7. Application rate of *Pseudomonas*. (20g/L, 10g/L, 5g/L)
8. Time of application of bio control agents. (Morning, Noon, Evening)
9. Viral disease can be controlled by (Complete removal of affected crop, spraying of pesticides, application of bio control agents)
10. One of the most important pests of cowpea is (Aphid, Leaf roller, Leaf borer)

6. Innovation proneness:

(Please indicate your agreement or disagreement to the following statements

SA –Strongly Agree, A – Agree, UD – Undecided, DA- Disagree, SDA - Strongly Disagree)

Sl. No.	Statements	SA	A	UD	DA	SDA
1.	You would feel restless unless, you tryout an innovative method which you have come across					
2.	You are cautious about trying new practices					
3.	You like to keep up to date information about the subjects of your interest					
4.	You would prefer to wait for others to try out new practices first					
5.	You opt for the traditional way of doing things than going for newer methods					

7. Risk orientation:

(Please indicate your agreement or disagreement to the following statement

SA –strongly agree, A – agree, UD – undecided, DA- disagree, SDA - strongly disagree)

Sl. No	Statements	SA	A	UD	DA	SD A
1	A farmer should grow a larger number of crops to avoid greater risk involved in growing one or two crops					
2	A farmer should take more chance in making a big profit than to be content with a smaller but less risky profit					
3	A farmer who is willing to take greater risk than the average farmer will be more financially stable					
4	It is good for a person to take risk when he knows his chance of risk is high					
5	It is better for a farmer not to try a new method in the cultivation of vegetables unless most others in the locality have used it with success.					
6	Trying entirely a new method in the terrace cultivation of vegetables involves risk but it is worth					

9. Extension agency contact:

(Please indicate your frequency of contact)

Sl. No.	Institutions	Frequency of contact		
		Regularly	Occasionally	Never
1	Krishi Bhavan			
2	KVK			
3	KAU			
4	VFPCK			
5	Others (please specify)			

10. Cost benefit ratio of house terrace cultivation:

Input analysis

(Please indicate the cost you have incurred to the following items while starting the house terrace cultivation)

First season

Sl. No.	Particulars	Number/Quantity(kg)	Rate (Rs.)	Amount (Rs.)
1	Sacks			
2	Cowdung			
3	Sand			
4	Planting materials			
5	Fertilizers			
6	Pesticides			
7	Hired labour			
8	Installation of drip irrigation			
9	Others, plz specify			
	Grand Total			

Second season

Sl. No	Particulars	Number/Quantity(kg)	Rate (Rs.)	Amount (Rs.)
1	Sacks			
2	Cowdung			
3	Sand			
4	Planting materials			
5	Fertilizers			
6	Pesticides			
7	Hired labour			
8	Installation of drip irrigation			
9	Any others,			
	Grand Total			

Output analysis

First season

Sl. No	Vegetables / components	Yield (kg) / number	Amount (Rs.)
1	Amaranthus		
2	Tomato		
3	Chilly		
4	Bhindi		
5	Cowpea		
6	Brinjal		
7	Bittergourd		
8	Family labour		
	Others(please specify)		

Second season

Sl. No	Vegetables / components	Yield(kg) / Number	Amount (Rs.)
1	Amaranthus		
2	Tomato		
3	Chilly		
4	Bhindi		
5	Cowpea		
6	Brinjal		
7	Bittergourd		
8	Family labour		
	Others(plz specify)		

8. Economic motivation:

(Please indicate your agreement or disagreement to the following statement

SA –Strongly Agree, A – Agree, UD – Undecided, DA- Disagree, SDA - Strongly Disagree)

Sl. No.	Statements	SA	A	UD	DA	SDA
1	The farmer should work towards larger yield and economic returns.					
2	The most successful farmer is one who makes the profit.					
3	A farmer should try new farming areas which may give more money.					
4	A farmer should grow more crops to increase monetary profit rather than growing crops for home consumption.					
5	It is difficult for farmer's children to start new venture unless the farmer provides them with economic assistance.					
6	A farmer must earn his living but the most important thing in life can't be defined in economic terms.					

11. Family labour utilization

(Please mention your extent of family labour utilization to the following statements)

Sl. No	Statements	To the full extent	As far as possible	To the least extent	Never
1	Do you feel that children should be involved in various operations on house terrace?				
2	To what extent you utilize family members for vegetable cultivation?				
3	If yes, in which of the following operations do they help you?				
a.	Preparation of potting mixture				
b.	Filling the sacks				
c.	Sowing of seeds				
d.	Irrigating the crops				
e.	Transplanting				
f.	Manuring				
g.	Identification of pests and diseases and their management				
h.	Harvesting				
i.	Marketing				

APPENDIX IV

OBSERVATION SCHEDULE

Respondent no. :

Name of respondent :

Area under terrace garden :

Year of starting terrace farming:

Number of components :

Number of crops grown :

Major crops cultivated on terrace :

Observation regarding farmer's practices :

Sl. No	Practices	Observation
1.	Utilization of terrace area	
2.	Container used	
3.	Media used for raising crops	
4.	Method of placing containers	
5.	Source of seeds	
6.	Method of irrigation	
7.	Source of irrigation	
8.	Type of fertilization	
9.	Types of manures and fertilizers used	
10.	Manures and fertilizers produced at home	
11.	Time of application of fertilizers	
12.	Plant protection measures	
13.	Plant protection inputs produced at home	

Sl. No	Practices	Observation
14.	Engineering aspects <ul style="list-style-type: none"> • Water proofing materials(coating of the terrace) • Reinforced the building using tiles or silpaulin sheets 	
15.	Crop rotation	
16.	Space utilization –vertical gardening	
17.	Hydroponics	
18.	Aquaponics	
19.	Medicinal plants	
20.	Renewability of containers	
21.	Subsidies	
22.	Agencies promoting terrace farming	

**TECHNO-SOCIO ECONOMIC ANALYSIS OF HOUSE
TERRACE CULTIVATION IN THIRUVANANTHAPURAM
CORPORATION**

by

GREESHMA UDAYAN

(2015-11-066)

Abstract of the thesis

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

MASTER OF SCIENCE IN AGRICULTURE

Faculty of Agriculture

Kerala Agricultural University



DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF AGRICULTURE

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KERALA, INDIA

2017

ABSTRACT

The present study entitled “Techno socio economic analysis of house terrace cultivation in Thiruvananthapuram Corporation” was carried out to study the extent of awareness and adoption on house terrace cultivation as recommended in adhoc package of practices for organic farming, health consciousness, inventorisation of agencies promoting house terrace cultivation and documentation of practices followed by the respondents. The study was conducted in six wards of Thiruvananthapuram Corporation namely Poojappura, Nemom, Kudappanakunnu, Kazhakuttom, Vizhinjam and Kadakampally. One hundred and twenty members of urban households involved in house terrace cultivation were selected by random sampling from six selected wards.

A well-structured interview schedule was used for data collection from the respondents. Four dependent variables and nine independent variables were selected and analysed with the help of different statistical tools like mean, quartile deviation, frequency, percentage and correlation.

It was found that majority (56.67%) of the respondents belonged to the middle age having degree (65.83%) with an annual income more than 4 lakhs (39.17%). The analysis of the profile characteristics indicates that most of respondents belonged to medium category of innovation proneness (52.50%), family labour utilization (55.83%), risk orientation (50.83%), economic motivation (55%) and extension agency contact (52.50%). Most of the urban households had high knowledge (79.17%) on house terrace cultivation.

Majority (48.33%) of the respondents belonged to medium level of awareness on house terrace cultivation and had positive and significant correlation with the variables like educational status, innovation proneness, family labour utilization, risk orientation, economic motivation and extension agency contact

Regarding the extent of adoption, 54.17% of respondents belonged to medium category and had positive and significant correlation with all the profile

characteristics. Majority (40.83%) of the respondents belonged to early majority adoption category followed by early adopters (25.83%), late majority (21.67%) and laggards (10.83%).

More than half of the respondents (60.83%) belonged to medium level of health consciousness. It had positive and significant relationship with variables like age, annual income, educational status, knowledge on house terrace cultivation, risk orientation, economic motivation and extension agency contact.

It was found that majority of the respondents (57.50%) comes under the benefit cost ratio of 1.40 to 2.37 and it had positive and significant relationship with annual income, educational status, innovation proneness, risk orientation, economic motivation and extension agency contact.

The study revealed that the major agencies promoting house terrace cultivation were Krishi bhavan, Kerala Irrigation Infrastructure Development Corporation, Integrated Farming System Research Station, Karamana, State Horticultural Mission and Department of Environment and climate change.

സംഗ്രഹം

തിരുവനന്തപുരം കോർപ്പറേഷനിലെ മട്ടുപ്പാവ് കൃഷിയുടെ സാങ്കേതിക - സാമൂഹിക സാമ്പത്തിക വിശകലനം.

ജൈവകൃഷിക്കായി നിർദ്ദേശിക്കപ്പെട്ട രീതിയിലുള്ള മട്ടുപ്പാവ് കൃഷിയിൽ നഗരങ്ങളിലെ ഗൃഹജനങ്ങളിലെ അവബോധവും, സ്വീകാര്യതയും, അതോടൊപ്പം തന്നെ അവരുടെ ആരോഗ്യ പ്രബുദ്ധതയുടെ വിശകലനവും ആണ് ഈ പഠനത്തിന്റെ പ്രധാന ലക്ഷ്യങ്ങൾ.

ഈ പഠനം നടത്തിയിരിക്കുന്നത് തിരുവനന്തപുരം കോർപ്പറേഷനിലെ ആറ് വാർഡുകൾ ഉിലാണ്. പുജപ്പുര, നേമം, കൂടപ്പനക്കുന്ന്, കഴക്കൂട്ടം, വിഴിഞ്ഞം, കടകംപള്ളി എന്നിവയാണ് വാർഡുകൾ. മൊത്തത്തിൽ 120 പേരാണ് ഈ പഠനത്തിനായ് തിരഞ്ഞെടുത്തത്. മട്ടുപ്പാവ് കൃഷിയിൽ നഗരഗൃഹജനങ്ങൾ സ്വീകരിക്കുന്ന വിവിധങ്ങളായ പ്രയോഗങ്ങളും ഒരു നിരുപണ പത്രികയും തയ്യാറാക്കിയിരിക്കുന്നു.

നന്നായി രൂപീകരിച്ച ഒരു അഭിമുഖ പത്രത്തിന്റെ സഹായത്തോടെയാണ് ഉത്തരാർത്ഥികളിൽ നിന്നും വസ്തുതകൾ സ്വീകരിച്ചത്. ഈ പഠനത്തിൽ നാല് ആശ്രിത പരിവർത്തിത വസ്തുക്കളെയും ഒൻപത് സ്വതന്ത്ര പരിവർത്തിത വസ്തുക്കളെയും സ്വീകരിച്ചിരിക്കുന്നു. കൂടാതെ, ഗണിതരീതികളായ ശരാശരി, അനുമാനം, ആവർത്തനം, കോറിലേഷൻ എന്നീ ഗണിത രീതികളും ഈ പഠനത്തിൽ ഉപയോഗിച്ചിട്ടുണ്ട്.

ഭൂരിപക്ഷം ഉത്തരാർത്ഥികളും മധ്യവയസ്കരും, കോളേജ് വിദ്യാഭ്യാസം ലഭിച്ചിട്ടുള്ളവരുമായിരുന്നു. കൂടാതെ അവരുടെ വാർഷിക വരുമാനം നാല് ലക്ഷത്തിൽ കൂടുതലുമായിരുന്നു. അവരിൽ കൂടുതൽ പേരും, നൂതന പ്രവണതയിലും കുടുംബാംഗങ്ങളെ തൊഴിലാളികളായി ഉപയോഗിക്കുന്നതിലും അപകടസാധ്യതയോടുള്ള മനോഭാവത്തിലും, സാമ്പത്തിക പ്രചോദനത്തിലും, വിജ്ഞാന വ്യാപന ശാഖകളുമായുള്ള സഹകരണത്തിലും ഇടത്തരം വിഭാഗത്തിൽ ഉൾപ്പെടുന്നവരുമായിരുന്നു.

ദുരിപക്ഷം നഗരകർഷകർക്കും മട്ടുപ്പാവ് കൃഷിയെക്കുറിച്ച് വളരെയധികം പരിജ്ഞാനം ഉണ്ടായിരുന്നുവെന്ന് കണ്ടെത്തി. കൂടാതെ വിജ്ഞാന വ്യാപന സ്ഥാപനങ്ങളായ കൃഷിഭവനം മായും വി.എഫ്.പി.സി.കെ.യുമായും നല്ല ബന്ധം കർഷകർ പുലർത്തുന്നു.

ദുരിപക്ഷം ഉത്തരാർത്ഥികളും നേരത്തെ പ്രയോഗങ്ങൾ സ്വീകരിക്കുന്ന ദുരിപക്ഷത്തിന്റെ വകുപ്പിലും ബാക്കി ഉള്ളവർ നേരത്തെ സ്വീകരിക്കുന്നവരിലും, വൈകി സ്വീകരിക്കുന്ന ദുരിപക്ഷത്തിലും തീരെ സ്വീകരിക്കാത്തവർ എന്ന വകുപ്പിലും പെടുന്നവർ ആയിരുന്നു. ദുരിപക്ഷം ഉത്തരാർത്ഥികൾക്കും മട്ടുപ്പാവ് കൃഷിയെക്കുറിച്ച് ഇടത്തരം അവബോധം ഉണ്ട് എന്നും ഈ പഠനം കണ്ടെത്തി.

ആരോഗ്യ പ്രബുദ്ധതയുടെ കാര്യത്തിൽ പകുതിയിൽ കൂടുതൽ ഉത്തരാർത്ഥികളും ഇടത്തരം പ്രബുദ്ധതയുള്ളവരായിരുന്നു. ലാഭ - നഷ്ട അനുപാതത്തിൽ ദുരിപക്ഷംപേരും 1.40 തൊട്ട് 2.37 എന്ന പരിധിക്കുള്ളിൽ വരുന്നവരായിരുന്നു.

ഈ പഠനത്തിൽ നിന്നും, കൃഷിഭവൻ, കേരള ജലസേചന ഇൻഫ്രാസ്ട്രക്ചർ വികസന കോർപ്പറേഷൻ, സംയോജിത കാർഷിക സംവ്രന്ധയ ഗവേഷണ കേന്ദ്രം, സംസ്ഥാന ഹോർട്ടികൾച്ചറൽ മിഷൻ, കേരള സംസ്ഥാന പരിസ്ഥിതി-കാലാവസ്ഥാ വ്യതിയാന വകുപ്പ് എന്നീ ഏജൻസികൾ മട്ടുപ്പാവിലെ കൃഷിക്ക് ഏറെ പ്രോത്സാഹനം നൽകുന്നു എന്ന് കണ്ടെത്താൻ കഴിഞ്ഞു.

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