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**PROMOTION OF TERRACE CULTIVATION OF VEGETABLES BY
URBAN HOUSEWIVES – AN ACTION RESEARCH**

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**Thesis submitted in partial fulfilment of the requirement
for the degree of**

Doctor of Philosophy in Agriculture

**Faculty of Agriculture
Kerala Agricultural University, Thrissur**

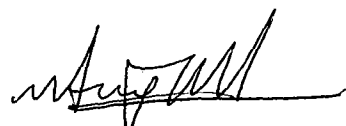
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DECLARATION

I hereby declare that this thesis entitled '**Promotion of terrace cultivation of vegetables by urban housewives – An action research**' 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 of any degree, diploma, associateship, fellowship or other similar title, of any other university or society.

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CERTIFICATE

Certified that this thesis entitled '**Promotion of terrace cultivation of vegetables by urban housewives – An action research**' is a record of research work done independently by Mrs. Sreedaya, G.S. (2001-21-10) under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.

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Dedicated to
My Dear Parents

*The Teachers who have taught me ever
since the beginning of my student life*

&

Almighty God

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Introduction

1. INTRODUCTION

Nature provides enough food, nutritional and environmental security for every living being. It is up to us to sustain the bounties of nature. In the good old days food was available in plenty but a phenomenal increase in population in modern times has resulted in food scarcity, nutritional deficiency and environmental insecurity. If the current trend continues, India may overtake China in 2045 AD and attain the distinction of being not only the most populous, but also the most illiterate. While global population has increased three times, population of India has increased five times. Intensive efforts are required, not only in family planning but also in other key areas such as education, health and women's status. It is essential to convert this bane of over one billion population into a boon.

With the increase in population, the demand for food is rising leading to heavy burden on the land. In order to bring balanced economic development, it is necessary to improve the health and the food availability for the people. Population, environment and economic development are interrelated; hence it is the responsibility of every Indian citizen to strike a balance between these three.

In the Indian context, vegetables play a very important role in the diet of an individual. They not only meet the quantitative needs but also to the same extent supply vitamins and minerals, which improve the quality of diet and maintain health. It is therefore necessary to ensure their availability throughout the year in fresh processed or preserved forms (Metha *et al.*, 2002).

Vegetable production of the country was very low (less than 20 million tonnes) during 1947, when India became independent. However the current production is 96.54 million tonnes, which contributes 13 per cent of the world production. Total area under vegetable cultivation is around 6.89 million hectares, which is about three per cent of the total

area under cultivation in the world (Government of India, 2004). Similarly per capita availability of vegetables is only 135 g/day whereas the requirement is 285g/head/day (Rajkumar, 2002). In Kerala, the production is only six lakh tonnes whereas the requirement is 17 lakh tonnes (Suresh, 2001).

Since available land for cultivation is shrinking drastically especially in urban areas, it is high time that alternative measures like terrace gardening are to be explored. Terrace cultivation of vegetables provides better time and space utilization, disposal of household organic garbage through compost making and utilizing it as the organic manure for vegetable cultivation, proper harvesting of sunlight, reduced incidence of pests and diseases, reduction of family expenditure, nutritional security due to physical and economic access to vegetables and above all better availability of fresh, hygienic, safe and eco-friendly vegetables at low cost on the house terrace itself.

Nearly half of the available human resource in India, as in other countries is women. It has been estimated that women contribute about 30 per cent of the total working population. For the past few years sincere efforts are being done by all government and non-government agencies to empower the rural women.

Though the scenario of urban women is quite satisfactory than rural women, they also need immediate attention. There is immense scope in Kerala to empower the urban housewives by the creation of employment and income through the proper utilization of their leisure time for terrace cultivation of vegetables (Padmanabhan and Swadija, 2004).

Horticultural therapy - a method of healing many inborn as well as acquired diseases by involving the patients in different steps of cultivation practices of vegetables as well as ornamentals. The deep involvement in various cultural operations like planting, transplanting, manuring, irrigation, harvesting and to an extent marketing, would help to develop

mental as well as physical confidence in the patients which helped them to overcome the difficulties. Terrace cultivation of vegetables is considered as one of the best methods for horticultural therapy (Jules, 1986).

Correct, timely and specific information on various aspects of terrace cultivation of vegetables by the urban housewives were required from the policy and practical perspectives and therefore the present action research was framed with the following specific objectives

1. To study the knowledge of urban housewives before and after the training in cultivation of vegetables and terrace cultivation of vegetables
2. To find out the attitude of urban housewives before and after the training towards terrace cultivation of vegetables
3. To identify the training needs of urban housewives in vegetable cultivation
4. To study the adoption of cultivation practices of vegetables by the urban housewives.
5. To study the time utilization pattern of urban housewives
6. To study the consumption pattern of vegetables by the urban families
7. To find out the cost-benefit ratio in terrace cultivation of vegetables
8. To study the profile characteristics of the urban housewives
9. To study the relationship between the selected profile characters and the selected other variables
10. To identify the constraints faced by the urban housewives in terrace cultivation of vegetables and their solutions

Scope of the study

The heuristic action mode to be employed in the generation of primary data regarding the participation of housewives in terrace cultivation of vegetables would provide valid and scientific data on various aspects. The measurement devices to be developed in the study to quantify cognitive, affective and conative components of human behaviour will be a useful contribution to the body of extension research methodology.

Limitation of the study

Since the study necessitates the presence of researcher throughout the period, from the training, door-to-door doubt clearance and until harvest in two complete seasons, the action research could be limited only to 30 respondents of a randomly selected ward of Thiruvananthapuram corporation. But every sincere effort has been taken by the researcher to popularize the terrace cultivation of vegetables by methods like lecture classes and method demonstrations.

Presentation of the study

The report of the study has been spread out under five chapters. The first chapter deals with introduction, wherein the statements of problem, the objectives, the scope and the limitation of the study are discussed. The second chapter covers the review of studies related to the present study. The third chapter deals with the methodology used in collecting the data and further analysis. The fourth chapter deals with the result of the study and also discussion on the result in detail. The fifth and the final chapter present the summary of the study and the suggestions for the future research. The references, appendices and abstract of the thesis are given at the end.

Theoretical Orientation

2. THEORETICAL ORIENTATION

In this chapter an attempt is made to give an orientation to concepts pertaining to the study and to link whatever research findings exist in the related areas of study with the research problem. For this purpose, a probe into the past research studies has been attempted. This helps to give a proper orientation of the study and also to place the problem on a theoretical perspective. The literature that appeared relevant is presented under the following heads.

- 2.1 Concepts, definitions and related studies on action research.
- 2.2 Vegetable production, nutritional significance of vegetables, biofertilizers and pesticides.
- 2.3 Concepts, definitions and related studies on women empowerment
- 2.4 Knowledge
- 2.5 Attitude
- 2.6 Training need
- 2.7 Adoption of cultivation practices of vegetables
- 2.8 Time utilization pattern
- 2.9 Consumption pattern of vegetables
- 2.10 Measurement of cost-benefit ratio
- 2.11 Profile characteristics.
- 2.12 Constraints faced and solutions

2.1 CONCEPTS, DEFINITIONS AND RELATED STUDIES ON ACTION RESEARCH

2.1.1 Concepts and Definitions of Action Research

Fallon (1983) explained action research as to take actions as a result of research findings. Action research as originally conceived followed the scientific method quite closely during the research phase.

Goode and Hatt (1983) summaries action research as a part of the programme aimed at changing existing condition whether slum conditions, race tension and prejudice or the effectiveness of the organisations.

Bennet (1985) stated that action research is a form of research where action is both an outcome of the research and a part of the research process. It aims to tackle problems that have relevance to theory and to report the findings to sponsors, scientists and practicing professionals through reports and professional journals. Action research thus has three taskmasters – the sponsors, the behavioural science practitioners and the scientific community.

According to Best and Khan (1986) action research is focused on immediate application, not on the development of theory or in general application. It has placed its emphasis on a problem in a local setting. It's findings are to be evaluated in terms of local applicability, not universal validity.

Subramaniyam (1987) reported that action research make full use of the available materials on fundamental and applied research and utilizes their results in finding out their correct applications under field conditions after making such modifications as many be warranted by the local situations.

McKernan (1991) stated that action research aims to contribute both to the practical concerns of the people in an immediate problematic situation and the goals of social science by joint collaboration within a mutually acceptable ethical framework.

Cohen and Manion (1998) suggested that as the name indicates action research is a methodology, which has the dual aims of action and research. Action to bring about change in some community or organization or programme and the research to increase understanding on the part of the researcher or the client or both.

2.1.2 Related Studies on Action Research

Lewin (1946) constructed a theory of action research, which described action research as proceedings in a spiral of steps, each of which is composed of planning, action and the evaluation of the results of action. Lewin argued that in order to understand and change certain social practices, social scientists have to include practitioners from the real social world in all phases of inquiry. This theory made action researches a method of acceptable inquiry.

Pareek (1981) put forward the three-dimensional model for action research and the three dimensions are concern for action, concern for research and concern for people. He proposes that all the efforts should be done by the research worker to maximize the concern for all the three for successful action research.

Based on the low and high concern on each dimensions, eight types of action research are derived.

Sl. No.	Concern for people	Concern for action	Concern for research	Action research model
1	Low	Low	Low	Indifferent
2	High	Low	Low	Missionary
3	High	High	Low	Activist
4	High	Low	High	Process research
5	Low	Low	High	Sterile research
6	Low	High	High	Project research
7	Low	High	Low	Don Quixote
8	High	High	High	Committed research

Bennet (1985) suggested that action research could be regarded as a learning cycle. It is said that systematic solution is an effective way for practitioners to learn.

Subramaniyam (1987) opined that action research offers people a chance to make use of their practice as research opportunity.

Grundy (1989) opined that there are mainly two types of action research; technical and mutual collaboration.

Mckernan (1991) opined that there are mainly four basic themes in action research, namely, empowerment of participants, collaboration through participation, acquisition of knowledge and social change.

According to White (1991) participatory action research is an applied research, but it contrasts sharply with most common type of applied researches, in which researcher serves as professional experts, designing the project, gathering data, interpreting the findings and recommending action to the client organization.

Carr and Zuber (1992) suggested that action research process consists of eight steps. They are

1. Dissatisfaction with current state of affairs.
2. Identification of a problem area.
3. Identification of a specific problem to be solved by action.
4. Formulation of several hypothesis and their preliminary testing.
5. Choice of hypothesis.
6. Design of action to test and implement the hypothesis.
7. Evaluation of the effect of action.
8. Generalisation.

Hussain (1992) conducted an action research on group management in rice production in Punchakari ela of Thiruvallam village of

Thiruvananthapuram district and reported that it was a tremendous success and majority of the farmers had favourable attitude towards group management in rice production.

According to Mckernan (1996) the aim of action research as opposed to much traditional or fundamental research is to solve the immediate and pressing day to day problems of practitioners. Action research is carried out by practitioners seeking to improve their understanding of events so as to increase the effectiveness of their practice. Such research does not have the writing of research reports and other publication as a primary goal.

Jayalekshmi (2001) had conducted an action research for empowering rural women through self-help groups by giving training in fruit and vegetable preservation in Kalliyoor panchayat of Thiruvananthapuram district.

Panigrahi (2004) reported that participatory approach has a major role in allocating rights and responsibilities over resources – a key concern is to identify approaches which can enhance the efficiency and accountability of the system.

2.2 VEGETABLE PRODUCTION, NUTRITIONAL SIGNIFICANCE OF VEGETABLES, BIOFERTILIZERS AND PESTICIDES

2.2.1 Vegetable Production

Wills and Lee (1981) emphasize the fact that vegetables are vital for increasing the income of farmers and generating employment in rural areas.

Smith *et al.* (1984) and El-Aidy (1986) reported that homesteads can be effectively utilized for the production of good quality tomato fruits.

Shanmughavelu (1989) considered vegetables as an asset providing a good source of income to growers. The author also emphasized its role in

Indian economy which earns two crores to four crores of rupees as foreign exchange by export of raw as well as processed products.

Singh (1989) reported that by adopting high yielding varieties, proven technology and by increasing area under cultivation, the productivity of vegetables can be increased to meet the requirements of our people.

Habibunsia (1995) estimated 90 million tonnes of fruits and vegetable production in India. With an annual production of around 100 million tonnes, fruits and vegetables earn 20 to 30 per cent more foreign exchange as claimed by Kanchana (1995).

An estimate of Rajkumar (1995) revealed that during the closing year of last decade, India exported 42, 000 tonnes of fresh vegetables. He also pointed out that inspite of high level of production, the lack of post-harvest technology and linkages result in a national loss of Rs. 5000 crores per year.

Thyagi (1995) has opined that horticulture crops cover about 6.8 per cent of the area and contributed 18 per cent of India's gross agricultural output.

Horticulture crops are high value crops with potential for both export and value addition through food processing as revealed by Vineetha and Latha (1995).

Sethi *et al.* (1987) proclaimed that India is the second largest producer of vegetables in the world after China with an estimated annual production of 66.58 million metric tonnes.

Tomato which is the world's most extensively grown vegetable after potato is cultivated in world in 2.85 million hectares and the production is 77.54 million tonnes (Dalletregulu, 1997).

In India, tomato is grown in an area of 0.32 million ha with an annual production of 5.00 million tonnes (Reddy and Rao, 1999).

Bhishwajit (2000) reported that tomato is the world's second largest grown vegetable crop after potato and it tops the list of canned vegetables.

Kumar (2000) reported that as the availability of open land is meagre in the state of Kerala, farmers utilize the interspace of perennial crops in homesteads for growing vegetables.

India has emerged as the second largest producer of fruit and vegetables next to Brazil and China in the world with an annual production of 41 MT of vegetables, contributing nearly 13 per cent of the world production (Jaiswal, 2000).

Kaur and Maini (2001) reported that vegetables contain phytochemicals and antioxidants which have significant health promoting effects and can reduce the incidence of cardio-vascular diseases, cancer, AIDS and various other degenerative diseases.

Parpia (2001) reported that inspite of this huge production it is estimated that approximately 50 per cent of the total production of fruits and vegetables in the country is lost due to wastage and value destruction and the cost of this wastage is accounted to be Rs. 23,000 crores annually.

Roy (2001) reported there is a considerable increase in the area and production of fruits and vegetables in India and this has been achieved greatly due to adoption of improved seeds, proper farm management techniques, judicious use of fertilizers and pesticides and improved irrigation facilities.

Sushama and Sreedaya (2001) reported that vegetable cultivation through self-help groups was a tremendous success in Kerala Horticulture Development Programme (KHDP) and Intensive Vegetable Development Programme (IVDP).

Praveen and Prabhat (2002) reported that though India is the leading vegetable producer after China, the productivity of vegetables is very low

per unit area. Poor nursery management is one of the factors responsible for low productivity.

Rai (2003) reported that production and productivity of cucurbits in the world is 70 million tonnes and 500 tonnes per ha respectively.

Government of India (2004) reported that the total production of vegetables of our country is 96.54 million tonnes and total cultivated area is 6.89 million hectares. It is also reported that India is next to China in area and production of vegetables, India contributes 13 per cent of the total vegetable production in the world and is in the first position in the production of cauliflower, second in onion and third in cabbage.

2.2.2 Nutritional Significance of Vegetables

Tindall (1980) detected high ascorbic acid and iron content in bittergourd.

Kumar *et al.* (1983) judged carrot as a rich source of vitamins and minerals.

Nath (1987) observed vegetables as a good source of proteins, carbohydrates, minerals, vitamins and roughage which constitute the essentials of a balanced diet.

Sethi (1996) emphasized that at least two fold increase in percapita availability is essential to balance our diet.

Sesadri (1989) considered vegetables as a rich source of crude fibre which not only help in bowel movement but also beneficial in reducing absorption of antinutritious factors and reducing incidence of ulcer, cancer and cardio-vascular diseases.

Shanmughavelu (1989) defines vegetables as protective supplementary foods since they contain large quantities of minerals, vitamins and essential amino-acids which are required for normal functioning of human metabolic process.

Beegum (1991) ascertained the vegetables as a good source of water and minerals which enables the body to maintain acid-base balance.

Swaminathan (1993) detected green leafy vegetables as a rich source of carotene ascorbic acid and calcium. He also pointed out beans and peas as good source of proteins.

Sandhu *et al.* (1999) reported that tomatoes are rich source of vitamin A and C.

Padmanabhan and Swadija (2003) reported that terrace farming facilitates better time and space utilization, disposal of household organic garbage as compost for vegetable cultivation, proper harvesting of sunlight, reduced incidence of pest and diseases, reduction of family expenditure and nutritional security by increased physical and economic access to fresh, hygienic and eco-friendly vegetables.

2.2.3 Biofertilizers and Pesticides in Vegetable Production

Gaur *et al.* (1984) reported that bio-farming in vegetables enable the production of superior quality produce devoid of toxic residues. Moreover, organically grown vegetables are preferred for their flavour, taste, nutritive value and extended shelf-life. He also reported increase in yield of chilli, bhindi, tomato and brinjal by organic manure application.

Subbiah (1990) reported an increase in yield of vegetable crops as the result of application of *Azospirillum* which is an associative symbiotic nitrogen fixing bacteria having high potential for N-fixation.

Meera (1995) reported that there has been indiscriminate use of chemical pesticides in vegetable pest control and this could cause environment contamination, pesticide residue and related health hazards.

Padmanabhan and Swadija (2003) reported that those urban families who have least cultivable land can rely on terrace cultivation of vegetables through which fresh, hygienic vegetables can be produced at low cost utilizing household biowaste and family labour.

2.3 CONCEPT, DEFINITION AND RELATED STUDIES ON EMPOWERMENT

2.3.1 Women Empowerment

Griffen (1987) defined empowerment as a process, awareness and capacity building leading to greater participation, to greater decision making power to control and to transformative action.

According to Rappaport (1987) empowerment conveys both a psychological sense of personal control or influence and a concern with actual social influence, political power or legal rights.

According to Devadas *et al.* (1988) empowerment is equipping one to improve her / his living conditions. It does not identify power of women in terms of domination over other but in terms of the capacity of women to increase their ability to gain control over the crucial material and non-material resources and this minimizes their risks.

Korten (1989) described the process of empowerment as one which ensures that local resources are locally controlled and control being broadly shared among the community members.

Mc Ardle (1989) defined empowerment as the process whereby decisions are made by the people who have to wear the consequence of those decisions.

According to FAO (1990) empowerment approach recognizes the triple roles of women, namely, production, reproduction and community management which manifests itself through the formation and organisation of groups.

Krishna (1994) defined empowerment as the acquisition of power, status and self confidence, the opportunity to develop a sense of autonomy and ability to manage one's own life.

According to Ackerly (1995) women empowerment is a change in the control of women's life that enables her increased capacity to lead a fulfilling human life. It is a positive change in the women's life circumstances, family status, health, educational level, experiential knowledge and internal qualities such as self-awareness and self-confidence.

According to Pinto (1995) empowering is development of skills and abilities of people to enable them to manage better, have a say in or negotiate with existing development delivery system.

According to Stoner and Freeman (1995) empowerment is the act of delegating power and authority to subordinates so that goals of manager can be accomplished.

Bhagyalekshmi (2004) reported that India as a signatory to the UN convention has taken several measures to ensure full development and advancement of women. The women-specific programmes are showing positive results in empowering women, yet one feels there are miles to go and promises to keep.

2.3.2 Related Studies on Women Empowerment

Heggade (1982) stated that women's participation in economic decision making was a vital means by which their economic dependency and social inequality could be removed, their participation in decision making resulted in increasing the employment opportunity for women, increasing the produce and income level of the community, reducing the exploitative elements in the economic system.

Bertell (1985) stated that there is a need for a new frame work or development of women where the values of women are seriously taken into account and they articulate their own needs. Research is seen as a

main area through which rural women's views can be expressed with action research acting as a tool for consciousness raising and mobilization.

Devadas *et al.* (1988) defined empowerment as the state of mind or attitude of a person. An empowered women has a positive self-image and takes an active part in decision making related to herself and her household.

Sharma and Thakur (1988) stated that fish-farming by women may prove to influence even the other non-farming communities as a dependable source of self-employment and high income without affecting their day to day domestic and vocational duties.

Ganguly (1990) stated that agrobased industries provided an excellent opportunity in promoting integrated development of agriculture and industry and in transferring a stagnant rural economy into a dynamic and buoyant economy. It provided local entrepreneurship, generated empowerment and also checked the concentration of economic power through diffusion of ownership of means of production.

Himachalam (1990) expressed that there should be suitable organizational arrangements for disseminating information about appropriate technology to the prospective entrepreneurs and the entrepreneurs should be given proper training in the technology to be adopted.

Gengaji and Setty (1992) expressed that the only meaningful approach to enhance the economic and social status of women is through enabling them and facilitating them through self-employment and income generating activities.

Muthukrishnan (1993) expressed that entrepreneurial requisites are to be achieved primarily through motivation, skills acquired and workable

planning and a know-how in the area engaged and of course the strength to mobilize finance are needed to sustain the growth.

Kaushik *et al.* (1994) stated that women should be motivated to form co-operatives so that they can avail better facilities for finance, health care, family planning and common care of infants and children.

Oakley (1994) stated that the informal networks such as NGO's women's groups, co-operatives and rural unions have taken a lead in promoting a participatory form of extension, which if its influence continues to grow, could bring greater benefits to small holders and the rural poor than the more traditional, top-down official system.

Krishna(1994) found that 'Matsyamahilavedi' could help to conscientize women about their situation and also show them how women can improve through collective action and emerge as a model for resource mobilization and empowerment.

Das (2000) reported that according to FAO, 73 per cent of the female population is involved in agriculture against 63 per cent of the male population.

Jabin and Manoharan (2001) while studying the socio-personal characteristics of kitchen garden maintaining urban women reported that majority of the respondents (73.33 per cent) were housewives.

2.4 KNOWLEDGE

Farmran and Areola (1976) reported that in the field of crop production and the management of soil, the knowledge and experience of local farmers are unrivalled and no alternative system of food production is found as competent as farmer's knowledge.

Bhaskaran (1978) observed that progressiveness of farmers was measured by taking knowledge of improved practice as one of the components of progressivism.

According to Rogers (1983) knowledge is the first stage of an innovation – decision process.

Studies conducted by Juma (1987) in East Africa showed that women usually possess remarkable knowledge about the qualities and uses of indigenous tree species and that many of those insights are unknown to men.

Ray (1991) stated that in addition to the knowledge that an innovation exists, there may be additional types of knowledge, how-to-knowledge and principles knowledge. That is in addition to knowing, that a particular new technology exists a farmer would like to know how and why to use it.

Sreedaya (2000) reported that farmers of KHDP posses more knowledge about different aspects of vegetable cultivation than those of IVDP.

2.5 ATTITUDE

Krech and Crutchfield (1948) defined attitude as an inducing organization of motivational, emotional, perceptual and cognitive process with respect to some aspects of the individual's world.

Cooper (1959) experimentally demonstrated that even when attitudes are aroused in an artificial laboratory setting, they are accompanied by relatively strong emotion.

Dahama (1976) opined that attitudes are learned responses and since they are always found in relation to object, ideas and persons, they play an important role in determining human behaviour.

According to Blair (1978) attitude is a pre-disposition to respond to a certain set of facts.

Kuppuswamy (1984) stated that attitudes are learned in the course of life experience which the individual to behave in characteristics ways towards persons, objects or issues to which they get related.

Rao and Narayana (1987) defined attitude as an internal state of person that is focused on the objects, events, people that can exists in persons psychological word. An individuals behaviour is also a function of attitude.

Pradeepkumar (1993) found that almost all the unemployed youth had more favourable attitude towards self-employment in agriculture and allied fields.

Jayalekshmi (1996) found a positive and significant relation between attitude towards self-employment and entrepreneurial behaviour of rural women.

Nagabhushanam and Nanjaiyan (1998) reported that farm women had favourable attitude towards had favourable attitude towards institutional training which is influenced by their education level, innovativeness, decision making pattern etc.

Sundaraswamy *et al.* (1997) reported that the graduating students of agriculture possess favourable attitude towards agriculture. They also reported that there is a need to instill confidence in them by focusing more on allied agricultural enterprises and mixed farming in order to treat agriculture as one of the business enterprise rather than just a way of life.

Beena (2002) reported that annual income is negatively correlated to the attitude of farmers towards Gramasabhas.

2.6 TRAINING NEED

Training need is the difference between what is and what ought to be. It is really the discrepancy between the actually estimated requirements and the estimated or measured attributes of the people incorporated judiciously in the training objectives.

Training need is defined in this study as the discrepancy between the actually estimated requirements and the estimated or measured attributes of the cultivators incorporated judiciously in the training objectives with respect to knowledge and skill level on different aspects of terrace cultivation of vegetables.

2.6.1 Influence of Training on the Knowledge Level of the Respondents

Ahamed (1981) stated that most of the farmers gained knowledge about the least scientific technique after training at the farmers training centre. Meera(1981) while studying the role of farmer's training centre in developing leadership in rural areas came to the conclusion that there was a definite enhancement of knowledge about improved package of practices due to the training imparted to the conveners of the farmers discussion groups by the farmers training centre.

Kanakasabapathi (1988) reported that there a tremendous increase in the level of knowledge of 'Irulas' of Attappady about various agricultural practices after undergoing training.

Syamkumar (1999) reported that training was an important tool of extension intervention for sustaining rice production.

Parvathy (2000) reported that training has increased the level of knowledge of women about various development programmes under people's plan.

2.6.2 Subject Matter Areas of Training

Anantharaman (1977) inferred that both the small and marginal farmers commonly needed training in characteristics of good seeds, pre-treatment of seeds, calculation of unit cost of fertilizers, application of fertilizers according to soil conditions, optimum dose of fertilizers, schedule of different plant protection chemicals, reclamation of acidity and alkalinity of soils, methods of soil conservation, marketing of produce through formal institution, nutrient value of different vegetables and fruits, crop rotation, maintenance of milch animals and calf rearing in that ordered sequence.

Mathiazhagan (1978) concluded that the banana growers mostly needed training in main areas such as manures and fertilizers, propagation, pruning and desuckering, plant protection, improved varieties and storage. The sub areas of training needs were harvesting, irrigation, intercultural operations, time of planting, spacing, crop rotation, intercropping and marketing.

Chandrasekaran (1981) reported that out of thirteen major areas under knowledge oriented training, the small tea growers identified seven areas, namely, plant protection, credits, pruning, care of young plants, manure and manuring, after cultivation and soil conservation for inclusion in the training programme.

Savarimuthu (1981) found that farmwomen needed intensive training on the method of sowing (65.83 per cent) followed by transplanting (64.17 per cent), weeding (63.13 per cent), manuring (62.50 per cent), nutrition and livestock keeping (60.83 per cent each). The last area in which the training sought was irrigation and marketing.

Alexander (1985) concluded that areas in which small rubber growers preferred to undergo training both in the knowledge and skill

aspects were in the order of plant protection, soil and leaf sampling and planting and maintenance.

2.6.3 Types of Training

Anantharaman (1977) found that small and marginal farmers gave top priority to peripatetic training and least preferences was given for correspondence course. Others such as institutional training programme and farm school on AIR were placed on second and third place respectively.

Chandrasekaran (1981) reported that about half of the trained small tea growers (53.12 per cent) preferred to have peripatetic training followed by institutional training (43.34 per cent). Savarimuthu (1981) also reported similar results.

Alexander (1985) reported that 80.91 per cent of small rubber growers preferred peripatetic or on-farm training while 19.09 per cent of the growers preferred institutional training.

Rathore *et al.* (1989) defined vocational training as the training design to teach the skills and knowledge needed for particular kinds of work.

2.6.4 Duration of Training

Anantharaman (1977) reported that more than half of the small and marginal farmers suggested two days peripatetic training while nearly one fifth favoured single days' training. As regards to the institutional training, nearly half of the small and marginal farmers suggested four days duration and nearly one-sixth of them reported for seven day training programme.

Chandrasekharan (1981) stated that nearly fifty per cent of trained small growers preferred to have 15-20 days training programme followed by 20-25 days of training by 28.22 per cent of trained small tea growers.

According to Savarimuthu (1981) majority of farm women (70.83 per cent) preferred two to three days training programme. Alexander (1985) has also reported similar findings.

2.6.5 Method of Training

Mathiazhagan (1978) reported that appropriate methods of training selected by the banana growers were demonstrations, field trips, discussion and lecture in the order of preference.

Shete (1978) observed that out of the four methods of training such as demonstration, filmhows, group discussion and lecture, demonstration emerged as an important method followed by films.

Chandrasekharan (1981) reported that majority of the trained small tea growers felt that demonstration was the best suited method followed by discussion and lectures. Similar findings were reported by Alexander (1985) who studied the training needs of small rubber growers.

Savarimuthu (1981) concluded that training imparted through group discussion was the most preferred method by farmwomen. The second method preferred was training through demonstration.

According to Arumugam (1983) in the combination of training methods, group discussion and demonstration and group discussion and field trips were considered most important by the sericulturists.

2.7 ADOPTION OF CULTIVATION PRACTICES OF VEGETABLES

Balasubramanion (1982) reported that summer ploughing was adopted by majority of the farmers in dry land (92 per cent). He further found that sorghum raised as mixed crop with lab-lab was practiced by 85 per cent of the farmers.

Jayakrishnan (1984) observed that paddy growers have medium level of adoption of low cost technologies.

Nanjaiyan (1985) reported that 64 per cent of the farmers had medium level of adoption in cultivation of IR-20 paddy.

Chauhan *et al.* (1987) consider adoption as the decision to make use of the technology which has already taken up and not only initiated.

Nehru *et al.* (1988) studied the group management in vegetable cultivation under lab to land programme of Kerala Agricultural University and revealed that there was an appreciable increase in the number of farmers adopting improved varieties of vegetable crops.

Ramachandaran (1988) reported that summer ploughing and intercropping were adopted by all the farmers in mini kit trials while adoption level of other technologies vary due to variety of reasons.

According to Babu (1995) in his study on evaluation perception on home land farmers in relation to opportunities of farming system and cropping pattern reported that about 25.22 per cent of the farmers were in the habit of using poly bags tied up on poles to ward off birds and rodents.

As observed by Preetha (1997) the practice of spraying a mixture of highly pungent pepper, garlic juice and asafoetida powder at panicle emergence and grain setting stage of paddy against the rice-bug was adopted by 27.4 per cent of farmers.

Mercykutty and Karippai (2000) reported that majority of the respondents were low adopters and this might be attributed to different constraints experienced in the client system such as in adequate awareness about biofertilizer technology, lack of suitable technological recommendations, non-availability of quality materials during the crop season and inaccessibility to the sales point.

Naresh and Narayanagowda (2000) reported that adoption level of trained sericulture farmwomen was significantly higher than that of the untrained sericulture farmwomen.

Sreedaya (2000) reported that majority of the vegetable growing farmers of the self help groups belong to medium category with respect to extent of adoption of recommended practices.

Beena (2002) reported that extent of adoption by the members of gramasabhas are comparatively higher than the non-members.

2.8 TIME UTILIZATION PATTERN

George and Batna (1983) found that the home-makers spent most of their time in preparing food and other household activities and the time used was greatly influenced by the size of the family and age of the homemakers.

Mazumdar (1983), Devi and Reddy (1984) and Prameelamma (1990) reported that education, farm size, material possession, income, extension participation and mass media participation of farm women had inverse relationship with the time spent on farm.

Balasubramanian (1988) stated that time is indispensable and irretrievable. It can neither be presented nor purchased.

Choudhary (1988) reported that 80.00 per cent of the working women had to work for eight hours daily.

Drucker (1988) reported that time is scarcest resource and unless it is managed nothing else can be managed.

Kapur (1988) has reported that the time spent by the rural women on different activities may vary according to the enterprises taken up and other socio-cultural situations.

Vinayagam *et al.* (1998) while studying the time utilization pattern of assistant agricultural officers reported that collection of soil samples and handling over the results was the activity which consumed more time

among the supporting duties as reported by 52.00 per cent of the respondents.

Saha and Kanchan (1991) reported that real women spent maximum time for domestic work due to lack of proper fuel supply and cooking facilities by cleaning the utensils and also by the lack of modern living facilities.

Sujaths and Nanjaiyan (1999) reported that majority of farm women worked more than eight hours during peak season and the reason was that most of the activities on farming, animal husbandry, poultry, fodder crops, sericulture and mushroom cultivation were carried out by themselves.

Sheela and Katteppa (1999) reported that marginal farm women spent more time on farm activities followed by small and large farm women and they also reported that the factors which contributed to the variation in the time utilization of farm women on farm activities were education, material possession, extension contact, social participation, age, family size etc.

Khetarpaul and Grover (2001) revealed daily time utilization pattern of rural women as

Activities	Time spent (Hours)
Child care	1.00
Food activities	2.15
Hauling, Fuel and Water	2.15
Market production	
Agriculture	5.00 – 6.00
Allied	1.00
Miscellaneous	2.00

2.9 CONSUMPTION PATTERN

Food habits of an individual are the characteristic repetitive acts that he performs under the impetus of the need to provide himself with nourishment and simultaneously to meet the assortment of social and emotional goals (Gift *et al.*, 1972).

Carlisle (1980) stated that vegetables had a low acceptance among adolescents. They accepted raw vegetables, more readily than cooked ones and sweet tasting vegetables over bland or bitter ones.

Grigorow *et al.* (1985) opined that diet of elderly should contain plenty of varied cereals, legumes, fruits and vegetables.

Verma (1989) had revealed that the food consumption was closely associated with the economic levels of the family and their land ownership.

Manson (1994) reported that people who eat more fruits and vegetables have about 54 per cent lower risk of getting heart stroke when compared to those who eat the least.

Rajaya (1995) reported that the production of processed fruits and vegetables increased by 30.28 per cent in the year 1992-93 and 23.66 per cent in the year 1993-94.

Epsy (1997) opined that it is redunt to say that healthy people enhance the human resources of a nation which ultimately contributes to a healthier economy.

Ajitha (2000) reported that 98 per cent of the urban senior citizens consumed vegetables on daily basis while daily consumption of vegetables by the senior citizen was only 19 per cent. She also reported that the use of roots and tubers was more frequent on rural citizens than urban citizens.

Bhattacharya (2001) reported that food security exist when all people at all time have physical and economic access to sufficient, safe and nutritious food for an active and healthy life.

Charanjit and Kapoor (2002) reported that the theory that fresh fruits and vegetables are more healthier than processed ones has now received a major set back and leading experts have referred this as the biggest misnomer regarding diet and food. Scientists claim that processed fruits and vegetables have equivalent, if not better nutrient profile than fresh or raw produce and are healthier options contrary to the common opinion.

2.10 BENEFIT COST RATIO

Based on the review of literature, the following studies were reported relating to the benefit cost relationship in plant production.

Rathuri *et al.* (1973) analysed the economics of vegetable crop like pot, tomato, frenchbeans and chillies. The per hectare total cost of cultivation was found to be Rs. 6,165, Rs. 7,667, Rs. 7,867 and Rs. 7,912 respectively. It was also found that over one third of total cost of cultivation was claimed by imputed rented value of land. The ratio of marginal value product to factor cost for different variables indicated vast scope for the allocation of resources.

Naidu and Rao (1977) conducted a study on costs, returns and marketing of brinjal crops in Tenali area Guntur district in Andhra Pradesh. Cost of cultivation of brinjal was found to be Rs. 1,136.60 per acre. It was found that labour cost was Rs. 380, which accounted for 33.44 per cent of total cost followed by fertilizers with Rs. 340.75. Gross income from brinjal was estimated at Rs. 1,968 and net income Rs. 831.33. Yield of brinjal was 60 quintals per acre.

Asthurkar *et al.* (1980) made an attempt to examine the performance of turmeric crop in Maharashtra state over a period of 14 years *i.e.*, from

1960-61 to 1974-75 in respect of area and production and to investigate the profitability of the crop. A basis amounted to Rs. 5,438 on an average, of which seed alone accounted for 45 per cent. On the revenue side, cultivators earned on an averages, Rs. 17,024 and thus the net receipt over the direct cost or cost A worked out to Rs. 11,506. The expenditure income ratio worked out to 1 : 1.77.

Subrahmanyam and Doss (1981) estimated cost of cultivation of vegetables in Malur and Chickballapur taluk of Kolar district of Karnataka. It was found that total cost of cultivation per hectare of tomato and brinjal were Rs. 5,133.75 and Rs. 4,141.5 respectively in Malur taluk and Rs. 5,604.71 and Rs. 5,456.17 respectively in Chickballapur taluk. Manures and manuring accounted for nearly 70 to 75 per cent of the total cost. Gross return were Rs. 21,222.12 from tomato and Rs. 13,990.29 from brinjal were 1:3.92 and 1 : 3.16 respectively.

Rajagopalan (1983) in his study on standardization of propagation method, time of planting, time of harvest and photochemical analysis of kacholam found that cost of cultivation of kacholam per hectare amounted to Rs. 7,696 with an yield of dry rhizomes 10.92 quintals and the sale price of Rs. 1,100 per quintal. Gross income per hectare was Rs. 12,012.00 and net income Rs. 316.

Saraf and Mishra (1987) have estimated the cost of cultivation of tomato, potato, cauliflower and brinjal based on samples drawn from the village situated within a radius of 10 km from Jabalpur city in Madhya Pradesh. The cultivation of tomato was shown to be quite remunerative as compared to the other three vegetable crops. The net return from tomato was Rs. 2,037 per acre followed by brinjal with Rs. 1,952 cauliflower with Rs. 1,467 and Potato with Rs. 1,428 per acre.

Venkatanarayanan (1990) analysed the economic of chilli cultivation in Khammam district of Andhra Pradesh. He found operation of diminishing factor returns in general on all the farm size groups.

Marginal value product to opportunity cost ratio indicated a high degree of resource use inefficiency and revealed the scope of re-organization of resources. High input-output – ratios revealed the profitability of chilli farming and break-even analysis also clearly indicated that chilli cultivation was a highly paying proportion.

Sandhya (1992) in her study on economics of production and marketing of vegetables in Ollukkara block in Thrissur district, calculated the total cost of cultivation for bittergourd and ashgourd on per hectare basis on various cost concepts. Cost A₁, Cost A₂, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ for bittergourd were as Rs. 13,548.55, Rs. 13,914.53, Rs. 13,964.23, Rs. 15,958.24, Rs. 20,562.37 and Rs. 22,556.38 respectively. The corresponding figures for ashgourd were Rs. 6,630.22, Rs. 6,910.22, Rs. 7,012.22, Rs. 8,689.80, Rs. 9,360.07 and Rs. 11,037.67 respectively. Input – wise costs incurred for bittergourd and ashgourd showed that human labour was the largest single item of expenditure in both cases.

Ram *et al.* (1992) in their study on curry leaf cultivation in four villages of Guntur district during four years of cultivation (1985-86 to 1988-89) have estimated costs and returns. The cultivations received the net returns of Rs. 65,322, Rs. 62,320, Rs. 69,324 and Rs. 59,527 per hectare in four years respectively. The price oscillated from Rs. 1 to 3 per kilogram.

Brahmaiah and Naidu (1993) in their studies on chilli crop reported that labour is one of the major constituents of total cost incurred in farm business and therefore has a direct impact on farm earnings. It shows that there was a direct relationship between size of the farm and total labour cost. Cost components for small, large and overall farms indicated that manures and fertilizers took the largest share in total expenditure, followed by other inputs like rent of land, plant protection, human labour and bullock labour on all size groups. Their findings indicated that chilli

crop in general was a fertilizer and manure responsive and labour intensive crop. Productivity was the highest on large farms with an average yield of 34.15 quintal per hectare and it decreased with decrease in farm size.

2.11 PROFILE CHARECTERISTICS OF URBAN HOUSEWIVES

2.11.1 Age

Sl. No.	Author	Year	Respondents	Relationship
1	Alexander	1985	Small farmers	Significant and positive relationship with training needs
2	Thampan	1990	Farmers	No relationship with knowledge
3	Manju	1997	Vegetable growers	Significant and positive relationship with knowledge
4	Sheela and Katteppa	1999	Farm women	Inverse relationship with time spent on farm activities
5	Sreedaya	2000	Members of SHGs involved in vegetable cultivation	Significant and positive relationship with extent of adoption of recommended practices
6	Allan	2000	Medicinal plant growers	Significant and positive relationship with knowledge
7	Jayalekshmi	2001	Rural women	Women belonging to middle age participated in farm operations more than others

2.11.2 Educational Status of the Family

Sl. No.	Author	Year	Respondents	Relationship
1	Chandrasekaran	1981	Small tea growers	Significant negative relationship with training need
2	Ranganathan	1984	Farm youth	Positive relationship with attitude
3	Sarmoh and Singh	1994	Coconut farmers	Significant and positive relationship on adoption
4	Sheela and Kattappa	1999	Farm women	Inverse relationship with time spent on farm activities
5	Sreedaya	2000	Members of SHGs involved in vegetable cultivation	Majority (67 per cent) of the respondents has low educational status
6	Jabin and Manoharan	2001	Kitchen garden maintaining urban women	Majority (57.50 per cent) of the respondents were highly educated

2.11.3 Cultivated Area

Sl. No.	Author	Year	Respondents	Relationship
1	Alexander	1985	Rubber growers	Non-significant relationship with training need
2	Binu	1991	Vegetable growers	Significant relationship with extent of adoption
3	Manju	1997	Vegetable growers	Non-significant relationship with knowledge
4	Jose	1998	Vegetable growers	Non-significant relationship with knowledge
5	Sheela and Katteppa	1999	Farm women	Inverse relationship with time spent on farm activities
6	Sreedaya	2000	Members of SHGs involved in vegetable cultivation	70 per cent of the respondents had medium farm size
7	Sindhu	2002	Vegetable growers	Significant and positive relationship social cost and benefit

2.11.4 Family Size

Sl. No.	Author	Year	Respondents	Relationship
1	Sharma	1980	Small scale farmers	Inverse relationship with training need
2	Agarwal	1992	Urban women	Significant and positive relationship with social cost and benefit
3.	Amey	1996	Coconut farmers	Significant and positive relationship with extent of adoption

2.11.5 Self Confidence

Sl. No.	Author	Year	Respondents	Relationship
1	Nizamudeen	1996	Kuttimulla cultivators	A good majority (86 per cent) of the respondents possess high self confidence
2	Sangeetha	1997	Banana growers	A good majority (74 per cent) of the respondents possess high self confidence
3	Sheela and Katteppa	1999	Farm women	Inverse relationship with time spent on farm activities.
4	Arunima	2001	Rural women	74 per cent were taking decision with the help of elder members of the family

2.11.6 Annual Income

Sl. No.	Author	Year	Respondents	Relationship
1	Kamarudeen	1981	Paddy growers	Non-significant relationship with knowledge Significant and negative relationship with attitude
2	Arumugam	1983	Small farmers	Positive relationship with training need
3	Manju	1997	Vegetable growers	Non-significant relationship with knowledge
4	Sheela and Katteppa	1999	Farm women	Inverse relationship with time spent on farm activities
5	Sreedaya	2000	Members of SHGs involved in vegetable cultivation	52 per cent of the respondents belonged to medium category
6	Jabin and Manoharan	2001	Kitchen garden maintaining urban women	Low income group were more involved in maintaining in kitchen garden
7	Sindhu	2002	Vegetable growers	Significant and positive relationship with social cost-benefit

2.11.7 Economic Motivation

Sl. No.	Author	Year	Respondents	Relationship
1	Porchezian	1991	Farmers	Significant and positive correlation with entrepreneurial behaviour.
2	Gangadharan	1993	Pepper growers	Significant and positive relationship with extent of adoption.
3	Manju	1997	Vegetable growers	Significant and negative relationship with knowledge
4	Jose	1998	Vegetable growers	Significant and positive relationship with training need.
5	Manjusha	1999	Bittergourd growers	Non-significant relationship with extent of adoption.

2.11.8 Social Participation

Sl. No.	Author	Year	Respondents	Relationship / observations
1	Ravichandran	1980	Sugarcane farmers	Significant and positive relationship with attitude.
2	Chandrasekaran	1981	Small tea growers	Significant and positive relationship with training need.
3	Manju	1997	Vegetable growers	Non-significant relationship with knowledge.
4	Sreedaya	2000	Members of SHGs involved in vegetable cultivation	Significant and positive relationship with extent of adoption.
5	Jabin and Manoharan	2001	Kitchen garden maintaining urban women	62.50 per cent of the respondents belonged to the category of medium level of social participation.

2.11.9 Extension Agency Contact

Sl. No.	Author	Year	Respondents	Relationship / observations
1	Govind	1992	Vegetable growers	Positive relationship with extent of adoption.
2	Gangadharan	1993	Pepper growers	Significant and positive relationship with knowledge.
3	Manju	1997	Vegetable growers	Non-significant relationship with extent of adoption
4	Sheela and Katteppa	1999	Farm women	Increase relationship with time spent on farm activities.
5	Syamkumar	1999	Rice growers	Non-significant relationship with attitude of farmers.
6	Sindhu	2002	Vegetable growers	Positive and significant relationship with social cost benefit.

2.11.10 Mass Media Contact

Sl. No.	Author	Year	Respondents	Relationship / observations
1	Lalitha	1986	Farm women	Significant and positive relationship with training.
2	Gnanadeepa	1991	Rice farmers	Significant and negative relationship with knowledge.
3	Manju	1997	Vegetable growers	Significant and positive relationship with extent of adoption.
4	Sheela and Katteppa	1999	Farm women	Inverse relationship with time spent on farm activities.
5	Jabin and Manoharan	2001	Kitchen garden maintaining urban women	47.5 per cent of the respondents had medium level of contact with mass media.

2.11.11 Risk Orientation

Sl. No.	Author	Year	Respondents	Relationship / observations
1	Jaleel	1992	Tribal farmers	Significant and positive relationship with extent of adoption.
3	Preetha	1997	Rice farmers	Significant and positive relation with knowledge.

2.11.12 Innovativeness

Sl. No.	Author	Year	Respondents	Relationship / observations
1.	Manju	1997	Vegetable growers	Non significant relationship with extent of adoption
2.	Jose	1998	Vegetable growers	Significant and positive relationship with knowledge
3.	Sreedaya	2000	Members of SHGs involved in vegetable cultivation	Inverse relationship with extent of adoption of recommended practices.

2.11.13 Health Consciousness

Sl. No.	Author	Year	Respondents	Relationship
1	Rao <i>et al.</i>	1987	Employed women	Outside employment led to negligence of their own health and had lead to various nutritional problems
2	Ghosh	1989	Unemployed urban women	Religion, economic motivation, education, believes and culture are important in the maintenance of health
3.	Varma	1990	Vegetable growers	The custom of women eating what is left over, causes serious nutritional problems
4	Park	1997	Rural women	Educational status and literacy rate have been proved to be powerful determinants of nutritional status
5	Sundar	2004		The factors which influenced food security in India is availability of food, access to food and absorption of food in the body. Access to the food depends on the purchasing power. The food absorption is a function of safe drinking water, environmental hygiene, primary health care and education

2.11.14 Experience in Vegetable Cultivation

Sl. No.	Author	Year	Respondents	Relationship / observations
1	Jayakrishnan	1984	Paddy growers	Significant and positive relationship with extent of adoption
2	Kanakasabapathi	1988	Tribals of Attapady	Non-significant relationship with training need
3	Jhingan	1990	-	With the repetition of the same work, one gets specialized in it which help him to do work in the best possible way which improves the skill
4	Sreedaya	2000	Vegetable growers	Significant and positive relationship with knowledge in vegetable cultivation

2 11.15 Management Orientation

Sl. No.	Author	Year	Respondent	Relationship / observations
1	Kamarudeen	1981	Paddy growers	Significant and positive relationship with extent of adoption
2	Shilaja	1990	Farm women	Significant and positive relationship with mixed farming community
3	Anantharaman	1991	Cassava farmers	Significant and positive relationship with knowledge
4	Sindhu	2002	Vegetable growers	Significant and positive relationship with social cost benefit

2.11.16 Family Labour Utilization

Sl. No.	Author	Year	Respondents	Relationship / observations
1	Manju	1997	Vegetable growers	Family labour income gives an idea regarding how much family is involved in cultivation
2.	Sindhu	2002	Vegetable growers	Significant and positive relationship with attitude towards vegetable cultivation Annual income has negative and significant correlation with family labour utilization

2.11.17 Irrigation Index

Sl. No.	Author	Year	Respondents	Relationship / observations
1	Manju	1997	Vegetable growers	Significant and positive relationship with extent of adoption Positive and non-significant relationship with knowledge
2	Majjusha	2000	Cowpea growers	Positive and significant relationship with both knowledge and extent of adoption
3	Manjusha	1999	Bitter gourd growers	Non-significant relationship with knowledge

2.12 CONSTRAINTS

Pandya and Trivedi (1988) defined constraints as those items of difficulties or problems faced by individuals in the adoption of technology.

Prakash (1989) defined constraint as the limiting factor, which stood in the way of accomplishing potential productivity.

2.12.1 Classification of Constraints

Classifying constraints into categories is useful to get a comprehensive picture of the problems and also helpful in solving them. Waghmare and Pandit (1982) reported that the tribal farmers of Madhya Pradesh experienced educational, economic, socio-cultural and practical constraints in the adoption of wheat technology.

Swaminathan (1984) classified the constraints causing yield gap in rice into two categories. The first category includes biological, chemical, hydrological and pedological constraints. The second category of constraints is economic and social.

Sagar and Ray (1984) classified the factors affecting farmers productivity of crops into agro-economic, socio-physiological and extension variable.

Paughal *et al.* (1994) classified constraints into three pertaining to production, technological and marketing constraints. Production constraints refers to the restraining factors which limit the production of cut flower and includes factors like non variability of new varieties, high cost of planting materials etc.

2.12.2 Constraints in Agricultural Production

Seshachar (1980) reported that lack of knowledge regarding application of farmyard manure, fertilizers and duration of plant

protection chemicals were the major constraints faced by the chilli cultivators.

Gokulraj (1981) reported that fluctuating market price, inadequate fund, no technical guidance, lack of knowledge regarding improved practice were constraints faced by tomato growers in rainfed areas.

Norman (1982) in his study inferred the problems in vegetable production were high attack of pests and diseases, high input cost and serious transportation problems.

Binu (1991) concluded in her study that high cost of plant, storage and post harvest facilities were the problems of commercial vegetable cultivation.

Sandhya (1992) observed that perishability, bulkness and reasonability in the production were some of the difficulties in marketing of vegetables.

Meera (1995) reported that the major constraint in the adoption of plant protection technology was the difficulty in finding the dosage of chemicals and difficulty in the selection of alternative chemicals.

Manjusha (1999) reported that high cost of material inputs was the most important economic constraint in bittergourd cultivation.

Sreedaya (2000) reported that lack of proper storage facility was the major constraints faced by the farmers of KHDP involving vegetable cultivation.

Methodology

3. METHODOLOGY

This chapter deals with the methodology employed for the study and are presented under the following subheadings.

- 3.1 Locale of the study
- 3.2 Selection of respondents
- 3.3 Action programme
- 3.4 Measurement of knowledge of urban housewives in cultivation of vegetables
- 3.5 Measurement of attitude of urban housewives towards terrace cultivation of vegetables
- 3.6 Training need of urban housewives in vegetable cultivation
- 3.7 Adoption of cultivation practices of vegetables by urban housewives
- 3.8 Measurement of time utilization pattern of urban housewives
- 3.9 Measurement of consumption pattern of vegetables by urban families
- 3.10 Measurement of cost-benefit ratio in terrace cultivation of vegetables
- 3.11 Selection and measurement of profile characteristics of urban housewives
- 3.12 Identification of constraints faced by urban housewives in terrace cultivation of vegetables and their solutions
- 3.13 Statistical tools used in the study

3.1 LOCALE OF THE STUDY

The study was taken up in a selected ward of Thiruvananthapuram corporation area since constant presence of the researcher was required throughout the study period in the study area to conduct intensive training and follow up activities to promote terrace cultivation of vegetables by the urban housewives. Besides, the presence of institution like college of Agriculture, Vellayani was also considered.

3.2 SELECTION OF RESPONDENTS

Thirty potential urban housewives for cultivating vegetables on house terraces in the selected ward would be identified with the help of residents' associations.

3.3 ACTION PROGRAMME

The present research study calls for the development of an action programme namely formulation, implementation, monitoring and evaluation of the action programme for promoting terrace cultivation of vegetables by urban housewives. The study was conducted in four phases.

3.3.1 First Phase / Preparatory Phase

As an initiation programme, publicity about the conduct of training programme for interested urban housewives was given through radio and newspaper. The response was immense. Since maximum number of responses were received from a particular ward, namely, Poojapura ward it was selected as the study area.

The researcher approached the residents' associations of the selected ward. Two residents' associations, namely, Chadiyara residents' association and Vidyadhiraja Nagar residents' association offered their help by which she could arrange a public meeting in order to conscientize the housewives

of the locality about the programme (Plate 1). A list of potential housewives interested in terrace cultivation of vegetables was collected from the two residents' associations and 30 housewives were selected randomly from the list. As a subsequent step, training need analysis of the selected urban housewives on different aspects of terrace cultivation was carried out.

The training programme was scheduled according to the results of the training need analysis conducted among the respondents. It was revealed that they preferred to get trained in plant protection first followed by preparation of organic manures like vermicompost and cultivation of azolla, preparation of organic pesticides like neem oil emulsion and nicotine emulsion. The result also indicated that field trip was the most preferred method of training followed by film shows and regarding the duration of training, first preference was for one day training and for venue they preferred, a nearby place of their residence.

3.3.1.1 Venue of Training

The training programme was conducted separately for the two groups of respondents. The first training programme was conducted on 12-15 January 2003 at 'Sree Bhavan', (CRA-31), Thalakkonam road, Poojapura. P.O, Thiruvananthapuram and the second training programme was conducted at 'Apsara' (VRNA-14), Vidyadhiraja Nagar, Poojapura, Thiruvananthapuram on February 12-15, 2003 taking into consideration the convenience the trainees (Plate 2).

3.3.1.2 Duration of Training

Though the first preference of the respondents was for one day training, most of them expressed their unwillingness to attend a full day training programme on working days due to household responsibilities. So the training was split in four days and was conducted from 1pm to 5 pm every day.



Plate 1. Conscientization programme conducted at the ward



Plate 2. Venue of training

3.3.1.3 Method of Training

The first preference of trainees on method of training was field trip. So field trip to different terrace gardens were arranged. Though the respondents preferred film shows and slide shows equally, due to unavailability of films on terrace cultivation of vegetables, slide shows were arranged followed by illustrated talks by the experts (Plate 3).

3.3.1.4 Area of Training

Emphasis was given on the different aspects of plant protection as required by the trainees. A demonstration class on various pests and diseases associated with vegetables and the measures to control them was handled by the researcher (Plate 4). A method demonstration on azolla cultivation, preparation of organic pesticides like neem oil emulsion and preparation of organic manures like vermicompost were conducted by Dr. V.B. Padmanabhan, Associate Professor, Department of Agricultural extension, College of Agriculture, Vellayani (Plate 5). Dr. M. Abdul Vahab, Associate Professor, Department of Olericulture, College of Agriculture, Vellayani handled classes on identification of suitable vegetables and their seeds, preparation of potting mixture, time of sowing and time of transplantation, manuring and irrigation to the crops (Plate 6). Demonstration on filling and placement of sacks, manuring and irrigation to the crops were handled by Dr. O. Kumari Swadija, Associate Professor, Department of Agronomy, College of Agriculture, Vellayani (Plate 7).

At the end of the training programme, inputs for starting terrace cultivation of vegetables such as sacks, seeds, powdered cowdung and azolla were distributed to the respondents.

3.3.2 Second Phase / Input Supply or Implement Phase

The second phase was started on the third week of February, 2003 and lasted up to May 2003. All the respondents started cultivation using the

supplied inputs on their house terraces. The respondents sought researcher's help in obtaining additional inputs from various agencies and seeds from College of Agriculture, Vellayani. The researcher made all the sincere efforts to make those things available to the trainees. They started the terrace cultivation of vegetables under the close monitoring and supervision of the researcher. The researcher herself started the cultivation of vegetables on her house terrace to act as a model for the trainees and to gain experiential learning and to have first hand information and data on vegetable cultivation on house terrace. She also started cultivating azolla and supplied it to those who needed it. As the cultivation progressed, the respondents requested a training on vermicomposting.

3.3.3 Third Phase / Constraint Removal Phase

Third phase was started on first week of June, 2003 and lasted up to the first week of September 2003. Illustrated talk cum method demonstration on the different aspects of compost making was handled by Dr. K. Ushakumari, Associate Professor, Department of Soil Science and Agricultural Chemistry, College of Agriculture, Vellayani at Bliss, VRNA-14, Vidyadhiraja Nagar, Poojappura. All the respondents cleared their doubts on different aspects of garbage disposal and vermicomposting.

A field visit by the members of the advisory committee of the researcher was conducted to the house terraces of randomly selected respondents. The cultivation continued and the researcher made frequent visits to their house terraces, took observation on yield, pest and disease incidence and other aspects of cultivation of vegetables, cleared their doubts and made all possible arrangements to make available the necessary inputs periodically.

Structured interview schedule (Appendix III) was developed and pretested. Data were collected at periodic intervals, analyzed and tabulated.



Plate 3. Method demonstration during training



Plate 4. Illustrated lecture class by the researcher



**Plate 5. Method demonstration on cultivation of azolla
by Dr. V.B. Padmanabhan**



Plate 6. Illustrated lecture class by Dr. Abdul Vahab



Plate 7. Lecture class by Dr. Kumari O. Swadija

3.3.4 Fourth Phase / Concluding Phase

Eighty percent of the respondents continued cultivation and seven of them had withdrawn due to children's marriage, illness and other personal reasons. It was also noticed that by the time, the respondents developed 'a we feeling' among them and started exchanging the inputs such as sacks, seeds/seedlings, organic manure, worms, azolla and also the produce obtained through terrace cultivation of vegetables.

3.4 MEASUREMENT OF KNOWLEDGE OF URBAN HOUSEWIVES IN CULTIVATION OF VEGETABLES

Knowledge was operationally defined as the quantum of scientific information possessed on the subject, namely, cultivation of vegetables on house terrace.

Different researchers have measured knowledge by different measurement procedures:

Author	Year	Respondents group	Method of measurement
Anantharaman	1991	Cassava growers	$\frac{\text{Number of correct answers}}{\text{Total score possible}} \times 100$
Majjusha	2000	Cowpea growers	Teacher - made test
Meera	1995	Farm women	$\frac{\text{Number of correct answers}}{\text{Total score possible}} \times 100$
Allan	2000	Medicinal plant growers	Free tailed questionnaire and the answers cross checked
Sreedaya	2000	Vegetable growers	Teacher- made test

In the present study, knowledge of urban housewives was tested before and after the training using a simple teacher-made test developed for

the purpose. Based on the review of literature and discussion with experts, a list of 16 questions were prepared, ten questions to test the knowledge on vegetable cultivation and six questions to test the knowledge on terrace cultivation of vegetables. These questions were further edited to avoid ambiguity and finally nine questions to test the knowledge on vegetable cultivation and five questions to test the knowledge on terrace cultivation of vegetables were formulated to which the respondent had to answer. A score of three was given to the correct answer, two for partially correct answer and one for wrong answer. The sum of the scores obtained for the nine questions indicated the knowledge on vegetable cultivation of the respondent and the sum of the score obtained for five questions indicated the knowledge on terrace cultivation of vegetables of the respondent.

3.5 MEASUREMENT OF ATTITUDE OF URBAN HOUSEWIVES TOWARDS TERRACE CULTIVATION OF VEGETABLES

The term attitude refers to the degree of positive or negative affect towards a psychological object. In the present study, attitude scale was developed using the method of summated rating suggested by Likert (1932).

3.5.1 Collection of Items

Based on the review of literature and discussion with experts, 50 statements regarding different aspects of terrace cultivation of vegetables were set, so as to make the respondents to reflect their attitude towards terrace cultivation of vegetables through their responses. Then the statements were edited in accordance with the criteria suggested by Edward and Kilpatrick (1948), so as to indicate both favourable and unfavourable attitude towards terrace cultivation of vegetables. In order to know the relevance of each of the statement, the statements thus selected were subjected to judges rating. The responses were obtained in a five point continuum, namely, 'very much relevant', 'much relevant', 'somewhat relevant', 'not relevant' and 'not at all relevant' with weightages of 5, 4, 3,

2 and 1 respectively. The relevance of each of these statements were analysed and only those statements considered relevant by more than 50 per cent of the judges were included for the study. For the selection of statements to the final attitude scale, item analysis was done.

For the purpose of item analysis, the statements were first administered to a group of 60 non sample respondents and they were requested to respond to each statement in terms of their own agreement or disagreement with the statement on a five point continuum namely 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree'.

The responses were assigned numerical weights. For positive statements, the scoring pattern was 5, 4, 3, 2 and 1 for 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' respectively. The scoring pattern was reversed for negative statements. The sum of weightage for all the statements was worked out to get the attitude score of an individual respondent. Scores were arranged in descending order. Twenty five per cent of the respondents with higher total score and 25 per cent of the respondents with lower total score were selected from among the respondents. These two groups formed the criterion groups in terms of which evaluation of individual statements were made.

The discrimination index 't' was computed for all the statements using the formula:

$$t = \frac{X_H - X_L}{\sqrt{\frac{S_H^2}{n_H} + \frac{S_L^2}{n_L}}}$$

X_H - the mean score on a given statement for the high group

X_L - the mean score on the same statement for lower group

S_H^2 - the variance of the distribution of responses of the high group to the statement

S_L^2 - the variance of the distribution of responses of the low group to the statement

n_H - the number of subjects in the high group

n_L - the number of subjects in the low group

Those statements with 't' value above 1.75 were selected. Finally 14 statements which consisted of both positive and negative statements (Appendix II) were included in the schedule.

3.5.2 Reliability of the Scale

A scale is said to be reliable only when it would consistently produce the same or similar results, when applied to the same sample at different time. Here reliability was tested by means of split half method.

The scale was administered to 30 non-sample respondents and was divided into two halves based on odd and even number of statements.

The summation of scores obtained by odd numbered items and the summation of scores obtained by even numbered items of the scale for each respondent was correlated by using Pearson's product moment correlation coefficient. The coefficient of internal consistency 'roe' was worked out using the formula.

$$\text{roe} = \frac{P_{XY}}{\sigma_X \times \sigma_Y} \quad \text{where}$$

roe = the correlation coefficient between sum of scores on odd and even numbered items in the scale

P_{XY} = the product moment of scores on odd and even numbered items

σ_X = the standard deviation of the distribution of scores on odd numbered items

σ_Y = the standard deviation of the distribution of scores on even numbered items.

The 'roe' value obtained will give half test reliability. Therefore it was corrected using spearman brown's prophecy formula and thus the reliability coefficient, r_{tt} , for the total length of the scale was obtained as given below.

$$r_{tt} = \frac{2 \text{ roe}}{1 + \text{roe}}$$

The reliability coefficient (r_{tt}) between the two scores was found to be highly significant (0.8). Hence it was concluded that the scale was reliable.

3.5.3 Validity of the Scale

The developed scale was tested for content validity. The main criteria of content validity was how the contents of the scale represented the subject matter under study. Since the items selected were from the universe of contents, it was ensured that the items covered all aspects of terrace cultivation of vegetables.

3.5.6 Administering the Scale

The final scale with negative and positive statements were administered to the urban housewives before the training and also during the second season. The responses were collected on a five point continuum namely 'strongly agree', 'agree', 'undecided', 'disagree', 'strongly disagree' with weightage of 5, 4, 3, 2 and 1 respectively. The scoring was reversed in the case of negative statements. The weightages on responses of all the statements were summated to get the attitude score of each individual.

The maximum possible score was 70 for an individual and minimum possible score was 14.

3.6 TRAINING NEED OF URBAN HOUSEWIVES IN VEGETABLE CULTIVATION

Ascertaining training need helps in exploring vulnerable areas wherein training could be designed as a basis of felt needs of the participants. It is more important because an effective training required motivation for an effective learning and transfer of learning on the part of the trainees, which have full bearing on the training objective.

Training need was operationally defined, as the perceived needed level of training for terrace cultivation of vegetables by the urban housewives of the selected ward of Thiruvananthapuram Corporation.

Different researchers, for assessment of training need followed different measurement procedure.

1. Weighted Mean Score

	Researcher	Year	Respondents	Measurement procedure
1	Anantharaman	1977	Small and marginal farmers	Training need on each subject matter area and the specific items were measured by the use of a three point rating scale with points 'much needed', 'somewhat needed' and 'not at all needed' with scores of 2, 1 and 0 respectively. The frequencies of each response categories was multiplied with corresponding scores and the scores were summed up and divided by the total weights to get weighted mean score for each subject matter area.

2	Ahamed	1981	Farmers	"
3	Chandrasekaran	1981	Small tea growers	"
4	Savarimuthu	1981	Farm women	"
5	Arumugam	1983	Sericulturist	"
6	Alexander	1985	Rubber growers	"

2. Miller's Method

Researcher	Year	Respondents	Measurement procedure
Miller	1979	Business Students	M - I = D M = Mastery of all necessary behaviour I = Inventory or common behaviour to both old and new way D = Deficiency or training need

3. Index of Consensus (Cq)

Researcher	Year	Respondents	Measurement procedure
Davis	1962	Youth	<p>When the training needs are collected on different tasks and activities from the trainees, the supervisors and supervisees (clients) on the same time and when each respondent makes but one choice, only then, consensus index can be worked out for each category of respondents. This is a simple tool and ranges from 0 to 1.</p> $Cq = \frac{f^l - c^l f}{f(c-1)}$ <p>Cq = Consensus index,</p>

			f = Mean frequencies of persons preferring each category c^1 = Number of categories with frequencies exceeding f f^1 = Category frequency larger than f
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4. Training Need Score

Researcher	Year	Respondents	Measurement procedure
Gill	1970	Poultry farmers	$\text{Training need score} = 1 - \frac{\text{average knowledge score}}{\text{Total knowledge score}}$
Allan	2000	Medicinal plant cultivators	$\frac{\text{No. of questions} \times \text{No. of respondents}}{\text{No. of questions} \times \text{No. of respondents}}$

5. Choice Scores (ACS and TCS)

Researcher	Year	Respondents	Measurement procedure
Bhatnagar	1984	Tea growers	<p>On the basis of the response of the people on the proforma given earlier, priorities based on the I, II and III choices could be tabulated and identified as training need. Following them total choice score (TCS) and average choice score (ACS), could be worked out by the formula</p> $\text{ACS} = \frac{(\text{CI} \times 3) + (\text{CII} \times 2) + (\text{CIII} \times 1)}{3}$ <p>where ACS = Average choice score CI = First choice, CII = Second choice CIII = Third choice</p>

6. Training Need Quotient (TNQ)

Researcher	Year	Respondents	Measurement procedure
Sharma and Singh	1966	A.H. Extension officers	<p>It ranges from 0 to 100</p> $TNQ = \frac{OS_{ij}}{MS_{ij}} \times 100$ <p>Where OS_{ij} = Sum of observed scores of j^{th} individual for the I^{th} item MS_{ij} = Maximum score attributable to the I^{th} item rated by j^{th} individual</p>

In the present study the training need of the urban housewives on different aspects of terrace cultivation of vegetables were measured before the training using average choice score method. In addition, their preference on method, frequency, duration and venue of training were also studied. Training programme was conducted in accordance with the results obtained during training need analysis.

3.7 ADOPTION OF CULTIVATION PRACTICES OF VEGETABLES BY URBAN HOUSEWIVES

According to Rogers and Shoemaker (1962) adoption refers to the continued use of recommended practice by an individual. He opined that adoption process is the internal process through which an individual passes from hearing about an innovation to its final adoption.

In the present study adoption behaviour was operationalised as the extent to which the various popular practices of vegetable cultivation including that of terrace cultivation were put into practice by the respondent.

The extent of adoption was measured using the method adopted by Ramachandran (1992) with slight modification. Based on the review of literature and discussion with experts, seven practices were identified and the respondents were asked whether they had adopted it or not. A score of 'three' was given for full adoption, two for partial or improper adoption and zero for non-adoption. The adoption score of the respondent was obtained by summing the score with respect to the selected practices.

3.8 MEASUREMENT OF TIME UTILIZATION PATTERN OF URBAN HOUSEWIVES

Time utilization pattern was operationally defined as the total amount of time, the respondents spend in day-from bed to bed for various activities.

Open-ended questionnaire was given to the respondents and they were asked to record how actually they spent a day from early morning to evening. The responses received were categorised, grouped and analyzed to find out the average number of hours spent by the urban housewives on different household activities during a day and corresponding percentage was also calculated.

3.9 MEASUREMENT OF CONSUMPTION PATTERN OF VEGETABLES BY URBAN FAMILIES

It was operationally defined as the type and quantity of vegetables consumed per week by the respondent and her family members and also its purchase pattern.

Food habits of an individual are the characteristics repetitive acts that he/she performs under the impetus of the need to provide himself/herself with nourishment and simultaneously to meet the assortment of social and emotional goals (Gift *et al.*, 1972).

The food consumption pattern has been measured by different researchers using different measurement procedures.

Paul (1999) measured food consumption on a 'five point' continuum. On the basis of the frequency of use, the foods were classified into five groups and scored as given below.

Frequency of use	Score
Never	0
Occasionally	1
Less than 3 days in a week	2
More than 3 days in a week	3
Daily	4

The total score for each of the food groups were calculated (Reabrun *et al.*, 1979). Based on the percentage score obtained the food articles were further classified into four groups based on the frequency scores obtained. Ajitha (2000) and Soumya (2001) also followed the same measurement procedure.

In the present study consumption of vegetables was measured by the procedure developed by the researcher for the purpose. The vegetables were divided into three sub categories, namely, leafy vegetables, roots and tubers and others which include bittergourd, snakegourd, bhindi, brinjal, cowpea, tomato, chillies and any other vegetable cultivated by the respondent on her house terrace. The respondents were asked to indicate the approximate quantity of vegetables they consumed per week before and after starting terrace cultivation of vegetables under these three subheads. The respondents were also asked to indicate the change in purchase pattern of vegetables after starting terrace cultivation of vegetables.

3.10 MEASUREMENT OF BENEFIT COST RATIO IN TERRACE CULTIVATION OF VEGETABLES

It was measured by the method developed by the researcher for the study. Benefit cost ratio would be worked separately for each of the

respondent by incorporating family labour and hired labour to the total cost and without incorporating family labour and hired labour to the total cost.

3.10.1 Cost of Cultivation

The cost of cultivation for terrace cultivation of vegetables for two seasons would be worked out and summated to get the cost of terrace cultivation of vegetables of the respondents. Parameters used to calculate the cost of terrace cultivation of vegetables in each season is given below.

First Season

Sl. No.	Particulars	Number / Quantity	Rate	Amount (Rs.)
1	Sacks			
2	Cowdung			
3	Sand			
4	Planting materials			
5	Biofertilizers			
6	Biopesticides			
	Grand Total			

Second Season

Sl. No.	Particulars	Number / Quantity	Rate	Amount (Rs.)
1	Sacks			
2	Cowdung			
3	Sand			
4	Planting materials			
5	Biofertilizers			
6	Biopesticides			
7	Grand Total			

3.10.2 Total Returns

The yield of vegetables in kilograms in two seasons and their corresponding price value would be found out and total returns calculated.

First Season

Sl. No.	Vegetables	Yield (kgs)	Amount (Rs.)
1	Amaranthus		
2	Tomato		
3	Chilly		
4	Bhindi		
5	Cowpea		
6	Brinjal		
7	Bittergourd		
	Others (specify)		

Second season

Sl. No.	Vegetables	Yield (kgs)	Amount (Rs.)
1	Amaranthus		
2	Tomato		
3	Chilly		
4	Bhindi		
5	Cowpea		
6	Brinjal		
7	Bittergourd		
	Others (specify)		

3.10.3 Labour

The respondents were asked to indicate total number of hours spent by all her family members in each crop season to help her in terrace cultivation of vegetables. Subsequently the number of man-hours was converted into rupees. Similarly the cost of hired labour was also found out. Cost of labour would be summated to the cost of cultivation to get the total cost of cultivation. The respondents were also asked to indicate the area of their house terrace

Sl. No.	Items	Number/Hours	Amount (Rs.)
1	Family labour		
2	Hired labour		
	Total		

Net returns = Total returns - Total cost

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

3.11 SELECTION AND MEASUREMENT OF PROFILE CHARACTERISTICS OF URBAN HOUSEWIVES

3.11.1 Selection of Profile Characteristics of Urban Housewives

Based on the objectives, review of literature, discussion with experts and observation made by the researcher, a list of 30 personal, socio-psychological, economic and situational variables were framed along with their operational definitions (Appendix I) and sent to 50 judges for eliciting their relevancy rating by the researcher in a five point continuum ranging from 'most relevant' to 'least relevant'. About 45 judges responded and from among these 45, 40 responses were received as complete and taken for analysis. The judges were those people who were the practitioners of terrace cultivation of vegetables. The scores were assigned as follows.

Response	Score
Most relevant	5
More relevant	4
Undecided	3
Less relevant	2
Least relevant	1

The total score obtained for each variable was worked out and according to the expert opinion, variables having index value above 180 were selected. The variables thus selected were

1. Age
2. Educational status
3. Cultivated area
4. Family size
5. Self confidence
6. Annual income
7. Economic motivation
8. Social participation
9. Extension agency contact
10. Mass media contact
11. Risk orientation
12. Innovativeness
13. Health consciousness
14. Experience in vegetable cultivation
15. Management orientation
16. Family labour utilization
17. Irrigation index

3.11.2 Measurement of Profile Characteristics

3.11.2.1 Age

Age was operationally defined as the number of calendar years completed by the respondent. This was measured by directly asking the respondent, the number of years she has completed at the time of interview.

In this study, respondents below the age of 35 were considered as young and above the age of 35 were considered as old (Devi, 1994).

3.11.2.2 Educational Status of the Family

Educational status was operationally defined as the extent of formal education attained by the respondent. The education was measured by the procedure developed by the researcher for the purpose; that is the respondents were asked to indicate whether they were undergraduates or graduates (and above).

3.11.2.3 Cultivated Area

Cultivated area was operationally defined as the total area in cents under any crop possessed by the respondent. Different researchers have tried to measure cultivated area in different ways.

In the present study, area under vegetable cultivation was taken as such in cents. The unit area was expressed in terms of cents.

3.11.2.4 Family Size

It was operationally defined as the total number of members in the family of the respondent living together.

It was measured by the procedure developed by the researcher for the purpose. The respondent was asked to indicate the number of old age people, adults and children in their family.

3.11.2.5 Self Confidence

Self confidence was operationally defined as the degree of faith the respondent had in her own abilities, initiative and zeal to achieve her goal or aim.

The variable was measured by using the scale designed by Pandiyaraj (1978). The scale consisted of eight items. The respondents were asked to give their responses on a five-point continuum ranging from 'strongly agree' to 'strongly disagree'. The scoring procedure followed was as follows for positive statement and reverse for negative statement.

Response	Score
Strongly agree	5
Agree	4
Undecided	3
Disagree	2
Strongly disagree	1

The self confidence score for each individual was calculated by summing up the scores on individual statement. The possible range of score of an individual in this scale was 8 to 40.

The same measurement procedure was followed by Jaleel (1992) and Parvathy (2000).

3.11.2.6 Annual Income

This was operationally defined as the income obtained by the

respondent and her family for a year through the major and subsidiary occupation.

Doddahanumaiah (1990) measured the annual income by asking the respondent to state the total annual income of his family from all the sources.

In this study, the annual income obtained as such was considered for the measurement.

3.11.2.7 Economic Motivation

Economic motivation was operationally defined as the the extent to which the respondent was oriented towards profit maximization in terrace cultivation of vegetables and relative value she places on monetary gains.

It was measured using the scale developed by Supe (1969). The scale consisted of six statements in which the responses were collected on five point continuum 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with weightages of 5, 4, 3, 2 and 1 respectively for positive statements and reverse in the case of negative statements.

The scores obtained on each statement was summed up to arrive at individual score on economic motivation. The possible score range was from 6 to 30.

3.11.2.8 Social Participation

social participation was operationally defined as the participation of respondent in various formal social institutions either as a member or as an office bearer.

In this study, social participation was measured using the scale developed by Sadamate (1978) and later used by Kamarudeen (1981), John (1991) and Sreedaya (2000). This scale was having two dimensions namely membership in organization and participation in organizational activities. The score were assigned as follows :

1. For membership in organisation

No membership in organisation	-	0
Membership in each organization	-	1
Office bearer in each organization	-	2

2. Frequency of participation

Never attending any of the meetings	-	0
Sometimes attending meeting / activities	-	1
Regularly attending meetings	-	2

The scores obtained by a respondent on the above two dimensions were summed up across each item for all the organization which gave the social participation score.

3.11.2.9 Extension Agency Contact

Contact with extension agency was operationally defined as the degree to which the respondent maintained her contacts with different extension agencies. The scoring procedure adopted by Krishnamoorthy (1988) was followed to measure this variable on two dimensions of the contact. In terms of frequency and purpose of contact. The scoring procedure was as follows.

Frequency of contacts	Score
Never	1
Sometimes	2
Regularly	3
Purpose of contact	Score
Non-agricultural	1
Agricultural	2

The total scores obtained by an individual on both items were taken as his score for contact with extension agencies.

The same measurement procedure was adopted by Meera (1995), Majjusha (2000) and Parvathy (2000).

3.11.2.10 Mass Media Contact

It was operationally defined as the extent to which the respondent was exposed to different mass media communications such as radio, television, news paper, magazines, leaflets, bulletins and cinema. The procedure used by Anantharaman (1977) to measure the extent of participation of the respondent in different mass media was followed with slight modification. The scoring was done as given below.

Mass medium	Frequency	Score
Radio	Daily	5
	2-6 days a week	4
	Once a week	3
	Once a fortnight	2
	Rarely	1
	Never	0

Television	Daily	5
	2-6 days a week	4
	Once a week	3
	Once a fortnight	2
	Rarely	1
	Never	0

Newspaper	Daily	5
	2-6 days a week	4
	Once a week	3
	Once a fortnight	2
	Rarely	1
	Never	0

Magazine / leaflets / Bulletins

Regularly	2
Occasionally	1
Never	0

Films (seen during last year)	More than 6 times	3
	4-6 times	2
	1-3 times	1
	Never	0

The total score of each respondent was computed by summing the scores on all the five sub items and was taken as respondents score on mass media participation. The score ranges from zero to 20.

The same measurement procedure was followed by Syamkumar (1999).

3.11.2.11 Risk Orientation

It was operationally defined as the degree to which the respondent was oriented towards encountering risks and uncertainty in adopting new ideas in the cultivation of vegetables on house terrace.

It was measured using the scale developed by Supe (1969). The scale consisted of six statements of which one statement was negative. The scoring was on a five point continuum as 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with weightages of 5, 4, 3, 2 and 1 for positive statements and was reverse in the case of negative statements. The sum of the scores of each statement is the score of the risk orientation of the respondent.

The same procedure was followed by Sindhu (1997), Majjusha (2000), Sreedaya (2000) and Parvathy (2000).

3.11.2.12 Innovativeness

It was operationally defined as the to the degree to which the respondent was relatively earlier in adopting new ideas.

The procedure followed by Selvanayagam (1986) was used to measure the innovativeness with slight modification. In this procedure, a question was asked as when the respondent would like to adopt an improved practice in terrace cultivation of vegetables. The responses were scored as follows.

Sl. No.	Response	Score
1	As soon as it is brought to my knowledge	4
2	After I had seen others tried successfully in their own trial	3
3	I prefer to wait and take my own time	2
4	I am not interested in adopting improved practices	1

3.5.2.13 Health Consciousness

It was operationally defined as the awareness, knowledge and interest of the respondent regarding the dietary requirements, personal hygiene and environmental sanitation.

It was measured by the procedure developed by the researcher for the purpose. Based on the review of literature and discussion with experts, three main dimensions, namely, personal hygiene, balanced nutrition and environmental sanitation were formulated to measure health consciousness. Based on these three dimensions, 20 statements were formulated and edited in accordance with the criteria suggested by Edward and Kilpatrick (1948) so as to indicate both favourable and unfavourable attitude of the respondent towards health consciousness. In order to know the relevance of each of these statements, the statements thus selected were subjected to judges rating. The responses were obtained on a five-point continuum, namely, 'very much relevant', 'much relevant', 'somewhat relevant', 'not relevant' and 'not at all relevant' with weightages of 5, 4, 3, 2 and 1 respectively. The relevance of each of these statements were analysed and only those statements considered relevant by more than 50 per cent of the judges were included for the study. Thus six statements, which consisted of both positive and negative, were included in the schedule.

. These six statements were administered to the respondents and the scoring was on a five-point continuum as 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with weightages of 5, 4, 3, 2 and 1 for positive statements and was reversed in the case of negative statement. The sum of the scores of each statement was the score of the health consciousness of the respondent and the score ranged from 30 to 6.

3.11.2.14 Experience in Vegetable Cultivation

It was operationally defined as the number of years since the respondent was actively involved in vegetable cultivation. Padmanabhan (1991), Rajagopalan (1986), Jaleel (1992), Nizamudeen (1996) and Sindhu (1997) measured experience in farming as the actual completed years of experience of the respondent in agriculture.

Chandrasekharan (1981) and Kanakasabapathi (1988) followed the scoring procedure as given below.

Sl. No.	Years of experience	Score
1	Upto 5 years	1
2	5 to 10 years	2
3	Above 10 years	3

Chandra (1988) adopted the following scoring.

Sl. No.	Years of experience	Degree of experience	Score
1	Upto 10 years	Low	1
2	Upto 20 years	Medium	2
3	Above 20 years	High	3

In the present study the experience in vegetable cultivation was measured by assigning a score of one for each completed years of experience, the respondent had in the cultivation of vegetables including on terrace at the time of investigation as followed by Jaleel (1992).

3.11.2.15 Management Orientation

Management orientation was operationalised as the degree to which the respondent was scientifically oriented towards planning, production and marketing aspects of an enterprise.

For measuring the management orientation, the scale developed by Samantha (1977) was used. It consisted of 14 statements, four for planning, five each for production and marketing orientation. In each group positive and negative statements were mixed. In case of positive statements, a score of two was given for agreement and one for disagreement. For negative statement, the scoring pattern was reversed. The sum of the scores obtained by the respondent was taken as his score for management orientation. The possible score ranges from 14 to 28.

3.11.2.16 Family Labour Utilization

It was operationalised as the extent of utilization of members of the family by the respondent for terrace cultivation of vegetable. The variable was measured by the procedure developed by Sindhu (2002).

To quantify the farmer's perception, the respondents were asked to state to what extent they feel, there was utilization of family members in cultivation of vegetables on house terraces and the responses were taken on a four-point continuum.

	Score
To the fullest extent	4
As far as possible	3
To the least extent	2
Never	1

3.11.2.17 Irrigation Index

Irrigation index was operationally defined as the extent to which crops were being irrigated.

For quantifying this variable, the procedure developed by Geethakutty (1993) was used. Two dimensions namely availability of irrigation water and frequency of irrigation were measured. Scores for these two dimensions were as follows.

Availability of irrigation water

Throughout the year	2
Partial availability	1
Never	0

Frequency of irrigation

Once in two days	4
Once in a day	3
Twice in a day	2
Occasionally	1

The scores obtained by a respondent for the availability of irrigation water and area under irrigation were multiplied to get the irrigation index.

3.12 IDENTIFICATION OF CONSTRAINTS FACED IN TERRACE CULTIVATION OF VEGETABLES AND THEIR SOLUTIONS

Constraints / problems were operationally defined as the difficulty encountered by the respondents in terrace cultivation of vegetables.

Solutions were operationally defined as the proposal to overcome the difficulty encountered in terrace cultivation of vegetables.

In this study, the researcher identified the constraints using the two steps as illustrated below.

Step I

In this phase respondents were asked to enlist those major constraints that they felt important and the solution as perceived by them.

Step II

The constraints obtained during the first phase were again given to them for ranking according to the order of importance.

The frequencies of the respondents ranking each constraint were found out and its percentage was calculated. The constraint with the higher percentage was considered as the most serious one and the rest are followed in the order of decreasing values. Thus the interview schedule made it possible to measure the perception of respondents regarding the constraints identified during the terrace cultivation of vegetables.

3.13 STATISTICAL TOOLS USED IN THE STUDY

The collected data were analyzed using the following statistical tools.

3.13.1 Mean

The respondents were classified into low groups and high groups for the dependent and independent variables based on the respective mean scores.

3.13.2 Percentage

To make simple comparison percentage analysis was done.

3.13.3 Chi-square Test

To test the relationship between dependent variables and independent variables, chi-square test was done using the formula.

$$\alpha^2 = \frac{\left| ad - bc \right|}{N} - \frac{N^2}{2}$$

$$N = a+b+c+d$$

3.13.4 Wilcoxon Sign-Rank Test

To test whether there is any significant difference in knowledge and attitude before and after the training, Wilcoxon sign-rank test was done using the formula:

$$Z = \frac{T - E(T)}{SE(T)}$$

Where, T is the test statistics

$$E(T), \text{ which is the mean} = \frac{n(n+1)}{4}$$

$$SE(T), \text{ which is the standard error} = \sqrt{\frac{(n+1)(2n+1)}{24}}$$

Results and Discussion

4. RESULTS AND DISCUSSION

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

- 4.1 Knowledge of urban housewives in cultivation of vegetables
- 4.2 Attitude of urban housewives towards terrace cultivation of vegetables
- 4.3 Training need of urban housewives in vegetable cultivation
- 4.4 Adoption of cultivation practices of vegetables
- 4.5 Time utilization pattern of urban housewives
- 4.6 Consumption pattern of vegetables by urban families
- 4.7 Cost-benefit ratio in terrace cultivation of vegetables
- 4.8 Profile characteristics of urban housewives
- 4.9 Constraints faced in terrace cultivation of vegetables and their solutions
- 4.10 Spread effect of terrace cultivation of vegetables
- 4.11 Implications of the study
- 4.12 Sustainability of terrace gardens
- 4.13 Development of a model for terrace cultivation of vegetables

4.1 KNOWLEDGE OF URBAN HOUSEWIVES IN VEGETABLE CULTIVATION

Table 1. Distribution of respondents based on their average knowledge score in cultivation of vegetables before the training

(n = 30)

Sl. No.	Category	Frequency	Mean score	Percentage
1	Low	13	≤ 10.30	44.00
2	High	17	> 10.30	56.00
Total		30		100.00

Table 2. Distribution of respondents based on their average knowledge score in cultivation of vegetables after the training

(n = 30)

Sl. No.	Category	Frequency	Mean score	Percentage
1	Low	01	≤ 13.2	03.00
2	High	29	> 13.2	97.00
Total		30		100.00

From the tables 1, it was clear that 56 per cent of the respondents had high knowledge and 44 per cent of the respondents had low knowledge in cultivation of vegetables before the training .

Table 2 revealed the percent of respondents having high knowledge in vegetable cultivation had increased up to 97 from 56 per cent where as the percent of respondents having low knowledge in vegetable cultivation had decreased to three per cent from 44 per cent after the training (Fig. 1 and 2).

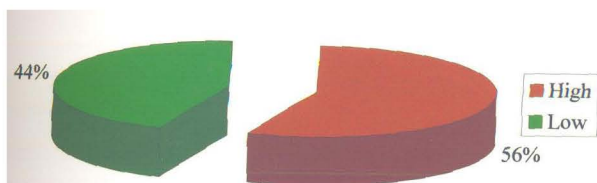


Fig. 1 Distribution of respondents according to the level of knowledge in cultivation of vegetables before the training

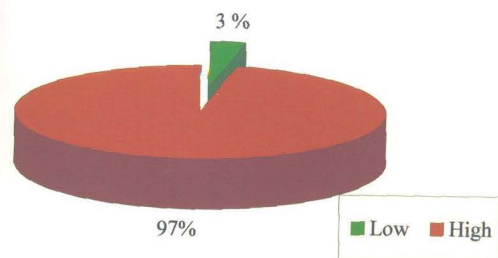


Fig. 2 Distribution of respondents according to the level of knowledge in cultivation of vegetables after the training

Table 3. Distribution of respondents according to their level of knowledge in terrace cultivation of vegetables before the training

(n = 30)				
Sl. No.	Category	Frequency	Mean score	Percentage
1	Low	21	≤ 26.3	70.00
2	High	09	> 26.3	30.00
Total		30		100.00

Table 4. Distribution of respondents according to their level of knowledge in terrace cultivation of vegetables after the training

(n = 30)				
Sl. No.	Category	Frequency	Mean score	Percentage
1	Low	01	≤ 30.6	03.00
2	High	29	> 30.6	97.00
Total		30		100.00

From the tables 3, it was clear that 30 per cent of the respondents had high knowledge and 70 per cent of the respondents had low knowledge in cultivation of vegetables before giving training.

Table 2 revealed, the percent of respondents having high knowledge had increased up to 97 from 30 per cent where as the percent of respondents having low knowledge in terrace cultivation of vegetables had decreased to three per cent from 70 per cent after giving training.

So it could be concluded with absolute clarity that the increase in per cent of respondents having high knowledge in cultivation of vegetables and in terrace cultivation of vegetables after training by 39 per cent and 65 per cent respectively was solely because of the information they gathered during lecture, demonstration and field visit during training.

It was also clear from table 1 and 3 that while 56 per cent of the respondents had high knowledge in cultivation of vegetables, only 30 percent of the respondents possess high knowledge in terrace cultivation

of vegetables. The result indicated that though majority of the respondents were well versed in general cultivation of vegetables, those who were really thorough in different aspects of terrace cultivation of vegetables were very low before attending the training programme.

Cultivation of vegetables on land is not so much innovative. Earlier people used to cultivate vegetables in their homesteads, paddy fields and other available land more frequently as the land was available in plenty. So exposure to different aspects of vegetable cultivation during their childhood might have helped them to gain high knowledge in vegetable cultivation.

Terrace cultivation of vegetables was an alternative strategy for population explosion and shrinkage of land. This was rather an innovative approach for the respondents, which might be the reason for low knowledge in terrace cultivation of vegetables before attending the training programme.

This finding is in line with the findings of Allan (2000) about medicinal plant cultivators and Syamkumar (1999) about rice growers.

4.2 ATTITUDE OF URBAN HOUSEWIVES TOWARDS TERRACE CULTIVATION OF VEGETABLES

Table 5. Distribution of respondents according to their attitude towards terrace cultivation of vegetables before the training

(n = 30)

Sl. No.	Category	Frequency	Mean score	Percentage
1	Unfavourable	10	≤ 45	33.00
2	Favourable	20	> 45	67.00
Total		30		100.00

It was clear from Table 5 that majority of the respondents (67 per cent) had favourable attitude and only 33 per cent exhibited unfavorable attitude towards terrace cultivation of vegetables before attending the training programme (Fig. 3).

Table 6. Distribution of respondents according to their attitude towards terrace cultivation of vegetables during the second season

(n = 30)

Sl. No.	Category	Frequency	Mean score	Percentage
1	Unfavourable	01	≤ 52	03.00
2	Favourable	29	> 52	97.00
Total		30		100.00

The figures of table 6 indicated that 97 per cent had favourable attitude and only three per cent exhibited unfavorable attitude towards terrace cultivation of vegetables during the second season of cultivation (Fig. 4).

Though the respondents were interested in the production of safe, eco-friendly and hygienic vegetables in their terraces, they were anxious about the factors like crop loss due to the incidence of pest and diseases, availability of inputs such as seeds, organic manures and sacks, preparation of organic pesticides and fungicides and above all the safety of their house terrace. But exposure to different terrace gardens during the field visit, lecture cum demonstration on the preparation and use of organic manures like vermicompost and demonstration on different aspects of terrace cultivation of vegetables like filling and placement of sacks in terraces might have changed their attitude towards terrace cultivation of vegetables which is reflected by an increase in the per cent of the respondents having favorable attitude from 67 per cent to 95 per cent.

The finding is in line with the findings of Jayalekshmi (2001) who reported that exposure to training had changed the attitude of rural women towards different self-employment schemes.

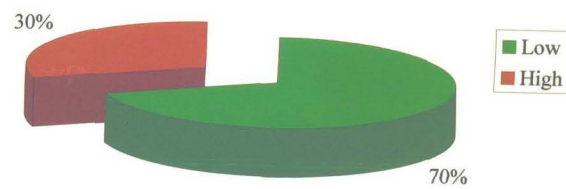


Fig. 3 Distribution of respondents according to their attitude towards terrace cultivation of vegetables before the training

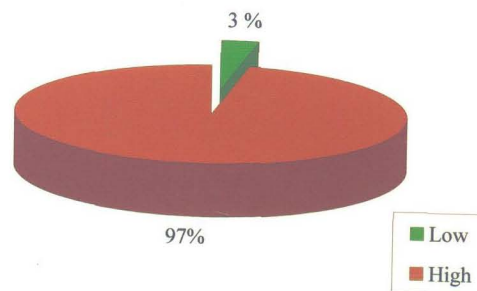


Fig. 4 Distribution of respondents according to their attitude towards terrace cultivation of vegetables during the second season

4.2.1 Case Study

It was found out from Table 1-6 that even after attending the training programme, only one respondent neither changed her attitude towards cultivation of vegetables nor obtained more knowledge in vegetable cultivation. The respondent was Mrs. Bindu B. Nair, Akshya, Thalakonam Road, Poojapura. During the training programme itself, the researcher could notice that she attended the training programme due to the pressure from her husband and she was also suffering from various illness like, diabetes, back pain etc. Though she started cultivation using the supplied inputs after the training programme with the help of her husband, it did not flourish well due to her lack of interest. Further she did not co-operate with the researcher during the visits to her home. So it is not a surprise to see that there is no positive change in her knowledge and attitude even after undergoing training.

4.2.2 Result of the Wilcoxon Sign-Rank Test

4.2.2.1 Knowledge

Wilcoxon sign-rank test for knowledge was conducted using the formula :

$$Z = \frac{T - E(T)}{SE(T)}$$

Where, T is the test statistics

$$E(T), \text{ which is the mean} = \frac{n(n+1)}{4}$$

$$SE(T), \text{ which is the standard error} = \sqrt{\frac{(n+1)(2n+1)}{24}}$$

Since the obtained value of $Z = 4.9$, which is greater than the table value of 1.96 at 1° of freedom, it can be assumed that there is significant difference in knowledge before and after the training programme.

4.2.2.2 Attitude

Since the obtained value of $Z = 3.26$, which is greater than the table value of 1.96 at 1° of freedom, it can be assumed that there is significant difference in attitude before and after the training programme.

4.3 TRAINING NEED OF URBAN HOUSEWIVES IN CULTIVATION OF VEGETABLES

Training need of urban housewives was conducted before giving training and the training programme was scheduled in accordance with the result obtained which is furnished below.

4.3.1 Method of Training Preferred by the Urban Housewives

Table 7. Preference of training methods by the respondents

(n=30)

Sl. No.	Training methods	ACS	Preferences
1	Field trips	27.4	1
2	Film show/Slide show	26.3	2
3	Demonstrations	25.9	3
4	Case study	24.6	4
5	Exhibitions	23.7	5
6	Group discussion	23.2	6
7	Lecture	22.5	7

Table 7 revealed that field trips were the most preferred method of training. This was followed by film show (ACS = 26.3), demonstration (ACS = 25.9), case study (ACS = 24.6), exhibitions (ACS = 23.7), group discussion (ACS = 23.2) and lecture (ACS = 22.5).

The respondents were housewives, who do not go outside more frequently. So it was quite natural that they preferred to have outside visits (field trips) with other members in a leisurely manner. The well organized field trips are one of the effective tools of any training programme. As 'seeing is believing', it is sure that the trainees would be more inspired if they could watch directly those things about which they had heard only through lectures and other methods.

The finding contrary to the finding of Allan (2000) who reported that the most preferred training methods by medicinal plant growers were film shows followed by exhibitions.

4.3.2 Duration of Training Preferred by the Urban Housewives

Table 8. Preference of training duration by the respondents

Sl. No.	Duration	ACS	Preferences
1	One- day	25.3	1
2	Two days	24.6	2
3	Three– six days	22.9	3
4	One week	22.5	4
5	Two weeks	21.7	5
6	One month	20.0	6

Table 8 points out that one day training was the first preference of the respondents (ACS = 25.3). This was immediately followed by two days programme (ACS = 24.6). Next in the order of preference was for

three to six days (ACS = 22.9), one week (ACS = 22.5), two weeks (ACS = 21.7) and one month (ACS = 20.0).

Generally the housewives, whether from the urban or rural areas, prefer only short term training programme as they could not stay away from their house for long. This might be the reason why one-day duration of training was perceived to be the most suitable (first preference) closely followed by two days of training and three-six days of training. Hence in the construction of training schedule, training institutions / agencies have to consider this important point of short-term capsule programmes. This finding is in conformity with Alaxander (1985), Kanakasabapathi (1988) and Allan (2000) who stated that training programme must be organized only for one or two days.

4.3.3 Frequency of Training Preferred by Urban Housewives

Table 9. Frequency of training preferred by the respondents

(n = 30)

Sl. No.	Frequency	ACS	Preferences
1	Once in six months	26.30	1
2	Once in a year	26.10	2
3	Once in two years	25.40	3
4	Once in three years	22.20	4
5	Once in four years	22.10	5
6	Once in five years	20.60	6
7	Once in two months	20.10	7
8	Once in a month	20.00	8
9	Once in a lifetime	19.00	9

From Table 9, it was clear that training programmes conducted once in six months were the best preferred by the respondents. (ACS = 26.30). Next in the order of preference was once in a year (ACS = 26.10), once in two years (ACS = 25.40), once in three years (ACS = 22.20), once in four years (ACS = 22.10), once in five years (ACS = 20.60), once in two months (ACS = 20.10), once in a month (ACS = 20.00) and once in a lifetime (ACS = 19.00).

There was an indication that the respondents do not want very frequent training. They needed training twice or once in a year or once in two years. Since maximum preference was for once in six months, half yearly training programmes could be introduced. This is in conformity with the findings of Allan (2000) on medicinal plant cultivators.

4.3.4 Venue of Training

Table 10 Venue of training preferred by the respondents

Sl. No.	Venue	ACS	Preference
1	A convenient place nearby	22.10	1
2	Agricultural College	16.20	2

From Table 10, it was clear that the training programme held at nearby place of the residence of respondents was mostly preferred. Agricultural College stood only on second only.

As most of the respondents were housewives and have many household responsibilities, it was quite natural that they would not prefer to go Agricultural College, Vellayani as it was situated almost 11 km from their place of residence. The result is in conformity with the findings of Kanakasabapathi (1988).

4.3.5 Aspects of Terrace Cultivation of Vegetables

4.3.5.1 Training Need Analysis of the Respondents with Respect to Different Aspects on Terrace Cultivation of Vegetables

Table 11. Preference of training on different areas of terrace cultivation by the respondents

(n= 30)

Sl. No.	Practices	ACS	Preferences
1	Plant protection	27.6	1
2	Preparation of organic manures like vermicompost and cultivation of azolla	26.8	2
3	Preparation of organic pesticides like neem oil emulsion and nicotine emulsion	26.6	3
4	Manuring	24.2	4
5	Preparation of potting mixture and time of sowing and time of transplantation	24.1	5
6	Filling of sacks and placement of sacks in terraces	23.7	6
7	Selection of suitable vegetables and their varieties	20.6	7
8	Irrigation	19.1	8

It was revealed from Table 11 that plant protection was perceived as the area, which needed maximum training by the respondents (ACS = 27.6). Preparation of organic manures like vermicompost and cultivation of azolla (ACS = 26.8), preparation of organic pesticides like neem oil emulsion and nicotine emulsion (ACS = 26.6), manuring (ACS = 24.2), preparation of potting mixture, time of sowing and time of transplantation (ACS = 24.1), filling of sacks, placement of sacks in terraces (ACS = 23.7), selection of suitable vegetables and their varieties (ACS = 20.6) and irrigation to the crops

(ACS = 19.1) were perceived in the descending order of importance which required training (Fig. 5).

From the Table 11, it was clear that the majority of the respondents preferred training on plant protection. Pest and disease was the major problem in any cultivation of crops. The crop loss due to pest and disease was sometimes very high. It was no doubt that all the respondents were anxious whether all their effort would finally be in ruin by the attack of pest and diseases. That might be the reason for their preference of training on plant protection first.

Garbage disposal was a major problem faced by almost every respondents of urban area and some times they have to walk long distance to put the daily garbage where the corporation workers used to collect it. Azolla-a floating fern is gaining popularity nowadays. The awareness that it could be used both as organic manure and poultry feed might have persuaded the respondents to prefer training on cultivation of azolla and preparation of vermicompost.

The health consciousness of the respondents was one of the reasons that they started vegetable cultivation by themselves. It could also be possible to escape from the clutches of hazardous pesticide residues. These two might be the reason for their preference to get trained on the preparation of organic pesticides like neem oil emulsion and nicotine emulsion.

4.4 ADOPTION OF CULTIVATION PRACTICES OF VEGETABLES

Table 12. Distribution of respondents according to their extent of adoption

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 18.2	12	40
2	High	> 18.2	18	60
			30	100

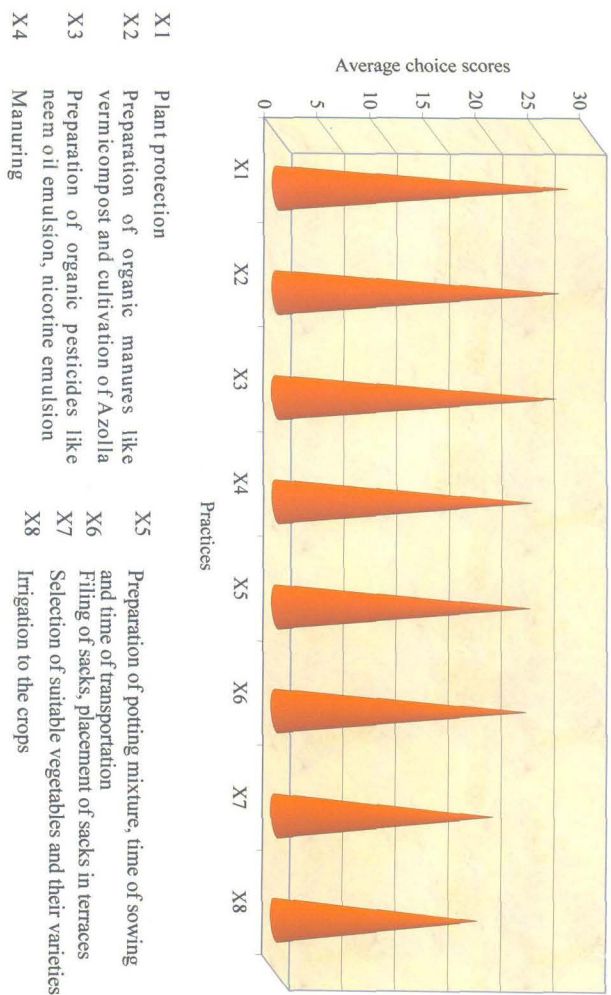


Fig. 5 Result illustrating the training need of urban housewives on various practices in terrace cultivation of vegetables

The perusal of Table 12 indicated that majority of the respondents were high adopters (60 per cent) and only 40 per cent of the respondents came under low adoption category.

As the respondents were highly educated, profit oriented women, it was not a surprise that they adopted any new cultivation practice which helped them to produce safe and eco-friendly vegetables.

4.5 TIME UTILIZATION PATTERN OF THE URBAN HOUSEWIVES

Table 13. Time utilization pattern of the respondents

Sl. No.	Activities	Average time spent	Per cent time spent
1	Kitchen duties	8 hrs	34
2	Attending the children	2 hrs	08
3	Watching television	2 hrs	08
4	Household duties like shopping, going to bank, paying electricity and water bill	2 hrs	08
5	Attending to terrace gardens	1 hr	04
6	Attending to ornamental gardens and kitchen garden	0.5 hrs	02
7	Attending to pets and other domestic animals	0.5 hrs	02
8	Other recreational and non recreational activities	1 hr	04
9	Sleeping	7hrs	30
	Total	24hrs	100

Table 13 indicated that the urban housewives spend majority of their time in kitchen duties / activities (34 per cent). On an average majority of them spend equal time in attending the children and watching the television and other household duties like shopping, going to bank and to pay water and electricity bills (8 per cent).

For attending the terrace gardens and ornamental gardens, they spend one hour and 0.5 hour respectively (4 per cent and 2 per cent). They spend 0.5 hours (2 per cent) of the total time for attending to pets and other domestic animals and spend 4 percentage of the total time in other recreational activities and utilizes 30 percent of their time in sleeping.

Majority of the Indian women spent a lot of time in kitchen whether they are working women or mere housewives. But definitely the number of hours spent by the housewives in kitchen would be more when compared to the working class. Likewise, child care is a second major duty as far as a women is concerned. Since the respondents belong to urban areas, they must have modern equipment in their kitchen and therefore would be able to spend some time for watching television (2 hours), attending to pets and other domesticated animals (0.5 hours) and other recreational activities (1 hour). They would definitely stretch a helping hand to their husbands by going for shopping and doing other household duties like taking the children to school, going to bank, paying electricity and water bills etc. as 99 per cent of the respondents were highly educated. Since all of them were interested in terrace gardens, it is quite natural that they spent on average one hour in maintaining terrace gardens and half an hour in maintaining ornamental and kitchen gardens (Fig. 6).

Roopa (2003) in a similar study on adolescent group reported that they spend nearly 48 per cent of their time in viewing television which was four times greater than that of urban women.

4.6 CONSUMPTION PATTERN OF VEGETABLES BY URBAN FAMILIES

It was found that there was an increase in the consumption of vegetables by all the respondents.

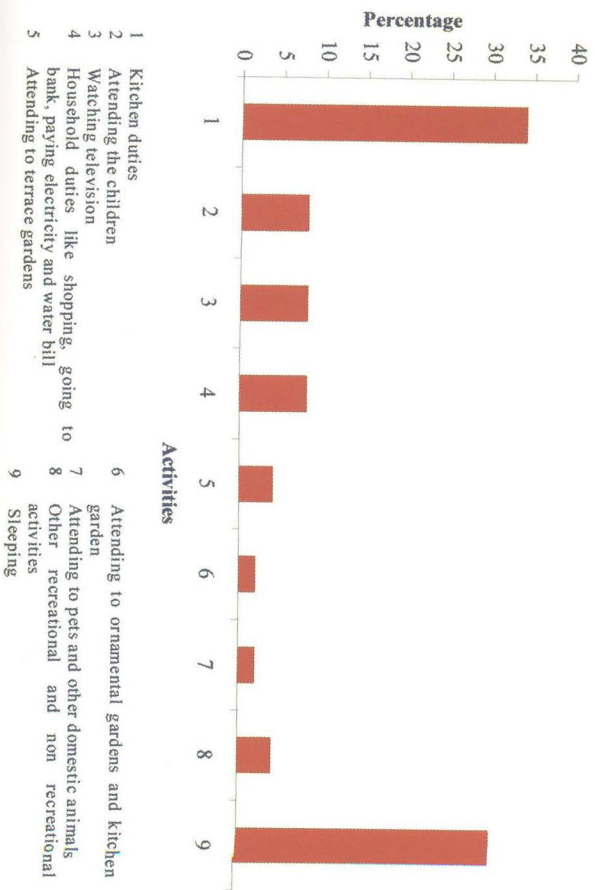


Fig. 6 Time utilization pattern of the respondents

4.6.1 Increase in the Consumption Pattern of Vegetables

Increase in the consumption of vegetables per week was measured in terms of kilograms (kg) and found that it ranged from 1.7 kg/week.

Table 14 Increase in the consumption of vegetables (kg)

(n = 30)				
Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 1.8	14	47
2	High	> 1.8	16	53
Total			30	100

A perusal of Table 14 shows that 53 per cent of the respondents came under the 'high' category whereas 47 per cent of the respondents belonged to the 'low' category of increase in the consumption pattern of vegetables.

All the respondents were actively involving in terrace cultivation of vegetables and therefore it was not a surprise that all of them experienced an increase in the consumption of vegetables.

4.6.2 Consumption of Vegetables before and after Starting Terrace Cultivation

Distribution of vegetables in the diet of respondents before and after starting the terrace cultivation of vegetables per week was found out and given in Table 15.

Table 15 Distribution of vegetables in the diet of respondents before and after starting terrace cultivation of vegetables per week

(n = 30)			
Sl. No.	Vegetables	Before starting terrace cultivation of vegetables (kg)	After starting terrace cultivation of vegetables (kg)
1	Leafy vegetables	0.4 kg	1.3 kg
2	Tubers	0.3 kg	0.4 kg
3	Others (any vegetables)	2.2 kg	2.9 kg

A perusal of Table 15 indicated clearly an increasing trend in the consumption of vegetables after starting terrace cultivation of vegetables by the respondents. It was seen that the consumption of leafy vegetables was increased by 0.9 kg, tubers by 0.1 kg and others which include any vegetable either cultivated or purchased by the respondents by 0.7 kg per week.

As most of the respondents were cultivating amaranthus – one of the prominent leafy vegetable, it is quite natural that they were experiencing more increase in consumption of leafy vegetables. Since tuber crops like amorphophallus and tapioca were less frequently cultivated compared to other crops, there was only a slight increase in the consumption of them compared to leafy vegetables and others.

Table 16 Change in the purchase pattern of vegetables per week before and after starting terrace cultivation of vegetables.

Sl. No.	Vegetables	Before starting terrace cultivation of vegetables (Rs.)	After starting terrace cultivation of vegetables (Rs.)
1	Leafy vegetables	10.00	0.00
2	Tubers	15.00	15.00
3	Others (any vegetables)	25.00	10.00

It is clear from Table 16 that after starting terrace cultivation of vegetables, there was a reduction in the purchase of vegetables by rupees 25 per week. It could be seen that there is no change in the purchase of tubers, but the purchase of leafy vegetables were almost stopped and the purchase of other vegetables had reduced by rupees 15.

4.7 BENEFIT COST RATIO IN TERRACE CULTIVATION OF VEGETABLES

4.7.1 Benefit Cost Ratio with Family Labour and Hired Labour

Table 17. Distribution of respondents according to the benefit cost ratio in terrace cultivation of vegetable by taking into consideration the labour, both family labour and hired labour, if any

(n = 30)

Sl. No.	BCR category	Frequency	Percentage
1	< 1	01	03
2	1-2	19	64
3	> 2	10	33
Total		30	100

It was clear from the Table 17 that majority of the respondents (64 per cent) came in the BCR category of (1-2), 33 per cent of the respondents were having higher BCR (>2) and 7 per cent of the respondents possessed BCR less than one (Fig. 7).

Benefit cost ratio was an indication of their profit and of course indirectly, the satisfaction they gained through it. All the 30 respondents had cost benefit ratio more than one except three.

Thirty three per cent of the respondents experienced terrace cultivation of vegetables as a huge success (BCR > 2). Involvement of family labour might be the major cause of reduction in total cost. The respondents could constructively utilize her family labour since she started terrace cultivation of vegetables, which otherwise would have been a waste. It was also revealed that majority of the respondents relied on family labour only for filling and placing the sacks on terraces, manuring, and irrigation to the crops without depending to the hired labour. The inputs include bricks, sacks, sand, soil, powdered cowdung and planting

materials. All the respondents were maintaining a vermicompost unit using the household garbage as well as azolla as organic manures and could prepare organic pesticides by them selves. So all together, it could be noticed that terrace cultivation of vegetables could provide not only safe, eco-friendly and hygienic vegetables but also could bring about a reduction in family expenditure.

4.7.2 Cost-Benefit Ratio without Family Labour and Hired Labour

Table 18. Distribution of respondents according to the benefit cost ratio in terrace cultivation of vegetable without taking into consideration the labour, both family labour and hired labour if any

(n = 30)

Sl. No.	BCR category	Frequency	Percentage
1	< 1	25	84
2	1-2	05	16
3	> 2	0	00
Total		30	100

It was clear from the Table 18 that majority of the respondents (84 per cent) came in the BCR category of < 1, 16 per cent of the respondents were having higher BCR in the range of 1-2 and none of the respondents possessed BCR greater than two (Fig. 8).

A comparison between Table 17 and Table 18 clearly shows the relevance of family labour in terrace cultivation of vegetables. Only three percent of the respondents were having a BCR of less than one when family labour was included for calculating benefit cost ratio, while 84% of the respondents were having a BCR of less than one when family labour was excluded from calculating the benefit cost ratio. In this contest, it must also be remembered that majority of the respondents relied on family labour only which would have been a waste otherwise.

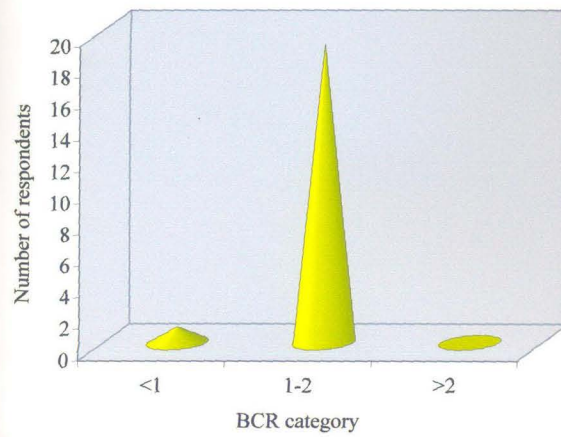


Fig. 7 Distribution of respondents according to the benefit cost ratio by taking into consideration the labour

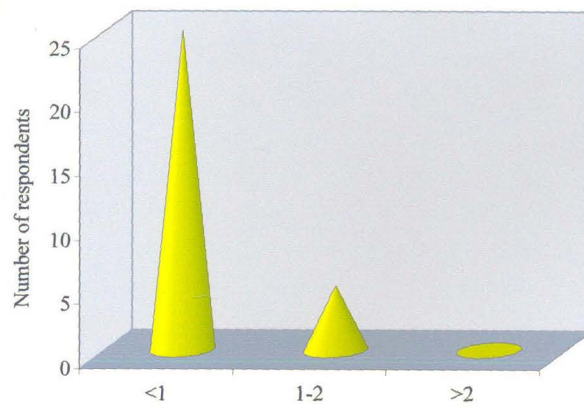


Fig. 8 Distribution of respondents according to the benefit cost ratio without taking into consideration the labour

4.7.3 Other Salient Findings

Table 19 Distribution of respondents according to the area of their house terrace in square feet (n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 1250	18	60
2	High	> 1250	12	40
Total			30	100

It could be inferred from Table 19 that 60 per cent of the respondents were having house terraces of area less than 1250 square feet whereas 40 per cent of the respondents were having house terraces of area greater than 1250 square feet.

Table 20 Distribution of respondents according to the number of sacks used for cultivation in a season (n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 85	18	60
2	High	> 85	12	40
Total			30	100

It could be inferred from Table 20 that 60 per cent of the respondents were cultivating in less than 85 sacks where as 40 per cent of the respondents were cultivating in more than 85 sacks.

Table 21 Distribution of respondents according to the average total returns obtained in the two seasons of terrace cultivation of vegetables (n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 1475	20	67
2	High	> 1475	10	33
Total			30	100

It could be inferred from Table 21 that 67 per cent of the respondents were having an average total return of less than 1,475 rupees from two seasons where as only 33 per cent of the respondents were having an average total returns of more than 1475 rupees.

Table 22 Result showing average number of sacks, average area of house terrace and average total returns

Sl: No	Category	Items
1	Average area of house terrace	1250square feet
2	Average number of sacks	85
3	Average total returns	Rs.1475

It could be recommended with the evidence of the study that it would be possible to cultivate in 85 sacks on a house terrace having an average area of 1250 square feet and could obtain a total return of 1475 rupees.

4.8 PROFILE CHARACTERISTICS OF THE RESPONDENTS

4.8.1 Age

Age of the respondents was measured by directly asking them the number of years she has completed at the time of interview. The respondents up to the age of 35 were considered as young and the respondents above the age of 35 were considered as old (Devi, 1994).

Table 23 Distribution of respondents according to their age

(n= 30)

Sl. No.	Category	Frequency	Percentage
1	Young	10	33
2	Old	20	67
Total		30	100

It was clear from Table 23 that only 33 per cent of the respondents were young and majority of them came under the old category (67 per cent).

The women in general become more conscious about their health when they enter into their middle age. That might be the reason why a majority of the respondents belonged to the old age (> 35 years) category since they were interested in producing safe, eco-friendly and hygienic vegetables.

4.8.1.1 Association of Age with Selected Variables

Table 24. Chi-square test between age and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Age	Young	4	6	6	4	7	3	2	8	7	3	2	8
	Old	18	2	11	9	12	8	7	13	10	10	8	12

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between age and the selected variables.

4.8.2 Educational Status of the Family

Table 25. Distribution of respondents according to their educational status

(n = 30)

Sl. No.	Category	Frequency	Percentage
1	Graduate and above	29	97
2	Undergraduate	1	3
Total		30	100

Table 25 shows that out of the 30 respondents, only one respondent did not possess graduation. It was not a surprise that all the respondents except one were graduates since they belonged to urban areas. This was in conformation with the finding of Bertell (1985) who reported that the percentage of graduate women in townships (urban area) is five to six times more than that of rural areas.

4.8.2.1 Association of Educational Status with Selected Variables

Table 26 Chi-square test between educational status and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Educational status	Under-graduates	0	1	0	1	0	1	1	0	1	0	1	0
	Graduate and above	7	22	9	20	15	14	20	9	21	8	15	14

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between educational status and the selected variables.

4.8.3 Cultivated Area

Since the study was conducted in urban area, all the respondents except two possessed an average area of two cents.

Table 27 Distribution of respondents according to cultivated area

(n=30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 2	18	60
2	High	>2	12	40
Total			30	100

It could be inferred from Table 27 that 60 per cent of the respondents were having cultivated area below two cents whereas only 40 per cent of the respondents were having cultivated area above two cents.

Available land was shrinking day by day due to population explosion. The urban areas, has to accommodate the 'immigrants' from rural areas also and so it is not a surprise that a respondent did not possess more than two cents in her homestead.

4.8.3.1 Association of Cultivated Area with Selected Variables

Table 28 Chi-square test between cultivated area and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Cultivated area	Low	12	6	2	16	12	6	14	4	7	11	6	12
	High	5	3	3	9	5	7	5	7	8	4	6	6

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between cultivated area and the selected variables.

4.8.4 Family Size

Table 29. Distribution of respondents according to their family size

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Small	≤ 4.2	20	67
2	Big	> 4.2	10	33
Total			30	100

The perusal of Table 29 shows that 33 per cent of the respondents had big family whereas 67 per cent of the respondents had small family size.

The concept of nuclear families had gained momentum very rapidly and at present it is being replaced by micro nuclear families having only three members. Shete (2000) reported that the nuclear families in urban areas consisted of maximum five members and it creates some sort of social insecurity especially among children.

4.8.4.1 Association of Family Size with Selected Variables

Table 30 Chi-square test between family size and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Family size	Low	10	10	12	8	8	12	16	4	10	10	8	12
	High	8	2	6	4	3	7	6	4	5	5	6	4

Since the result of the chi square test is less than 3.84, which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between family size and the selected variables.

4.8.5 Self Confidence

Table 31. Distribution of respondents according to their self-confidence

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 30.5	17	57
2	High	> 30.5	13	43
Total			30	100

It is clear from Table 31 that 57 per cent of the respondents were having only low self-confidence whereas 43 per cent of the respondents possessed high self-confidence.

All the respondent housewives, except one were graduates. This high education and urban background might be reason for their high self-confidence.

4.8.5.1 Association of Self Confidence with Selected Variables

Table 32 Chi-square test between self-confidence and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Self confidence	Low	13	4	12	5	5	12	14	3	12	5	9	8
	High	2	11	2	11	4	9	12	1	6	7	9	4

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between self-confidence and the selected variables.

4.8.6 Annual Income

Table 33. Distribution of respondents according to their annual income

(n = 30)

Sl. No.	Category	Average income	Frequency	Percentage
1	Low	$\leq 1,30,000$	20	67
2	High	$> 1,30,000$	10	33
Total			30	100

It was evident from table 35 that 67 per cent of the respondents were having low annual income and only 33 per cent of the respondents possessed high annual income.

Average annual income of a family from urban area was comparatively larger than from rural areas. Still 67 per cent of the respondents stood below average annual income of Rs. 1,30,000. So it is no doubt that, they started terrace cultivation of vegetables as a measure to decrease their family expenditure in addition to the intention of producing ecofriendly vegetables.

4.8.6.1 Association of Annual Income with Selected Variables

Table 34 Chi-square test between annual income and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Annual income	Low	15	5	4	16	6	14	12	8	10	10	10	10
	High	1	9	5	5	8	2	6	4	8	2	5	5

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between annual income and the selected variables.

4.8.7 Economic Motivation

Table 35. Distribution of respondents according to their economic motivation

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 26.16	14	37
2	High	> 26.16	16	63
Total			30	100

Perusal of Table 35 shows that majority of the respondents (63 per cent) had high economic motivation and only 37 per cent of the respondents possess low economic motivation.

High economic motivation might be one of the reasons why the respondents opted for own cultivation of vegetables on terraces and thereby could make a reduction in family expenditure and lend a helping hand to their husbands.

4.8.7.1 Association of Economic Motivation with Selected Variables

Table 36 Chi-square test between economic motivation and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Economic motivation	Low	4	10	7	7	4	10	10	4	9	5	2	12
	High	2	14	2	14	8	8	11	5	8	8	8	8

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between economic motivation and the selected variables.

4.8.8 Social Participation

Table 37. Distribution of respondents according to their social participation

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 2.6	12	40
2	High	> 2.6	18	60
Total			30	100

The perusal of Table 37 showed that majority of the respondents had high social participation (60 per cent) and 40 per cent of the respondents possessed low social participation.

High social participation might be one of the major reasons for attending to the training programme. Their high education and urban background might be the reason for high social participation. Above all the respondents were housewives so that they could easily find some time in going to various social institutions either as member or as office bearers.

4.8.8.1 Association of Social Participation with Selected Variables

Table 38 Chi-square test between social participation and attitude, adoption, knowledge, increase in consumption and BCR.

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Social participation	Low	6	6	9	3	6	6	7	5	8	4	7	5
	High	8	10	9	9	8	10	8	10	12	6	7	11

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between social participation and the selected variables.

4.8.9 Extension Agency Contact

Table 39. Distribution of respondents according to their extension agency contact (n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 8.5	12	40
2	High	> 8.5	18	60
Total			30	100

It is evident from Table 39 that 60 per cent of the respondents had high extension agency contact whereas only 40 per cent of the respondents had low extension agency contact.

High extension agency contact might have helped the respondents to acquire more and better inputs like sacks, seeds and organic manures from various agencies. They could easily clear their doubt regarding different stages of crop management and also could acquire quality-planting materials very fast.

4.8.9.1 Association of Extension Agency Contact with Selected Variables

Table 40 Chi-square test between extension agency contact and attitude, adoption, knowledge, increase in consumption and BCR

		(n = 30)											
		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Extension agency contact	Low	8	4	8	4	10	2	8	4	6	6	10	2
	High	3	15	4	14	5	13	6	12	12	6	10	6

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between extension agency contact and the selected variables.

4.8.10 Mass Media Contact

Table 41. Distribution of respondents according to their mass media contact

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 11.6	13	43
2	High	> 11.6	17	57
Total			30	100

Table 41 showed that 57 per cent of the respondent had high mass media contact whereas 40 per cent of the respondents had only low mass media contact.

Due to high mass media contact, the respondents came to know about the training programme on terrace cultivation of vegetables and could able to participate in it. Exposure to different mass media source might be one of the reasons, which helped them to get more information regarding terrace cultivation of vegetables and to extend their knowledge on it.

4.8.10.1 Association of Mass Media Contact with Selected Variables

Table 42 Chi-square test between mass media contact and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Un-favourable	Favourable	Low	High	Low	High	Low	High	Low	High
Mass media contact	Low	7	6	5	8	7	6	9	4	8	5	9	4
	High	5	12	2	15	4	13	14	3	12	5	10	7

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between mass media contact and the selected variables.

4.8.11 Risk Orientation

Table 43. Distribution of respondents according to their risk orientation

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 22.4	15	50
2	High	> 22.4	15	50
Total			30	100

It is evident from Table 43 that respondents were equally distributed among low and high-risk orientation category.

4.8.11.1 Association of Risk Orientation with Selected Variables

Table 44 Chi-square test between risk orientation and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Risk orientation	Low	10	5	7	8	8	7	8	7	8	7	9	6
	High	3	12	9	6	6	9	10	5	12	3	10	5

Since the result of the chi square test is less than 3.84, which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between risk orientation and the selected variables.

4.8.12 Innovativeness

Table 45. Distribution of respondents according to their innovativeness

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 3.4	16	53
2	High	> 3.4	14	47
Total			30	100

Perusal of Table 45 shows that 53 per cent of the respondents belonged to lower innovation category whereas 47 per cent of the respondents belong to higher innovation category.

4.8.12.1 Association of Innovativeness with Selected Variables

Table 46 Chi-square test between innovativeness attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Innovativeness	Low	12	4	8	8	11	5	10	6	8	8	8	8
	High	1	13	2	12	1	13	10	4	7	7	7	7

Since the result of the chi square test is less than 3.84, which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between innovativeness and the selected variables.

4.8.13 Health Consciousness

Table 47. Distribution of respondents according to their health consciousness
(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 27.13	9	30
2	High	> 27.13	21	70
Total			30	100

It was evident from Table 47 that majority of the respondents (70 per cent) had high health consciousness where as only 30 per cent of the respondents possessed low health consciousness.

High health consciousness of the respondents was definitely the major reason for starting the terrace cultivation of vegetables. Their main intention was to produce and to consume ecofriendly vegetables, which is devoid of any pesticide residues and toxicity.

4.8.13.1 Association of Health Consciousness with Selected Variables

Table 48 Chi-square test between health consciousness and attitude, adoption, knowledge, increase in consumption and BCR
(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Health consciousness	Low	5	4	5	4	2	7	8	1	8	1	7	2
	High	12	9	11	10	16	5	14	7	16	5	13	8

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no

significant relationship between health consciousness and the selected variables.

4.8.14 Experience in Vegetable Cultivation

Table 49. Distribution of respondents according to their experience in vegetable cultivation

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 2.9	19	63
2	High	> 2.9	11	37
Total			30	100

It was clear from Table 49 that only 37 per cent of the respondent possessed high experience in vegetable cultivation whereas majority (63 per cent) had low experience in vegetable cultivation.

Since the respondents were hailing from urban background, it was quite natural that they possessed less experience in vegetable cultivation.

4.8.14.1 Association of Experience in Vegetable Cultivation with Selected Variables

Table 50 Chi-square test between experience in vegetable cultivation and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Experience in vegetable	Low	18	1	12	7	10	9	13	6	14	5	6	13
	High	3	8	7	4	6	5	4	7	9	2	9	2

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between experience in vegetable cultivation and the selected variables.

4.8.15 Management Orientation

Table 51. Distribution of respondents according to their management orientation
(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 24.5	15	50
2	High	> 24.5	15	50
Total			30	100

The perusal of Table 51 shows that respondents were equally distributed among low and high category of management orientation.

4.8.15.1 Association of Management Orientation with Selected Variables

Table 52 Chi-square test between management orientation and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Management orientation	Low	10	5	4	11	6	9	6	9	11	4	3	12
	High	10	5	10	5	12	3	7	8	7	8	4	11

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no

significant relationship between management orientation and the selected variables.

4.8.16 Family Labour

Table 53. Distribution of respondents according to family labour

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 6.13	6	20
2	High	> 6.13	24	80
Total			30	100

Table 53 shows that very majority of the respondents (80 per cent) had high family labour whereas 20 per cent of the respondents had low family labour.

High family labour was definitely the major reason for the tremendous success of terrace cultivation of vegetables, which resulted in high cost-benefit ratio. If the respondents were not starting terrace cultivation of vegetables, this family labour would have turned to be a waste. In that context, family labour could be considered as an input also.

4.8.16.1 Association of Family Labour with Selected Variables

Table 54 Chi-square test between family labour and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Family labour	Low	1	5	1	5	0	6	4	2	2	4	3	3
	High	6	8	15	9	15	9	6	18	17	7	12	12

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between family labour and the selected variables.

4.8.17 Irrigation Index

Table 55. Distribution of respondents according to their irrigation index

(n = 30)

Sl. No.	Category	Mean score	Frequency	Percentage
1	Low	≤ 4.6	12	40
2	High	> 4.6	18	60
Total			30	100

Table 55 showed that majority of the respondents (60 per cent) had high irrigation index and only 40 per cent possessed low irrigation index.

4.8.17.1 Association of Irrigation Index with Selected Variables

Table 56 Chi-square test between irrigation index and attitude, adoption, knowledge, increase in consumption and BCR

(n = 30)

		Adoption		Attitude		Knowledge in vegetable cultivation		Knowledge in terrace cultivation		Increase in consumption		BCR	
		Low	High	Unfavourable	Favourable	Low	High	Low	High	Low	High	Low	High
Irrigation index	Low	6	6	4	8	5	7	4	8	6	6	6	6
	High	3	15	3	15	12	6	5	13	11	7	9	9

Since the result of the chi square test is less than 3.84 which is the table value at 1 degree of freedom, it could be inferred that there was no significant relationship between irrigation index and the selected variables (Fig. 9).

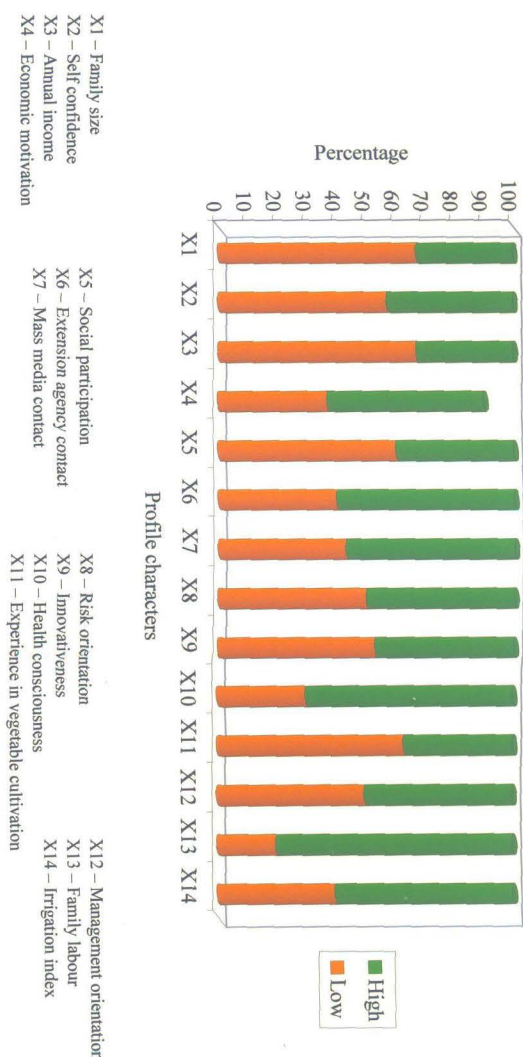


Fig. 9 Profile characteristics of respondents involved in terrace cultivation of vegetables

The result of chi-square test between all the profile characteristics with that of the selected variables revealed that there was no significant relationship between them. Therefore it could be recommended that anybody who, was interested could start the terrace cultivation of vegetables irrespective of profile characteristics.

4.9 CONSTRAINTS AND SOLUTIONS AS PERCEIVED BY THE RESPONDENTS

Broadly, the following constraints were to be tackled in order to obtain an economic yield of good quality of vegetables through terrace cultivation of vegetables (Fig. 10).

Table 57 Results showing constraints as perceived by the respondents

Sl. No.	Problems	Percentage	Rank
1	Difficulty in getting on house terrace more frequently	92.28	I
2	Difficulty in obtaining the inputs such as sacks, seeds, cowdung, bricks, etc.	90.60	II
3	Difficulty in bringing the inputs from the ground to the house terrace	87.21	III
4	Difficulty in transferring the filled sacks from one place to another	86.25	IV
5	Problems associated with direct sunlight to the seeds / seedlings	80.12	V
6	Crop loss due to pests and diseases	79.95	VI
7	Lack of water to irrigate the crops	79.25	VII
8	Huge weight of the filled sacks was a threat to the house	78.00	VIII
9	Frequent wetting of a particular area damages the ceilings and the floor becomes dirty very fast	72.00	IX
10	Sacks become damaged in every one or two crops /crop seasons and difficulty in replacing them	69.50	X
11	Difficulty in getting labour	68.20	XI
12	Difficulty in getting azolla and worms for compost making	66.15	XII

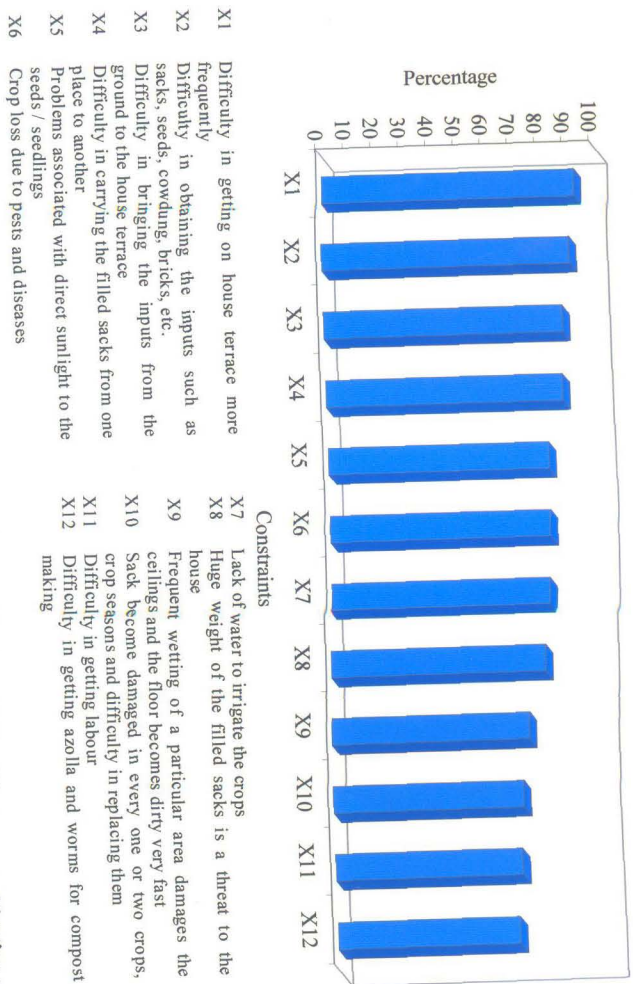


Fig. 10 Result showing constraints as perceived by respondents involved in terrace cultivation of vegetables

Table 57 clearly indicated the following constraints, which has to be tackled in order to obtain an economic yield of good quality of vegetables through terrace cultivation of vegetables. Majority of the respondents (92.28 per cent) perceived 'difficulty in getting on house terraces more frequently' as the major constraint. The second major constraint identified was the 'difficulty in obtaining the inputs such as sacks, seeds, cowdung, and bricks' (90.60 per cent) followed by 'difficulty in bringing the inputs from ground to the house terrace' (87.21 per cent), 'difficulty in carrying the filled sacks from one place to another' (86.25 per cent), 'constraints associated with direct sunlight to the seeds/seedlings' (80.12 per cent), 'crop loss due to pests and diseases' (79.95 per cent), 'lack of water to irrigate the crops' (79.25 per cent), 'huge weight of the filled sacks which was a threat to the house' (78.00 per cent), 'frequent wetting of a particular area which causes damage to the ceilings and the floor became dirty very fast' (72.00 per cent), 'sacks became damaged in every one or two crops/ crop seasons and difficulty in replacing them' (69.50 per cent) and 'difficulty in getting the labour' (68.20 per cent) and difficulty in getting azolla and worms for compost making (66.15)

4.9.1 Difficulty in Getting on House Terrace more Frequently

Though an inevitable difficulty, this could be solved a little bit by spending more time during a particular visit to the terrace and also by seeking the help of children and other members for irrigating the crops, manuring, mechanical destruction of pests and harvesting of the produce.

4.9.2 Lack of Availability of Inputs such as Sacks, Seeds, Cowdung, Bricks etc.

Respondents had to face certain difficulties in obtaining the inputs such as sacks, seeds, cowdung, bricks and sometimes even the soil. This problem could be solved with the help of residents' associations; as the

association could supply these materials on payment to each of the household.

4.9.3 Difficulty in Bringing the Inputs from the Ground to the House Terrace

The respondents residing in two-storied building mainly had to suffer from this problem. This could be reduced to certain extent by lifting the inputs from ground in a plastic container using a rope and a pulley.

4.9.4 Difficulty in Carrying the Filled Sacks from One Place to Another

This was a severe problem especially for the respondents having backache. Pulling the sack from one place to another by using the rope could minimize this problem. Also, there should be prior and proper planning before the placement of sacks. If the person is not using the rope to transfer the filled sacks, he should completely bent down and hold the bottom of sack instead of taking the top edge or middle part of the sack which would reduce the strain on his body.

4.9.5 Problems Associated with Direct Sunlight to the Seeds / Seedlings

This problem could be reduced little bit by unfolding the edge of the sack to provide shade to the seedlings. It could be still reduced by putting 100 grams of azolla; a floating fern, which harbours the nitrogen fixing blue green algae at the base of the seedlings and frequent irrigation twice a day at least in the seedling stage. Also small polythene/plastic cover/case with minute holes could be filled with water and placed at the base of crops. Continuous dripping of water from the polythene case would give coolness to the soil and crop.

4.9.6 Crop Loss due to the Pests and Diseases

The incidence of pests and diseases were comparatively lower in terrace gardens than in the ground. Still it was perceived as a problem. This could be resolved by daily observation and mechanical methods to

destroy the pests. If necessary, organic pesticides like neem oil emulsion and fungicides like Bordeaux mixture (1%) could also be used. Crop rotation should be followed in each sack.

4.9.7 Lack of Water to Irrigate the Crops

Scarcity of water, even the drinking water was major problem in the selected ward especially those who were solely depending on corporation water supply alone. So the respondents faced a big difficulty in irrigating the crop frequently. Tanks could be constructed on terraces (either built in or synthetic) to store water and to irrigate the crop in order to solve this problem to an extent.

4.9.8 Huge Weight of Filled Sack was a Threat to the House

This problem could be reduced little bit by arranging the sacks in line on the terrace-ensuring wall underneath (Plate 8). Only seventy five per cent of the volumes of the plastic sacks were to be filled with potting mixture (soil, sand and cowdung in the ratio of 2:1:1).

4.9.9 Frequent Wetting of a Particular Area Damages the Ceiling

The top edges of the sacks were to be folded in order to facilitate easy irrigation to the crops. Besides, the sacks should be placed in bricks kept in triangular format in order to avoid direct contact between the sacks and the terrace. Only adequate quantity of water should be used for irrigation to avoid the leakage of excess water to the roof. It was also advisable to change the position of the sacks and bricks occasionally to avoid permanent wetting of a particular area itself, which helps to keep the terrace always neat and clean. Never heap the excess soil on the terrace, which would create drainage problems.

4.9.10 Sacks become Damaged in Every One or Two Crops/Crop Seasons and Difficulty in Replacing them

It was better to prefer fertilizer sacks to other sacks like gunny bags. Also, it was advisable to have only two hills in a sack and two



Plate 8. Sacks placed in line ensuring the wall underneath

seedlings per hill. If the sack were overcrowded with plants, the root mass of the plants would rupture the sacks very fast. Only 75 per cent of the sacks should be filled. Above all, care should be taken while transferring the sacks from one place to another.

4.9.11 Difficulty in Getting Labour

This was a major problem faced by almost all people residing in the city areas. The respondents perceived that by involving children and other members of the family, the problems could be faced and solved. Many of them felt that as the cultivation progressed, their roof garden became a venue for their pleasant togetherness.

4.9.12 Difficulty in Getting Azolla and Worms for Compost Making

The respondents felt that this problems could be solved by mutual help among them and occasional visits by one or two members of their locality to Agricultural College, Vellayani inorder to purchase seeds, other planting materials and organic manure.

4.10 SPREAD EFFECT OF TERRACE CULTIVATION OF VEGETABLES

Spread effect resembled more to the multi-step flow model, the concept of which, suggested variable number of relays in communication flow from a source to a large audience. Some members will obtain message directly from the source while others may remain several steps away from the origin of the message (Dey, 1993). According to Aravindakshan *et al* (2003), spread effect is a construct lying between awareness and diffusion. Spread effect is a combination of two words 'spread' meant literally and 'effect' meant here as consequences in terms of extent of relationship

The ratio of number respondents who acquired training on terrace cultivation of vegetables, to the number of persons at the secondary level

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The ratio of number respondents who acquired training on terrace cultivation of vegetables, to the number of persons at the secondary level

who received information from the respondents at the primary level is called spread effect ratio.

It was measured by asking the respondents, the number of persons to whom they had conveyed the information regarding terrace cultivation of vegetables and also the number of persons who actually adopted it.

Table 58 Result of spread effect of terrace cultivation of vegetables.

Particulars	Number of persons
Number of respondents at the primary level	30
Total number of respondents at the secondary level who received information on terrace cultivation of vegetables from primary level	330
Total number of respondents at the secondary level who adopted terrace cultivation of vegetables	60

It was revealed from Table 58 that on an average, 30 of the respondents could transfer the awareness regarding terrace cultivation of vegetables to another 330 farmers. So the spread effect ratio was found to be 1:11; which indicated that one respondent who acquired training on terrace cultivation of vegetables, diffused information to eleven other persons.

To study the spread effect further, probing was undertaken to assess the number of persons who actually adopted terrace cultivation of vegetables after they got the information about it from the respondents. Table 60 also revealed that out of the total 330 persons who received information regarding terrace cultivation of vegetables, only 60 persons adopted it, leading to the conclusion that the ratio of respondents: total number of persons who received the information: total number of persons who actually adopted it is equal to 1: 11: 2.

The result of the study revealed that even the persons who were holding unfavorable attitude toward terrace cultivation of vegetables changed their attitude after the training and also due to the experience they gathered during the terrace cultivation of vegetables. So the persons who were only aware of terrace cultivation of vegetables would have definitely started the terrace cultivation of vegetables, if they were also exposed to different training programmes.

4.11 IMPLICATIONS OF THE STUDY

4.11.1 Implications to the Field of Agriculture

Since available land for cultivation is shrinking drastically especially in urban areas, cultivation of vegetables and other suitable crops on house terrace was one of the best alternative measures. The study contributed certain factors to the discipline of agriculture.

In general, incidence of pests and diseases was comparatively low in terrace gardens compared to the cultivation on land. It was found out that all the respondents preferred amaranthus than other crops, as it was an easily established crop and could be harvested in the third week after transplanting. The attack of leaf webber was almost absent except two respondents where they could control it with the help of neem oil emulsion 1%. Regarding the variety, the respondents preferred 'Arun'-a reddish amaranth variety (Plate 9). But in the subsequent season, all the respondents realized the value of green variety, which was more resistant to diseases. So they started cultivating the green variety, namely, Co-1 simultaneously with the red one.

Forty per cent of the respondents preferred tomato after amaranthus. Like amaranthus, the cultivation of tomato (*Lycopersicon esculentum*) was also a success story for the respondents. All the respondents cultivated the variety 'sakthi' which was resistant to bacterial wilt. But it was noticed that the fruit size was small compared to tomatoes available in the market.

Twenty per cent of the respondents preferred okra (*Abelmoschus esculentus*) after amaranthus. They cultivated the variety 'kiran' which was light and green coloured fruit. Most of the respondents faced the incidence of jassids and they could control it through mechanical destruction and by the use of organic pesticides.

Twenty per cent of the respondents liked to cultivate chillies (*Capsicum annum*) (Plate 10) after amaranthus. The respondents were given the seeds of jwalamukhi and jwalasakhi. All the respondents faced the incidence of bacterial wilt, mosaic and pests like mites and aphids. They could control it to an extent with the help of bordeaux mixture (1%), organic pesticides and by mechanical destruction.

Ten per cent of the respondents preferred to cultivate cowpea (*vigna unguicalta*) (Plate 11). They made 'pandals' in the terraces for trailing of cowpea. The incidence of pea aphids was a major problem. Some of the respondents tried turmeric powder emulsion to control the aphids.

Ten percent of the respondents preferred to cultivate brinjal (*Solanum melongena*) and the varieties included 'surya', 'swetha' and 'pusa purple'. In addition pulses like Winged bean (*Psophocarpus tetragonolobus*) (Plate 12) and cucurbits like bittergourd (*Momordica charantia*), snake gourd (*Trichosanthes cucumerina*), pumpkin (*Cucurbita moschata*), little gourd (*Coccinia grandis*) and cauliflower (*Brassica oleraceae*) (Plate 13) were also grown by the respondents.

Azolla, a floating fern which harbours the nitrogen fixing blue green algae was cultivated by the respondents. Azolla was found to be the best feed for cattle, poultry and above all it was reported as one of the best organic manure. Surprisingly, it was also noticed that azolla and mosquitoes repel each other.

Azolla is cultivated in shallow tanks made out of thick polythene sheets in partially shaded corners of terrace. Bricks and wood pieces were



Plate 9. Amaranthus - variety 'Arun'



Plate 10. Chilli variety 'Jwalamukhi'



Plate 11. Cowpea variety 'Vyjayanthi'



Plate 12. Winged bean



Plate 13. Cauliflower

used as sides of tank to have a depth of 10 cm on the terrace. Red soil was spread with uniform thickness at the bottom of the tank @ 7 kg m^{-2} of the area. Fresh cowdung @ 2.5 kg m^{-2} of area was made into a slurry and poured uniformly on the red soil in the tank. Rajphos or mussoriphos @ 15 g m^{-2} of area was given along with cowdung slurry. Water was added to the tank to a depth of 8 cm. Healthy azolla @ $250 - 500 \text{ g m}^{-2}$ of area was spread uniformly in the tank. Azolla started multiplied after a period of one week

So it could be reported with pride that all the respondents resorted only to organic pesticides and manures for their cultivation on terraces in addition to the mechanical destruction.

4.11.2 Implications to the Field of Health, Hygiene and Nutrition

Terrace cultivation of vegetables facilitated better time and space utilization, disposal of household organic garbage through compost making and utilizing the organic manure for vegetable cultivation. Also promoted 'nutritional security' to an extent due to the easy availability and access of safe, hygienic, eco-friendly and nutritious vegetables at low cost on their terraces itself. It was found that there was an increase in consumption of vegetables by 1.7 kg per week by each of the urban family (leafy vegetables 0.9 kg , tubers 0.1 kg , other vegetables by 0.7 kg) and a reduction in the purchase of vegetables. Above all, terrace cultivation of vegetables could develop a 'we' feeling among the respondents who were mostly the residents of the same locality as they exchanged both the inputs as well as the produce among them. Moreover the terrace became a venue for the get-togetherness of family members. The children developed more self-confidence and self-respect.

All the respondents were really suffering from the problems of garbage disposal and attack of mosquitoes. In order to solve this problem, a unit of vermicompost was maintained successfully either on the terrace or on the

ground by all the respondents. It was a very effective measure of recycling of organic/ household garbage and could control the mosquitoes.

Horticultural therapy - a method of healing many inborn as well as acquired diseases by involving the patients in different steps of cultivation practices of vegetables as well as ornamentals. The deep involvement in various cultural operations like planting, transplanting, manuring, irrigation, harvesting and to an extent marketing, would help to develop mental as well as physical confidence in the patients which helped them to overcome the difficulties. The study revealed that certain respondents got relief from asthma, joint pain and rheumatism after involving in terrace cultivation of vegetables. A case study is presented below.

Mrs. Padmini Devi, a retired professor, resident of Bliss, Vidyadhirajanaagar, Poojapura (Plate 14) was suffering from joint pain and rheumatism. Later, it was revealed that she attended the training programme only because of the compulsion from her husband. But as she started terrace cultivation of vegetables, she could gradually overcome from all her physical discomforts a little by little and she turned to be a promising practitioner of terrace cultivation of vegetables.

So in nutshell, terrace cultivation of vegetables brought about better health, hygienic and nutritional environment than before, a reduction in family expenditure and above all 'a feeling of satisfaction', one factor which could not be purchased with money alone. A case study is presented below

Mrs. Geetha Rani, resident of Mohanam, Kulathinkara, Poojapura was having two small kids, but still with the help of her husband, she was able to cultivate in 80 sacks (Plate 15). She included leafy vegetables, tubers, bitter gourd, cowpea, brinjal, chilly, tomato and cauliflower in her terrace gardens in order to obtain the entire vegetable requirement from the terrace only. She stopped purchasing the vegetables and could able to



Plate 14. Mrs. Padmini Devi with her husband



Plate. 15. Mrs. Geetha Rani with her children

supply it to her neighbours also. She could motivate ten other housewives to start terrace cultivation of vegetables and stood as a model for them.

4.11.3 Implications to the Field Empowerment

Terrace cultivation of vegetables provides an immense scope in Kerala to empower the urban housewives by the creation of employment and income through proper utilization of their leisure time. Schools, old age homes, hostels and even educational institutions could promote it and help the nation to attain self sufficiency in vegetable production in coming years.

4.12 SUSTAINABILITY OF TERRACE GARDENS

As the study progressed, the researcher could observe that seven, out of thirty respondents were forced to withdraw due to many personal reasons (Table 59). But the remaining 23 respondents were practicing it very successfully even after the withdrawal of the researcher (Plates 16, 17, 18 and 19).

Table 59 The reason of withdrawal of certain respondents

Sl. No	Reason	Number of respondents
1	Marriage of the family member	2
2	Illness/personal discomforts	2
3	Permanent/temporary shifting of the house	2
4	Construction of another floor	1

The most common criticism towards any action research programme was that action would be stopped after the withdrawal of the researcher. But in the present study, researcher had made all the arrangements with the local residents' associations to offer timely help needed by the respondents including arranging another training programmes and also to seek help of the researcher when ever necessary.



Plate 16. Ms. Soumya Chandran on her house terrace



Plate 17. Mrs. Sathidevi on her house terrace



Plate 18. Mrs. Sarojiniamma on her house terrace



Plate 19. Mrs. Meena Sukumara Pillai on her house terrace

4.13 DEVELOPMENT OF A MODEL FOR TERRACE CULTIVATION OF VEGETABLES

With the background of the splendid experience gained through the present research work, the researcher proposes a model for those who are really interested in terrace cultivation of vegetables and there by to contribute some thing to the total vegetable production of the state and more over to attain the nutritional security of own household.

With the evidence of the study, the researcher recommends to accommodate 65-70 sacks in an area of 1000 square feets. The researcher also recommended different types of vegetables (Table 60) in order to attain the vegetable self sufficiency from the terrace itself for a family having four members of which two are children below the age of 10 years.

Since garbage disposal was a major problem in most of the urban, and in certain parts of rural areas, it could be effectively recycled to vermicompost, which could be used as organic manure for the vegetable crops. Pits could be constructed beside the kitchen or plastic tanks could be kept on the bricks encircled with water to protect from the attack of ants. The top of the plastic container is covered with the GI net to provide a cool environment for the worms used.

Additionally a third factor could also be incorporated, namely, azolla -which is a floating fern harboring nitrogen fixing blue green algae and could be effectively utilized as organic manure for vegetables. It could be grown in suitable places, preferably shady corners of the terraces in an area of 7-10 square feet.

4.13.1 Method of Cultivation

Azolla is cultivated in shallow tanks made out of thick polythene sheets in partially shaded corners of terrace. Bricks and wood pieces were used as sides of tank to have a depth of 10 cm on the terrace. Red soil was spread with uniform thickness at the bottom of the tank @ 7 kg m^{-2} of the

area. Fresh cowdung @ 2.5 kg m^{-2} area was made into a slurry and poured uniformly on the red soil in the tank. Rajphos or mussoriphos @ 15 g m^{-2} area was given along with cowdung slurry. Water was added to the tank to a depth of 8 cm. Healthy azolla @ $250 - 500 \text{ m}^{-2}$ area was spread uniformly in the tank. Azolla started multiplied after a period of one week

In addition to the above-mentioned three components, which are rather inevitable, other components could also be incorporated to exploit all the available resources. Rearing of poultry, rabbit, lovebirds etc will develop a 'love for nature' in children in addition to the economic benefits. Their litter could also be used as manure in addition to vermicompost and azolla

Table 60. Types of vegetables recommended for a houses terrace having an area of 1000 square feet with four members

Sl. No.	Type of vegetable	Number of sacks
1	Leafy vegetables	6
2	Tomato	5
3	Bhindi	6
4	Chillies	5
5	Coccinia	4
6	Brinjal	6
7	Snake-gourd	5
8	Bitter-gourd	5
9	Cowpea	5
10	Curry leaf	2
11	Pumpkin	2
12	Cucumber	2
13	Tuber crops (Tapioca, Colocasia etc.)	5
14	Cauliflower	5
15	Any other vegetables preferred	8

Summary

5. SUMMARY

The consumption pattern of food may vary among the population, but the basic structure and composition remains the same mainly comprising of pulses, cereals, fruits and vegetables, milk and milk products, oil and seeds, egg and poultry. Among these, vegetables are being considered as the most important and therefore it is necessary to ensure their availability throughout the year in fresh, processed or preserved forms. The vegetable production of the country was very low (less than 20 million tonnes) during 1947 when India became independent. However the current production is 96.54 million tonnes and the area under vegetables is 6.89 million hectares, which contribute 13 per cent and three per cent of the world share respectively. Per capita availability of vegetables is only 135 g/day whereas requirement is 285g/head/day. The picture is also not so attractive in Kerala.

Since available land for cultivation is shrinking drastically especially in urban areas, it is high time that alternative measures like terrace gardening are to be explored. Terrace cultivation of vegetables provides better time and space utilization, disposal of household organic garbage through compost making and utilising the organic manure for vegetable cultivation, proper harvest of sunlight, reduced incidence of pests and diseases, reduction of family expenditure, nutritional security due to physical and economic access to vegetables and above all better availability of fresh, hygienic, safe and eco-friendly vegetables to the urban families.

Nearly half of the available human resource in India is women. For the past few years, sincere efforts are being taken by all government and non-government agencies to empower rural women, which constitute 75 per cent of the total women population. Though the scenario of urban

women is quite satisfactory when compared to the rural women, they also need immediate attention. There is an immense scope in Kerala to empower the urban housewives by the creation of employment and income through proper utilization of their leisure time for terrace cultivation of vegetables.

Correct, timely and specific information on various aspects of terrace cultivation of vegetables by the urban housewives were required from the policy and practical perspectives and therefore the present action research was framed with the following specific objectives.

1. To study the knowledge of urban housewives before and after the training in cultivation of vegetables and terrace cultivation of vegetables
2. To find out the attitude of urban housewives before and after the training towards terrace cultivation of vegetables
3. To identify the training needs of urban housewives in vegetable cultivation
4. To study the adoption of cultivation practices of vegetables by the urban housewives.
5. To study the time utilization pattern of urban housewives
6. To study the consumption pattern of vegetables by the urban families
7. To find out the cost-benefit ratio in terrace cultivation of vegetables
8. To study the profile characteristics of the urban housewives
9. To study the relationship between the selected profile characters and the selected other variables
10. To identify the constraints faced by the urban housewives in terrace cultivation of vegetables and their solutions

The present research study calls for the development of an action programme *i.e.*, formulation, implementation, monitoring and evaluation of the action programme for promoting terrace cultivation of vegetables by urban housewives. The study was conducted in four phases.

Since the study necessitated the presence of researcher throughout the period, from the training, door-to-door doubt clearance and until harvest in two complete seasons, the action research could be limited only to 30 respondents of a randomly selected ward of Thiruvananthapuram corporation. But every sincere effort has been taken by the researcher to popularize the terrace cultivation of vegetables by methods like lecture classes and method demonstrations.

As an initiation programme, an advertisement regarding the conduct of training programme for interested urban housewives were given through radio and newspaper. The responses were immense. Since maximum numbers of responses were received from a particular ward (Poojapura ward), it was selected as the study area.

The researcher approached the residents association of the selected ward and with their help, she could arrange a public meeting in order to conscentize the programme. A large number of housewives came forward; thirty of them were selected by seeking the help of residents association. For convenience they were divided into two groups and were given training on January and February 2003.

The venue for the first training programme was 'Sree bhavan', Thalakkonum road, Poojapura as majority of the respondents were from nearby areas. The second training programme was conducted at Vidhyadhiraja Nagar, Poojapura as majority of the trainees were the residents of that Nagar.

The training programmes included visit to different terrace gardens, training on azolla (a floating fern; organic manure and poultry feed) cultivation and preparation of organic pesticides by Dr. V.B. Padmanabhan, lecture cum demonstration on different types of seeds and their selection by Dr. M. Abdul Vahab and illustrated lecture class by the researcher on identification and methods to control pests and diseases.

At the end of the training programme inputs for starting terrace cultivation of vegetables such as sacks, seeds, powdered cowdung and azolla were distributed to the respondents

All the respondents started cultivation using the supplied inputs in their house terraces. Majority of the respondents sought researcher's help in obtaining additional inputs from various agencies and seeds from Agricultural College. The researcher made all the sincere efforts to make those things available to the respondents. They started the terrace cultivation of vegetables under the close monitoring and supervision of the researcher. Periodical observation was taken by the researcher. In addition, the researcher herself started the cultivation of vegetables on her house terrace to act as a model for the trainees and to get first hand experiential learning. She also started cultivating azolla and supplied it to those who needed it.

As the cultivation progressed, majority of the respondents requested training on vermicomposting. A lecture class cum demonstration by Dr. Ushakumari, Associate Professor, Department of Soil Science and Agricultural Chemistry, College of Agriculture, Veliayani was conducted at Bliss, VRNA-14 at Vidhyadhirajanagar, Poojappura. All the respondents cleared their doubts on different aspects of garbage disposal, and vermicomposting.

A field visit by the members of the advisory committee was conducted to the house terrace of randomly selected respondents. The

cultivation continued and the researcher made frequent visits to their house terraces, took periodic observations, cleared their doubts and made all possible arrangements to make available the necessary inputs.

Structured interview schedule was developed and pretested. Data at periodic intervals were collected, analyzed and tabulated.

For selecting independent variables, a list of 30 profile characteristics were framed along with their operational definitions after the review of literature, discussion with experts, based on the objectives and observation made by the researcher. They were sent to 50 judges for eliciting their relevancy on a five-point continuum ranging from 'most relevant' to 'least relevant'. About 45 judges responded and from among 45, 40 responses were received as complete and taken for analysis. The judges were those people who were the practitioners of terrace cultivation of vegetables. The variables thus selected were age, educational status of the family, cultivated area, family size, self confidence, annual income, economic motivation, social participation, extension agency contact, mass media contact, risk orientation, innovativeness, health consciousness, experience in vegetable cultivation, management orientation, family labour utilization, and irrigation index.

Respondents below the age of 35 were considered as young and above the age of 35 were considered as old. The educational status was measured by asking the respondents whether they were undergraduates or graduates (and above). The respondents were asked to indicate the number of old age people, adults and children in their family to know their family size. The self-confidence was measured by using the scale developed by Pandyaraj (1978). Annual income obtained as such was considered for the measurement. Economic motivation was measured using the scale developed by Sup (1969). The scale developed by Kamarudeen (1981) was used to measure social participation. Extension

agency contact was measured by using the scoring procedure adopted by Krishnamoorthy (1988). The procedure used by Anantharaman (1997) was used to measure mass media contact. Risk orientation was measured using the scale developed by Supe (1969). The procedure followed by Singh and Choudhary (1977) was used to measure innovativeness. Health conscious was measured by the procedure developed by the researcher for the purpose. The procedure followed by Jaleel (1992) was used to measure experience in vegetable cultivation. Management orientation was measured by using scale developed by Samantha (1977). Family labour utilization and irrigation index were measured using the procedure developed by Sindhu (2002) and Geethakutty (1993) respectively.

Knowledge in vegetable cultivation was tested before and after the training, using teacher made test developed for the purpose. Attitude of the respondents towards the terrace cultivation of vegetables was measured before the training and during the second season of terrace cultivation of vegetables using the method of summated rating suggested by Likert (1932). Training need of the respondents in different areas of terrace cultivation of vegetables was assessed using average choice score method before the training. Adoption of cultivation practices was measured using the method adopted by Ramachandran (1992) with slight modification. Time utilization pattern and vegetable consumption by the urban families were measured by procedure developed by the researcher for the purpose. Benefit Cost ratio was measured by using the method developed by the researcher for the study. In order to identify the constraints, the respondents were asked to indicate the constraints they faced during terrace cultivation of vegetables and they were again given to them for ranking

The statistical tools used were mean, percentage, chi-square test and Wilcoxon sign-rank test.

It was revealed that, the percent of respondents having high knowledge in vegetable cultivation had increased upto 97 from 56 per cent where as the percent of respondents having low knowledge in vegetable cultivation had decreased to three per cent from 44 per cent after the training. It was also found out that 97 percent of the respondents had favorable attitude and only three per cent exhibited unfavorable attitude towards terrace cultivation of vegetables during the second season of cultivation.

Regarding the method of training, first preference was for field trips followed by film show, method demonstration, case study, exhibitions, group discussion and lecture. It was found out that the respondents preferred one day training and preferred to attend the training once in six months followed by once in an year, once in two years, once in three year, once in four years, once in five years, once in two months, once in a month and once in life time. Majority of the respondents preferred a convenient place near their place of residence as the venue for training. Plant protection was the most preferred area for training followed by preparation of organic manures like vermicompost and cultivation of azolla, preparation of organic pesticides like neem oil emulsion, manuring, preparation of potting mixture, time of sowing and time of transplantation, filling of sacks and placement of sacks in terraces, selection of suitable vegetables and their varieties and irrigation to the crops.

Regarding the adoption of cultivation practices, it was found out that 60 per cent of the respondents had high adoption and 40 per cent of the respondents belonged to low adoption category.

It was revealed that the respondents spent 34 per cent (8 hours) in kitchen; 8 per cent (2 hours) of their time in attending children, in watching television and in household duties like shopping, going to bank, paying electricity and water bill; four per cent (1 hour) in terrace gardens

and for other recreational activities and two per cent (0.5 hours) of their in ornamental garden, kitchen garden and with pets and other domestic animals. On an average, they used to sleep for seven hours (30 per cent) of their time.

Regarding the consumption pattern of vegetables, an average increase of 1.7 kg of vegetables per week was found. It was also found that the consumption of leafy vegetables had increased by 0.9 kg and tubers by 0.1 kg.

It was found that majority of the respondents (63 per cent) came in the BCR category of (1-2), 30 per cent of the respondents were having higher BCR (>2) and 7 per cent of the respondents possessed BCR less than 1 when BCR was calculated by taking into consideration the labour. But when BCR was calculated without taking into consideration the labour, majority of the respondents (84 per cent) came in the BCR category of < 1 , 16 per cent of the respondents were having higher BCR in the range of 1-2 and none of the respondents possessed BCR greater than 2. It could be recommended with the evidence of the study that it would be possible to cultivate in 85 sacks on a house terrace having an average area of 1250 square feet and could obtain a total return of 1475 rupees per week.

Majority of the respondents (75%) continued cultivation though a few of them (25%) withdrawn due to personal reasons like children's marriage, illness, permanent/temporary shifting of house and construction of another floor. It was also noticed that the respondents developed 'a we feeling' among them and started exchanging the inputs such as sacks, seeds/seedlings, organic manure, worms, azolla and also the produce obtained through terrace cultivation of vegetables.

Broadly 12 constraints were faced by the respondents and they are difficulty in getting on house terrace more frequently, difficulty in obtaining the inputs such as sacks, seeds, cowdung, bricks, etc., difficulty in bringing the inputs

from the ground to the house terraces, difficulty in carrying the filled sacks from one place to another, problems associated with direct sunlight to the seeds / seedlings, crop loss due to pests and diseases, lack of water to irrigate the crops, huge weight of the filled sacks is a threat to the house, frequent wetting of a particular area damages the ceilings and the floor becomes dirty very fast, sack become damaged in every one or two crops/crop seasons and difficulty in replacing them, difficulty in getting labour and difficulty in getting azolla and worms for compost making.

It was found out that only 33 per cent of the respondents were young and majority of them came under the old category (67 per cent), Out of the 30 respondents, only one respondent did not posses graduation and 60 per cent of the respondents were having cultivated area below two cents whereas only 40 per cent of the respondents were having cultivated area above two cents. Result indicated that 33 per cent of the respondents had big family whereas 67 per cent of the respondents had small family size and 57 per cent of the respondents were having only low self-confidence whereas 43 per cent of the respondents possessed high self-confidence. The result revealed that 67 per cent of the respondents were having low annual income and only 33 per cent of the respondents possessed high annual income and majority of the respondents (53 per cent) had high economic motivation and only 37 per cent of the respondents possessed low economic motivation.

The result showed that majority of the respondents had high social participation (60 per cent) and 40 per cent of the respondents possessed low social participation. 60 per cent of the respondents had high extension agency contact whereas only 40 per cent of the respondents had low extension agency contact. It was found that 57 per cent of the respondents had high mass media contact whereas 40 per cent of the respondents had only low mass media contact and that respondents were equally distributed among low and high-risk orientation category. It was revealed that 53 per cent of the

respondents belonged to lower innovation category whereas 47 per cent of the respondents belong to higher innovation category. The result indicated that majority of the respondents (70 per cent) had high health consciousness whereas only 30 per cent of the respondents possessed low health consciousness and only 37 per cent of the respondent possessed high experience in vegetable cultivation whereas majority (63 per cent) had low experience in vegetable cultivation. It was also revealed that respondents were equally distributed among low and high category of management orientation, majority of the respondents (80 per cent) had high family labour whereas 20 per cent of the respondents had low family labour and majority of the respondents (60 per cent) had high irrigation index and only 40 per cent possessed low irrigation index.

The results of the chi-square test revealed that there was no association between the independent variables selected and dependent variables. The result of Wilcoxon sign-rank test revealed that there is significant difference in knowledge and attitude of the respondents before and after undergoing the training.

It was found out that on an average 30 of the respondents could transfer the awareness regarding terrace cultivation of vegetables to another 330 farmers. So the spread effect ratio was found to be 1:11, which indicated that one respondent who acquired training on terrace cultivation of vegetables, diffused information to eleven other persons.

Implications of the study

Since available land for cultivation is shrinking drastically especially in urban areas, cultivation of vegetables and other suitable crops in house terrace is one of the best alternative measures. The study contributed certain factors to the discipline of agriculture especially to olericulture and agronomy, to the field of health, hygiene and nutrition and also to the field of empowerment

All the respondents were really suffering from the problems of garbage disposal and attack of mosquitoes. In order to solve this problem, a unit of vermicompost was maintained successfully either on the terrace or on the ground by all the respondents. It was a very effective measure of recycling of household organic garbage and could control the mosquitoes. Horticultural therapy, which is a method of healing many inborn as well as acquired diseases by involving the patients in different steps of cultivation practices of vegetables as well as ornamentals. The deep involvement in various cultural operations like planting, transplanting, manuring, irrigation, harvesting and to an extent marketing would help to develop mental and physical confidence and the patient could overcome the difficulties. The study revealed that certain respondents got relief from asthma, joint pain and rheumatism after involving in terrace cultivation of vegetables. So in nutshell, terrace cultivation of vegetables brought about better health, hygienic and nutritional environment than before, a reduction in family expenditure and above all 'a feeling of satisfaction' one factor, which could not be purchased with money alone.

Model for Terrace Cultivation of Vegetables

With the evidence of the study, the researcher recommends 65-70 sacks in an area of 1000 square feet. The researcher also recommends different types of vegetables (table 62) in order to attain the vegetable self sufficiency from the terrace itself for a family having four members of which two are children below the age of 10 years. Since garbage disposal was a major problem in most of the urban, and in certain parts of rural areas, it could be effectively recycled to vermicompost, which could be used as organic manure for the vegetable crops. Azolla -which is a nitrogen fixing fern, could be effectively utilized as organic manure for vegetables. It could be grown in suitable places, preferably shady corners of the terraces in an area of 7-10 square feet.

Future line of research

The researcher proposes to extent the terrace cultivation of vegetables in the same line to different wards of Thiruvananthapuram Corporation.

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Appendices

APPENDIX – I

KERALA AGRICULTURAL UNIVERSITY

College of Agriculture, Vellayani

Dr. V.B. Padmanabhan
Associate Professor

Department of Agricultural Extension
Vellayani. Dated 10.10.2002

Dear Sir/Madam,

Mrs. Sreedaya G.S., Ph.D. student of this department under my guidance is undertaking a research study entitled "Promotion of terrace cultivation of vegetables by urban housewives – an action research". In this connection she has collected few profile characters, which are likely to influence terrace cultivation of vegetables by urban housewives, and given in Annexure I.

As you are a practitioner of terrace cultivation of vegetables, you been identified as a judge for rating the relevancy on a five point continuum of 'most relevant', 'more relevant', 'undecided', 'less relevant' and 'least relevant' by showing a (✓) mark in the appropriate column. If you feel that any more important variables are left out, kindly add the same with your judgment.

I request you kindly spare some of your valuable time to go through these variables and give your valuable responses. Thanking you in advance for your kind contribution for completing this portion of her research work.

With regards,

Yours sincerely,

Dr. V.B. Padmanabhan
Associate Professor
Department of Agricultural Extension
College of Agriculture, Vellayani

ANNEXURE – I

Sl. No.	Variable	Definition	Most relevant	More relevant	Undecided	Less relevant	Least relevant
1	Age	It is defined as the number of calendar years completed by the respondent					
2	Educational status	Defined as the extent of literacy attained by the respondent and the family members					
3	Nativity	It refers to whether the respondent hails from a rural community or urban community					
4	Annual income	Defined as the income obtained by the respondent and her family for a year through the major and subsidiary occupation					
5	Family size	It was defined as the specific number of members in the family living together					
6	Information source utilization	Refers to the sources / channels from which the respondent got the information on terrace cultivation of vegetables					
7	Training attended	Refers to the number of trainings attended by the respondent at the time of enquiry					
8	Progressiveness	Refers to an individuals relative higher receptivity to modern values and practices					

9	Experience in vegetable cultivation	It is defined as the number of years since the respondent has been involved in cultivation of vegetables					
10	Cultivated area	Refers to the total area in cents under any crop cultivated by the respondent					
11	Area of the house terrace	It refers to the area in square feet of the respondent's house terrace					
12	Self confidence	It refers to the degree of faith the respondent has her own abilities, initiative and zeal to achieve her goal or aim					
13	Persuasiveness	It refers to the ability to influence by argument, by reason, inducement or to win over other persons to accept something to be true, credible commendable or worthy					
14	Risk orientation	It refers to the degree to which respondent was oriented towards encountering risks and uncertainty in adopting new ideas in vegetable cultivation					
15	Mass media contact	It refers to the extent to which the respondent was exposed to different mass media communications such as radio, newspaper and television					
16	Social participation	It refers participation of the respondent in various formal social institutions either as a member or as an office bearer					
17	Level of aspiration	It is operationally defined as the respondent's overall					

		assessment of the concern for wishes and hopes for future or for the fears and worries about the future in her own reality world					
18	Economic motivation	Refers to the extent to which a person was oriented towards profit maximization and relative value she places on monetary gains					
19	Sociability	It is defined as the extent to which the respondent made friends, liked social contact and social activity					
20	Status need	It refers to the perception of respondents to the degree to which vegetable cultivation can bring status to the society					
21	Immediacy of returns	Refers to the degree to which vegetable cultivation could make immediate returns					
22	Family labour utilization	It is defined as the extent of utilization of members of the family of the respondents for terrace cultivation of vegetables					
23	Management orientation	It is defined as the degree to which the respondent was scientifically oriented towards planning, production and marketing aspects of vegetables					
24	Extension agency contact	Defined as the extent to which the respondent comes in contact with the extension agency within a fixed period					

25	Irrigation index	It is defined as the extent to which the crop was being irrigated					
26	Livestock possession	It refers to the number of animals / poultry possessed by the respondent					
27	Health consciousness	It refers to the awareness, knowledge and interest of the respondent regarding the dietary requirements, personal hygiene and environmental sanitation					
28	Scientific orientation	Refers to those aspects of respondents orientation which commits her to the observance of certain scientific principles					
29	Innovativeness	Refers to the degree to which the respondent was relatively earlier in adopting new ideas					
30	Cosmopolitaness	It is defined as the degree to which the respondent was oriented to her immediate outside social system					

Relevancy score of Profile characters

1	Age	189.2
2	Educational status	188.1
3	Cultivated area	186.0
4	Family size	186.45
5	Self confidence	186.00
6	Annual income	188.50
7	Economic motivation	185.80
8	Social participation	181.00
9	Extension agency contact	181.10
10	Mass media contact	182.10
11	Risk orientation	180.20
12	Innovativeness	181.50
13	Health consciousness	194.50
14	Experience in vegetable cultivation	181.40
15	Management orientation	182.40
16	Family labour utilization	1832.8
17	Irrigation index	181.1

Appendix II

Selected statements for measuring attitude of urban housewives towards terrace cultivation of vegetables

1. Leisure time could be effectively utilized by involving in terrace cultivation of vegetables.
2. Terrace cultivation of vegetables helps to reduce the family expenditure.
3. The kitchen waste could be effectively utilized through terrace cultivation of vegetables.
4. Terrace cultivation of vegetables is a tedious process.
5. Terrace cultivation of vegetables is a recreational activity for those involved.
6. Eco-friendly vegetables could be produced through terrace cultivation of vegetables by using bio-fertilizers and bio-pesticides.
7. Terrace cultivation of vegetables is a threat to the safety of the house.
8. By the cultivation of vegetables, the terrace always remain dirty
9. Due to the splendid availability of sunlight, crop yield is more in terrace cultivation of vegetables.
10. The members can escape from direct sunlight and overheat by cultivating vegetables on terraces.
11. Terrace cultivation provides horticultural therapy treatment to the mentally retarded children and physically handicapped members of the family.
12. Watering the plants every day is a difficult task.
13. By the exchange of seeds, planting materials and other produce, terrace cultivation of vegetables brings about more social interaction between the members.
14. Terrace cultivation of vegetables become a venue for the get togetherness of the whole family members.

APPENDIX – III

KERALA AGRICULTURAL UNIVERSITY COLLEGE OF AGRICULTURE, VELLAYANI

Promotion of terrace cultivation of vegetables by urban housewives – an action research

Interview schedule

1. Name and address of the respondent :
2. Age in completed years:
3. Educational status:
4. Experience in vegetable cultivation years
Experience in terrace cultivationyears
of vegetables
5. Family size
Adults : Number Age
Children :
Old aged :
6. a) Total cultivated area :
b) Area under cultivation of
vegetables (if any) :
7. Annual income :

8. Self confidence

Please put tick mark in the appropriate column

(SA – Strongly agree, A – Agree, UD – Undecided, DA – Disagree, SDA – Strongly disagree)

Sl. No.	Statements	SA	A	UD	DA	SDA
1	I feel no obstacle can stop me from achieving my final goal.					
2	I am generally confident in whatever I do.					
3	I am bothered by the feeling that I cannot compare me with others.					
4	I am not interested to do things at my own initiative.					
5	I usually work out things for myself rather than to show others.					
6	I get discouraged easily.					
7	Life is a struggle for me most of the times.					
8	I find myself worrying about something or others.					

9. Economic motivation

Please indicate your agreement or disagreement to the following statements

Sl. No.	Statements	SA	A	UD	DA	SDA
1	A woman should work towards larger yields and economic returns.					
2	A person should try any new idea, which may give more money.					
3	The most successful person is one who has positive outlooks and not at all concerned about money.					
4	A housewife should grow maximum number of vegetables possible to reduce the household expenses.					
5	Eventhough it is recreational, more emphasis should be given to cost-benefit ratio.					
6	Growing vegetables on terraces and sharing with others gives more satisfaction than the money.					

10. Social participation

Please indicate whether you are a member or office bearer in any of the following. If so, indicate the frequency of participation

R – Regularly, ST – sometimes, N – Never

Sl. No.	Organisation	Nature of participation		Frequency of participation in meetings / activities		
		Member	Office bearer	Regularly	Some times	Never
1	Panchayat					
2	Co-operative society					
3	Women's club					
4	Youth club					
5	Socio-cultural organisations					
6	Any other (specify)					

11. Risk orientation

Please give your degree of agreement or disagreement about of the following statements

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

Sl. No.	Statements	SA	A	UD	DA	SDA
1	One should grow larger number of crops to avoid greater risks than growing one or two crops.					
2	One should take more of chances in making a big profit than to be content with a smaller but less risky profit.					

3	One who is willing to take greater risk usually does better financially.					
4	It is good for a person to take risk when he is sure that his chance of success is fairly high.					
5	It is better for a housewife 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.					

12. Innovativeness

When would you like to adopt an improved / new practice in terrace cultivation of vegetables?

1. As soon as it is brought to my knowledge
2. After I had seen others tried successfully
3. I prefer to wait and take my own time
4. I am not interested in adopting improved practices

13. Family labour utilization

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

14. Management orientation

Please state the agreement or disagreement to each of the following statements below.

A – Agree, DA – Disagree

Sl. No.	Statements	Response A/DA
A. Planning orientation		
1.	It is necessary to think ahead of the cost involved in starting an enterprise.	
2.	One need not consult any expert organisation for planning.	
3	It is possible to make profit through production plan	
4	It is not necessary to make prior decision about starting an enterprise.	
Production Orientation		
1.	Timely production ensures more profit.	
2.	One should use those raw materials for production one like.	
3	Scientific methods in production involve high cost.	
4	For scientific production one should have proper knowledge about the technology.	
5	Training is essential for starting an enterprise.	
Marketing orientation		
1.	Market news is not useful to an enterprise.	
2.	An entrepreneur can get good price by grading his produce.	
3	One should sell the produce to the nearest market irrespective of the price.	
4	One should purchase the input from shops where one's retailer purchases.	
5	One should start those enterprises, which have more market demand.	

15. Extension agency contact

Please indicate your frequency of contact and purpose of contact with each of the following extension personnel

Sl. No.	Extension agents	Frequency of contact			Purpose of contact	
		Never	Sometimes	Regularly	Non-agricultural	Agricultural
1	Agricultural Officer					
2	Agricultural Assistant					
3	Agricultural University					
4	Veterinary Doctor					
5	Irrigation Department					
6	Corporation					
7	Co-operative Society					
8	Field Officers of Bank					
9	Other Dealers					

16. Irrigation index

Please put tick (✓) mark in appropriate item

1. Source of irrigation

Tank/Well/Borewell/Canal/Rivers/Others (specify)

2. Period of water availability

Throughout the year

Partial availability

Never

3. Frequency of irrigation

Once in two days

Once in a day

Twice in a day

Occasionally

17. Mass media contact

Please put tick (✓) mark in the appropriate item

Sl. No.	Mass media source	Frequency
1.	Radio	Daily / 2-6 days a week / once in a week / once in a fortnight / rarely / never
2.	Television	Daily / 2-6 days a week / once in a week / once in a fortnight / rarely / never
3.	News paper	Daily / 2-6 days a week / once in a week / once in a fortnight / rarely / never
4.	Magazines/leaflets/ Bulletins	Regularly / occasionally / Never
5.	Films (seen during last year)	1-3 times / More than 6 times / 4 to 6 times /Never

18. Health consciousness

Please indicate your opinion against the following statements

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

Sl. No.	Statements	SDA	DA	UD	A	SA
1	The health could be maintained only if we take balanced diet.					
2	Only those who have clear vision					

	about the life would be concerned about the personal hygiene.					
3	One should find time for cleaning his environment along with caring about his own health.					
4	The children who would be brought up in a cleanless and dirty atmosphere will physically as well as mentally ill.					
5	One should throw away the 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.					

19 Adoption of cultivation practices

Please indicate your response to the following statements

1. Are you doing vegetable cultivations now / Do you have any vegetable crops now ?

Yes / No

If yes, specify 1) Whether in terrace or in soil

2) Specify the crops and their No. ?

Vegetables

1)

2)

3)

2. Do you experience any incidence of pest and disease in your crop ?

Yes / No

If yes what are the measures you are taking to control them.

3. At what stage you harvest the crops ?

4. What material do you use for terrace cultivation of vegetables ?

a) Pots, b) Sacks c) by heating soil in terrace

5. Where do you place the sacks at your terrace ?

At random, By taking into account of the support wall Beneath, Corners.

6. How do you prepare the potting mixture ?

a) By using soil sand and cowdung in the ratio of 2:1:1

b) Other methods

c) By mixing cowdung and soil in the same proportion

7. Upto which extent would you fill the sack ?

a) Half

b) Three fourth

c) Full

8. How do your prepare neem oil emulsion ?

20. Vegetable consumption pattern

Have you experienced any change in the vegetable consumption pattern in your family after starting terrace cultivation of vegetables ?

Vegetable used	Before starting terrace cultivation of vegetables	After starting terrace cultivation of vegetables
	Approximate quantity	Approximate quantity
Leafy vegetables		
1. Amaranthus		
2. Moringa		
3. Others if any (specify)		
Total		

Roots and tubers		
1.Amorphophallus		
2.Dioscorea		
3.Yams		
4.Tapicoca		
5.Ginger		
6.Others if any (specify)		
Total		
Other vegetables		
1.Bittergourd		
2.Snakegourd		
3.Bhindi		
4.Brinjal		
5.Cowpea		
6.Tomato		
7.Chilli		
8.Others if any (specify)		
Total		

21.Purchase of vegetables

Have you experienced any change in the purchase pattern of vegetables after starting terrace cultivation of vegetables? .

Vegetable Purchased	Before starting terrace cultivation of vegetables	After starting terrace cultivation of vegetables
	Amount in Rs	Amount in Rs
Leafy vegetables		
1.Amaranthus		
2.Moringa		
3.Others if any (specify)		
Total		
Roots and tubers		
1.Amorphophallus		
2.Dioscorea		
3.Yams		
4.Tapicoca		

5. Ginger		
6. Others if any (specify)		
Total		
Other vegetables		
1. Bittergourd		
2. Snakegourd		
3. Bhindi		
4. Brinjal		
5. Cowpea		
6. Tomato		
7. Chilli		
8. Others if any (specify)		
Total		

22. Training need analysis

a) Method of training

Please indicate your extent of preference towards each of the following method of training.

Sl. No.	Training methods	Most preferred	Somewhat preferred	Least preferred
1	Lecture			
2	Group discussion			
3	Exhibition			
4	Field trip			
5	Case study			
6	Film shows			
7	Demonstration			
8	Others (specify)			

b) Duration of training

Sl. No.	Duration	Most preferred	Somewhat preferred	Least preferred
1	One day			
2	Two days			
3	3-6 days			
4	1 week			
5	2 weeks			
6	1 month			

c) Frequency of training

Please mention your extent of preference towards each of the following

Sl. No.	Frequency	Most preferred	Somewhat preferred	Least preferred
1	Once in a month			
2	Once in 2 months			
3	Once in 6 months			
4	Once in a year			
5	Once in 2 years			
6	Once in 3 years			
7	Once in 4 years			
8	Once in 6 years			
9	Once in life time			

d) Venue of training

Sl. No.	Venue	Most preferred	Somewhat preferred	Least preferred
1	Agricultural College			
2	A convenient place nearby			

e) Identification of training need

Please indicate the preference of your training need in the following subject matter areas related to the cultivation of vegetables on house terraces.

Sl. No.	Areas of training	Much needed	Somewhat needed	Not at all needed
1	Selection of suitable vegetables and their varieties			
2	Preparation of organic manures like vermicompost and cultivation of azolla			
3	Filling of sacks and their suitable placement in terraces			
4	Irrigation to the crops			
5	Manuring			
6	Plant protection			
7	Preparation of organic pesticides like nicotine oil emulsion and , neem oil emulsion.			
8	Preparation of potting mixture, time of sowing and time of transplantation			

23. a) Knowledge about the vegetables and their cultivation

1. How many grams of vegetables an adult person should take during a day ?

(100, 300, 500)

2. Bhindi is propagated by

(Direct sowing, transplanting, cuttings)

3. Sakthi is a variety of

(Amaranthus, Tomato, Bhindi)

4. Nicotine emulsion is a
(Chemical pesticide, biopesticide, biofertilizer)
5. Amaranthus is transplanted usually after.. days of sowing
(within one week, 2 – 3 week, one month)
6. Jwalamukhi and Jwalasakhi are the varieties of
(Chilli, Bittergourd, Amaranthus)
7. One of the important pests of cowpea is
(Aphid, leaf roller, leaf borer)
8. Leaf spot of Amaranthus which is prevailing in rainy days is a
(Disease, pest, neither the two)
9. Vitamin C enricher vegetables is
(Amaranthus, cowpea, bhindi, bittergourd)

b) Knowledge about terrace cultivation of vegetables

- (1) In order to control pests and diseases on terrace cultivation of vegetables
(Apply chemical pesticides, should observe daily and mechanically destruct them, should not do any thing)
- (2) In terraces, the incidence of pest and disease is.....
(More, less, neither of the two)
- (3) The suitable position for placing sacks in terrace is
(Corners only, any where, in areas having supporting walls below)
- (4) The frequency of watering in terrace cultivation of vegetables
(Once in a day, once in two days, morning and evening)
- (5) Compared to the land cultivation, the incidence of pest and disease in terrace cultivation is
(More, less, difficult to say)

24. Time utilization pattern

1. Please indicate how do you utilize your time from from morning to evening (bed to bed)?

Time
From To Activity

25. Attitude towards terrace cultivation of vegetables

Please indicate your response to the following statements

Statements	SA	A	UD	DA	SDA
1. Leisure time could be effectively utilized by involving terrace cultivation of vegetables.					
2.Terrace cultivation of vegetables help to reduce the family expenditure.					
3.The kitchen wastes could be effectively utilized through terrace cultivation of vegetables.					
4.Terrace cultivation of vegetables is a tedious process.					
5.Terrace cultivation of vegetables is a recreational activity.					
6.Ecofriendly vegetables could be produced through terrace cultivation of vegetables by using biofertilizers and biopesticides.					
7.Terrace cultivation of vegetable is a threat to the safety of the house.					

8.By the cultivation of vegetables, the terrace always remains dirty.					
9. Due to the splendid availability of sunlight, crop yield is more in terrace cultivation of vegetables.					
10.The members can escape from direct sunlight and overheat by cultivating vegetables on terraces.					
11.Terrace cultivation provides horticultural therapy treatment to the mentally retarded children and physically handicapped members of the family.					
12.Watering the plants every day on terrace is a difficult task.					
13.By the exchange of seeds, planting materials and other produce, terrace cultivation of vegetables brings about more social interaction between the members.					
14.Terrace cultivation of vegetables become a venue for the get togetherness of the family members..					

26. Cost – Benefit ratio

Input analysis

Please indicate the cost you have recurred to the following items while starting the terrace cultivation of vegetables?

First Season

Sl. No.	Particulars	Number / Quantity	Rate	Amount (Rs.)
1	Sacks			
2	Cowdung			
3	Sand			
4	Planting materials			
5	Biofertilizers			
6	Biopesticides			
	Grand Total			

Second Season

Sl. No.	Particulars	Number / Quantity	Rate	Amount (Rs.)
1	Sacks			
2	Cowdung			
3	Sand			
4	Planting materials			
5	Biofertilizers			
6	Biopesticides			
7	Grand Total			

Output analysis

First Season

Sl. No.	Vegetables	Yield (kgs)	Amount (Rs.)
1	Amaranthus		
2	Tomato		
3	Chilly		
4	Bhindi		
5	Cowpea		
6	Brinjal		
7	Bittergourd		
	Others (specify)		

Second season

Sl. No.	Vegetables	Yield (kgs)	Amount (Rs.)
1	Amaranthus		
2	Tomato		
3	Chilly		
4	Bhindi		
5	Cowpea		
6	Brinjal		
7	Bittewrgourd		
	Others (specify)		

Labour

Please indicate the extent of use of labour(either family or hired)

Sl. No.	Items	Number/Hours	Amount (Rs.)
1	Family labour		
2	Hired labour		
	Total		

27. Identification and constraints

List out the constraints you had faced during the terrace cultivation of vegetables?

- 1.
- 2.
- 3.
- 4.

**PROMOTION OF TERRACE CULTIVATION OF VEGETABLES BY
URBAN HOUSEWIVES – AN ACTION RESEARCH**

SREEDAYA, G.S.

**Abstract of the
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ABSTRACT

The study which intended to promote production of safe, hygienic and ecofriendly vegetables through the cultivation on house terraces was conducted among the urban housewives. Thirty randomly selected housewives of Poojapura Ward of Thiruvananthapuram Corporation were the respondents. In the first phase of action research, two separate trainings were conducted. The training programme was scheduled in accordance with the result of the training need analysis conducted among the respondents. The training programme included illustrated lecture classes and method demonstrations on various aspects of terrace cultivation of vegetables by the researcher and experts and field visit to different terrace gardens. Inputs like sacks, seeds and organic manures were distributed to the trainees in the concluding session of the training programme. The respondents started cultivation on their house terraces and continued for two seasons under the strict monitoring and supervision of the researcher. Seventy five per cent of the respondents continued cultivation while 25 per cent of them had withdrawn due to inevitable personal reasons.

It was found out that there was a positive change in the knowledge and attitude of respondents after the training programme. Majority of the respondents were high adopters of different cultivation practices on vegetable cultivation. On an average, they spend eight hours (34 %) of their time in kitchen duties and one hour (4 %) in their terrace gardens. The study also revealed that the consumption pattern of vegetables by the urban family had increased by 1.70 kg per week and a reduction in the quantity of vegetables purchased was also reported. It was also found out that 97 per cent of the respondents had a cost-benefit ratio of greater than two and only three per cent of respondents were reported to have a low cost-benefit ratio of less than one. Spread effect ratio was found to be 1 : 11 : 2.

The study had certain implication towards the field of agriculture, health, hygiene, nutrition and empowerment. Vermicomposting was found not only a means for garbage disposal, but also, it was a means for producing enough organic manures for the vegetables. Azolla, which is a floating fern was found to be an effective organic manure, poultry feed, cattle feed and mosquito repellant.

Terrace cultivation of vegetables facilitated a reduction in the purchase of vegetables at the rate of Rs. 25 per week and increase in the consumption of vegetables at the rate of 1.7 kg per week. It is one of the best method for horticultural therapy through which mentally retarded children could be brought to the mainstreams of life. In addition, terrace cultivation of vegetables is also a means of empowerment of the residents of old age home and the students of orphanage schools.

With the evidence of the study, the researcher recommends 65-70 sacks in an area of 1000 square feet. The researcher also recommends different types of vegetables in order to attain the vegetable self-sufficiency from the terrace itself for a family having four members of which two are children below the age of 10 years.

Above all terrace cultivation of vegetables provided an invaluable feeling of satisfaction through the production of safe, hygienic and eco-friendly vegetables at low cost on house terrace itself and provide nutritional security to the households.