PROBLEMS AND PROSPECTS OF MEDICINAL PLANT CULTIVATION IN THIRUVANANTHAPURAM DISTRICT

By

ALLAN THOMAS

THESIS

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VELLAYANI

THIRUVANANTHAPURAM

2000

Dedicated

To

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I hereby declare that this thesis entitled "**Problems and prospects of medicinal plant cultivation in Thiruvananthapuram district**" 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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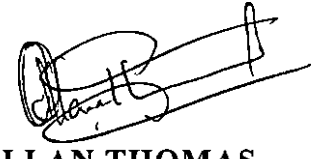

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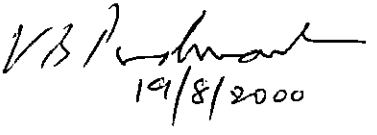
Dr. V. B. Padmanabhan
(Chairman, Advisory Committee)
Associate Professor
Department of Agrl. Extension
College of Agriculture, Vellayani
Thiruvananthapuram

APPROVED BY:

CHAIRMAN

Dr. V.B. PADMANABHAN



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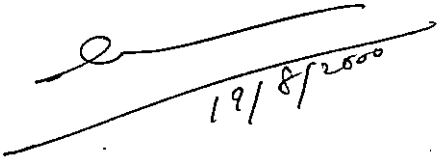

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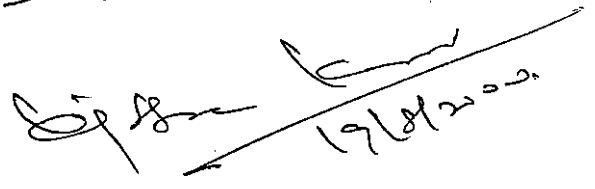

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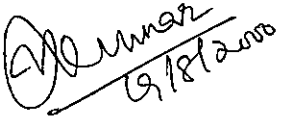

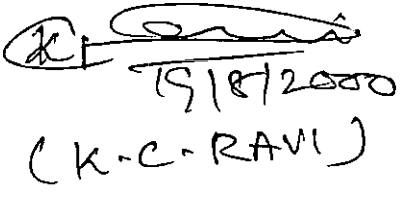

EXTERNAL EXAMINER

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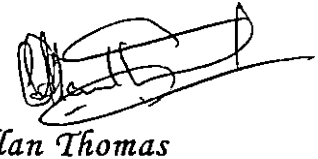

Allan Thomas

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INTRODUCTION

CHAPTER – I

INTRODUCTION

Plants are an important source of medicine. Since ancient period of civilization medicinal plants are known as one of the gifts of nature to cure a number of diseases of human beings. They are the foundation of health care systems all over the world. For example, 80 per cent of people in rural Subsaharan Africa go to traditional medicine doctors, who often administer extracts of local plants. It is reported that there is a traditional doctor for every 100 to 1000 people, but the ratio of modern western doctors is in the ratio of 1 : 1000 to 100000. This is because in Africa virtually every one in a community knows some of the common medicinal plants and they grow it in home gardens but only specialists know the modern western medicines. This highlights how important is to grow medicinal plants and know its method of use (Cunningham, 1993).

The earliest mention of the medicinal use of plants is to be found in the Rigveda, which is one of the oldest, if not the oldest, repositories of human knowledge, having been written between 4500 and 1600 BC (Viswanathan, 1994). The knowledge of Ayurveda has led to the discovery of many potentent bioactive agents in modern drug development. Still 75 per cent of total population relies on medicinal plants in the rural and remote areas by way of traditional systems of medicine.

India is one of the richest countries for medicinal and aromatic plant genetic resources in the world. Its botanical panoply comprises over 45000 species including 17500 flowering plants. Although around 3000 plant species have been used for the last 5000 years in traditional systems of medicine, in India, currently only 1500 species are in use. In the modern system of medicine, the list is still very thin - only 40 major medicinal plant species (with 11 exotic species) are now exploited by pharmaceutical industry. Most of the plant-based drugs are on Vinblastine, Vincristine, Morphine, Codeine, Quinine, atropine and digitalis till 1990.

The technology rich nation continues to rob gene rich nations. Advent of biotechnology has hastened the process. Situation is very alarming in case of high value medicinal plants where unscrupulous native agencies help trans-national corporations exercise bio-plundering leading to loss of national gene wealth. The system suppressing approach, growing unethical practices and bioincompatability (side effects) coupled with sky-rocketing cost of synthetic drugs under the modern system of medicine (allopathy) have turned the world now 'back to nature'.

The present trend of 'back to nature' and government of India's policy of health for all by 2000 AD necessitates that valuable medicinal and aromatic plant species are to be preserved and their cultivation developed in order to make available sufficient plant material for pharmaceutical and cosmetic industry.

Table 1 Ten biosphere reserves (*in situ* conversation) declared in India

Sl. No.	Biosphere resources	Area covered (km^2)	States/sites
1.	Panda Devi	2600	Uttarpradesh
2.	Nokrek	160	Meghalaya
3.	Manas	2837	Assam
4.	Uttarakhand (Valley of flowers)	3941	Uttarpradesh
5.	Namdapha	7000	Himalayan belt
6.	Kaziranga	37283	Himalayan belt
7.	Sundarbans	9630	West Bengal
8.	Mannar gulf	555	Tamil Nadu
9.	Nilgiri	5520	Karnataka, Kerala and Tamil Nadu
10.	Great Nicobar	885	Andaman and Nicobar island

Source : J. R. Sharma. PGR issues : National concern and global concepts with special reference of medicinal and aromatic plants. *Journal of medicinal and aromatic plant sciences* (1999) 21 : 1111-1118

It is estimated that the world demand for medicinal and aromatic plant products is growing at the rate of 10 per cent per annum and at this trend it is expected that during 2000 AD our export demand could be of the value of Rs. 4000 million (NBPGR). It is also estimated that the demand and use of these plant products in the home market may be of the order of a multiple of three to five times of export figure at raw material level.

India being a varietal emporium of medicinal plants is now showing special interest in synthesising natural substances as they are found to be more effective in particular applications. The forest belt of India is immensely rich in medicinal plants and livelihood of local tribes mainly depends upon their collection and trade. The wild growing populations of important medicinal plant species are fast reducing due to over exploitation in their known habitats and their substitutes and allies have appeared in the market.

Traditional medicines or folk medicines are prolific sources of useful drugs and therefore, a great emphasis has now been laid to revive the study of medicinal plants. Government has formulated diverse schemes to preserve Indian medicines to produce herbal drugs and to open a central cell on medicinal and aromatic plants. Large-scale productions of medicinal plants are also mooted on Indian hills and plains following scientific extraction of chemicals from them. Many of the species of medicinal plants now grown wild in forest and wastelands have been identified and can be exploited for commercial purposes.

The important medicinal and aromatic plants cultivated commercially in Kerala are opium poppy (*Papaver somniferum*), Sarpagandhi (*Rauvolfia serpentina*),

periwinkle (*Catharanthus roseus*), lemon grass (*Cymbopogan flexuosus*), palmarosa (*Cymbopogan martinii* var. *motia*), vetiver (*Vetiveria zizanioides*), patchouli (*Pogostemon cablin*), Koduveli (*Plumbago rosea*) and *Gymnema silvistris*. Official estimates of area and production of medicinal and aromatic plants are not available.

There are very few scientific studies on problems and prospect of medicinal plants. With the background of the knowledge on medicinal plants associated with rich and diverse culture and its important commercial resume for the survival of medicinal plants and their economic values and the billion of dollars worth of plant species are traded every year an attempt to study the problems and prospect of medicinal plant cultivation is made. The major objectives of the study are the following.

(1) To assess the knowledge of the medicinal plant cultivators on the medicinal value of the plants cultivated by them.

(2) To identify the training need of the cultivators in medicinal plant cultivation.

(3) To study the market orientation of the cultivators .

(4) To analyse the cost - benefit relationship of medicinal plant cultivation.

(5) To identify the problems and solutions in medicinal plant cultivation.

The thesis is divided into five chapters including the present one. A review of the relevant literature and the theoretical frame built for the study are given in chapter two. A brief description of the area of study and the methodology adopted are given in chapter three. The results and discussion are presented in the fourth chapter. A summary of the major findings of the investigation is given in the last chapter.

1.1 Scope of the study

In the homesteads of Kerala, medicinal plant cultivation has its own scope. As per the action plan for 1998-99 of the State Department of Agriculture, an amount of Rs. 9 lakhs has been sanctioned for the development of medicinal and aromatic plants.

The launch of People's Plan Programme has opened more avenues in this field. Sustainable management of non-wood forest products which include mostly the medicinal plants has been emphasized in the generation of employment and income, especially in the rural areas as well as in the conservation of biodiversity.

The study will assess the extent of knowledge possessed by the medicinal plant cultivators on the medicinal value of the plants cultivated and will identify their training needs in medicinal plant cultivation. The results of the study will help the organisers of training programmes to provide the cultivators with need based training programmes in medicinal plant cultivation. The study will reveal the market orientation of the medicinal plant cultivators, which includes information on selection of marketing channels, and identification of the markets. The analysis of cost-benefit relationship will identify the medicinal plants profitable for cultivation. The study will also bring to light information on the problems and solutions in the field of medicinal plant cultivation as perceived by the cultivators, procurers and retail shop dealers of medicinal plants which will be an eye-opener for the people engaged in planning and promotion of medicinal plant cultivation.

1.2 Limitations of the study

Since this study is confined to a small region and conducted within a short period of time, the conclusions were restricted to conditions prevailing there and any attempt at generalisation must be done with care. Farmers and traders do not maintain proper records and they furnish data mainly from their memory. Therefore, information gathered is not free from recall bias. Moreover, the respondents in general are reluctant to reveal the extent of income generation and the source of income. They show a tendency and present inflated figures for costs and deflated figures for returns. This has created problems in making accurate and reliable estimate during the study. However care has been taken to make the estimates as accurate as possible through cross checking.

THEORETICAL ORIENTATION

CHAPTER II

THEORETICAL ORIENTATION

The objective of the chapter is to link whatever research findings and other observations exist in the area of study with the research problem. For this, a review of literature has been made to integrate important findings, which give proper orientation for the proposed research. This chapter explains the theoretical perspective adopted for the study. The results of the review are presented under the following main heads.

2.1 Knowledge

2.2 Relationship between knowledge and independent variables

2.3 Training need

2.4 Market orientation

2.5 Problems and solutions

2.6 Conceptual framework for the study

2.1 Knowledge of farmers on medicinal value of plants

English and English (1958) defined knowledge as the body of understood information possessed by an individual or by a culture.

Knowledge is defined in this study as the body of understood information possessed by the medicinal plant cultivators on the medicinal value of he plants cultivated by him.

Kalinina (1982) reported the prospects for harvesting minor forest products in relation to forest management taking into consideration the knowledge of the aborigines of forest on the medicinal value of the commercially important medicinal plant species.

The results of the study conducted by Fogelfors (1984) revealed that *Mentha arvensis* has been extensively used in folk medicine and cooking.

The results of the study conducted by Ortiz and Browner (1985) reported that forty-eight medicinal plants were used for the management of reproduction and the treatment of women's reproductive health problems. The efficacy of these plants is assessed according to both the community members', knowledge of the therapeutic use and the standards of conventional western medicine.

Do-Tat-Loi and Dung (1991) reported that for thousands of years the Vietnamese treated diseases with herbs and plants, which were gathered from gardens and forests, based on their traditional knowledge on the use of those medicinal plants. From generation to generation by oral folklore and through literature, people have collected a lot of medicinal plants and especially a lot of medicinal prescriptiary based on a large empirical knowledge of medicinal and toxic plants.

According to Chan *et al.* (1993) Chinese herbal medicines and Chinese proprietary medicines are widely used by people of Chinese origin through out the world based on their inherent knowledge on medicinal value of the used medicinal plants.

Rosenbaun (1993) opined that herbal remedies for men's health problems have been ignored due to lack of knowledge of the people on the medicinal value of different plant species.

Schultes (1993) reported that the Indians of the northwest Amazon respect age and try of care for those suffering from Alzheimer's disease and similar problems. Since the medicinal value of plants are known to them, the particular plants are administered orally as teas of the leaves or roots and over a period of several days to numerous weeks. The plants used by them are from 15 phanerogamic families.

Devi (1994) stated that nearly half of both male and female agricultural labourers had high level of knowledge in farming.

Grosvenor *et al.* (1995) reported that the ethnic people of Sumatra island knowledge on 114 species of flowering plants that claimed to have medicinal uses.

Independent variables

Based on the review of literature and discussions with experts, 12 independent variables were selected for the study. Here an attempt was made to study their relationship with the selected dependent variable namely knowledge. The independent variable selected were

1. Age

2. Education

3. Farming experience

4. Experience in medicinal plant cultivation

5. Farm size

6. Area under medicinal plant cultivation

7. Annual income

8. Income from medicinal plant cultivation.

9. Extension contact

10. Extension participation

11. Mass media exposure

12. Information seeking behaviour.

2.1.2 Independent variables and their relationship with the dependent variable (knowledge)

2.1.2.1 Age

Age refers to the total number of years completed by the individual at the time of interview. The following are some of the research studies, which reported association between age and knowledge.

Table 2 Review of research studies showing relationship between age and knowledge

Sl. No.	Author	Year	Relationship
1.	Thampan	1990	No relationship
2.	Gnanadeepa	1991	Significant positive
3.	Manju	1996	No relationship
4.	Preetha	1997	No relationship

2.1.2.2 Education

Formal education expands the ability of an individual to use modern communication media. Many researchers studied the association of education and knowledge. A review of such studies are presented below:

Table 3 Review of research studies showing relationship between education and knowledge

Sl. No.	Author	Year	Relationship
1.	Gnanadeepa	1991	No relationship
2.	Babu	1995	Significant positive
3.	Manju	1997	No relationship
4.	Preetha	1997	No relationship

2.1.2.3 Farming experience / experience in medicinal plant cultivation

The following are some of the studies, which reported relationship between farming experience and knowledge.

Table 4 Review of studies showing relationship between farming experience and knowledge

Sl. No.	Author	Year	Relationship
1.	Gnanadeepa	1991	Significant positive
2.	Manju	1997	Significant positive
3.	Preetha	1997	Significant positive
4.	Jose	1998	No relationship

2.1.2.4 Farm size / area under medicinal plant cultivation

Many researchers studied the association of farm size and knowledge. A review of such studies are presented below:

Table 5 Review of research studies showing relationship between area and knowledge

Sl. No.	Author	Year	Relationship
1.	Satheesh	1990	Significant positive
2.	Manju	1996	No relationship
3.	Manju	1997	No relationship
4.	Preetha	1997	No relationship

2.1.2.5 Annual income / income from medicinal plant cultivation

Income plays a vital role in the execution of activities in the farm. Research studies showing relationship between annual income and knowledge are presented below:

Table 6 Review of studies showing relationship of annual income with knowledge

Sl. No.	Author	Year	Relationship
1.	Kamarudeen	1981	No relationship
2.	Manju	1996	No relationship
3.	Preetha	1997	No relationship
4.	Jose	1998	No relationship

2.1.2.6 Contact with extension agency

The following studies reported association between contact with extension agency and knowledge.

Table 7 Review of research studies, which reported relationship between contact with extension agency and knowledge

Sl. No.	Author	Year	Relationship
1	Khaleel	1978	Significant positive
2.	Nizamudeen	1996	Significant positive

2.1.2.7 *Extension participation*

Cultivators gain a lot of information by participating in extension programmes organized by developmental agencies and input dealers which would help them in implementing profitable technologies in their farm. The following studies reported association between extension participation and knowledge.

Table 8 Review of research studies, which reported relationship of extension participation with knowledge

Sl. No.	Author	Year	Relationship
1.	Gnanadeepa	1991	No relationship
2.	Manju	1996	No relationship
3.	Preetha	1997	No relationship
4.	Jose	1998	Significant positive

2.1.2.8 Mass media exposure

Nowadays considerable coverage in mass media is given to various aspects of medicinal plant cultivation, which may ultimately influence the knowledge level of cultivators. Research studies showing relationship of mass media exposure with knowledge is presented below. :

Table 9 Review of research studies, which reported relationship between mass media exposure and knowledge

Sl. No.	Author	Year	Relationship
1.	Lalitha	1986	Significant negative
2.	Gnanadeepa	1991	Significant negative
3.	Manju	1996	No relationship
4.	Preetha	1997	Significant positive

2.1.2.9 Information seeking behaviour

Information on different aspects of farm production namely, prices, production methods and institutional arrangements for inputs are required by

farmers all the time. One adjusts his activities on the basis of information he gathers. Research studies showing relationship of information seeking behaviour with knowledge is presented below:

Table 10 Review of research studies, which reported relationship of information source utilization with knowledge

Sl. No.	Author	Year	Relationship
1.	Gnanadeepa	1991	Significant negative
2.	Manju	1996	No relationship
3.	Preetha	1997	Significant positive

2.3 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 medicinal plant cultivation.

2.3.1 Influence of training on the knowledge level of the respondents

Programme Evaluation Organisation (1968) evaluated the impact of three days 'Gram Sahayaks' Training camps in Rajasthan. All Gram-

Shahayaks and non-gram-sahayaks had knowledge of seed treatment, improved seeds, sowing and weeding. But higher proportion of gram-sahayaks had greater knowledge of all improved practices, than the non gram-sahayaks.

Singh (1967) while evaluating the Panchayat Raj Training Programme observed that the participants liked such programmes, which gave them an opportunity to learn more about agricultural innovations. He reported that the farmers in Bihar could gain more knowledge about improved agricultural practices even during their short stay in the training institute.

Programme Evaluation Organisation (1968) observed that the farmers of the package villages had more knowledge in the chemical plant protection measures (32.80 per cent) than the farmers of the non-package villages (26.27 per cent). This was due to the more educational activities conducted in the package villages.

Evaluation Committee on Farmers Training and Education Programme (1969) reported that specific information and details regarding the cultivation of high yielding varieties of crops, particularly those relating to the sophisticated inputs were obtained by farmers through farmers training programme.

Rao and Darakimath (1969) reported that in the case of majority of the farmers who visited a national demonstration on hybrid jowar, the level of knowledge was enhanced upto 31.29 per cent in respect of seeds and sowing, fertilizers and plant protection as a result of training.

Rao and Dudhani (1969) observed appreciable increase in the knowledge level of trainees as a result of exposure to training situations. They further concluded that the gain in knowledge was more about the general characteristics of the high yielding varieties of paddy.

According to Verma and Rao (1969) farmers' training increased the knowledge of participants about farm practices over above those in the control villages. Khuspe (1970) found that all the group of farmers who underwent different training programmes gained higher knowledge than those who did not receive any training. The training has significant impact on the knowledge of farmers. Owing to training there was significant change in their attitude towards HYVP. Similar findings were reported by Paul (1970), Gopal (1974), Katteppa (1975), Singh (1977), Singh and Sagar (1977), Ahamed (1981) and Meera (1981).

Salvi (1970) stated that most of the farmers gained knowledge about the latest scientific techniques after their training at the Farmers' Training Centre.

Menon and Basha (1973) while studying the role of Farmers' Training Centre in developing leadership in rural areas came to the conclusion that there was a definite enhancement of knowledge about the improved package of practices due to the training imparted to the convenors of the farmers' discussion groups by the Farmers' Training Centre.

2.3.2 Subject matter areas of training

Gill (1970) revealed that the farmers felt that they received adequate training in all aspects except seedbed preparation, ploughing operations and proper harvesting to prevent shedding.

Sastry (1970) emphasized that plant protection, manures and fertilizers, improved seeds and agronomic practices of high yielding varieties were the subjects for which training was needed by the farmers.

Sharma (1970) stated that the knowledge and skill of farmers needed to be increased in subjects like plants protection, manures and fertilizers and improved seeds.

Singh and Sohal (1970) stated that all training should be practice-oriented and the trainees should receive opportunities to master farming skills through practices in the use of inputs, namely, seeds, fertilizers, insecticides, farm implements and machinery such as seed cum fertilizer drills, spraying pumps, dusters, electric engine and diesel engine.

Sohal and Yankal (1970) felt that the top priority should be given to agronomy, farm machinery and plant protection in farmers' training programme.

Extension Education Institute (1971) recommended that training in plant protection was the foremost need of farmers followed by training in the use of fertilizers and new seed varieties. The priority ranks in the order of major subject matter areas were plant protection equipments, irrigation and water management, dairy farming, poultry farming, soil conservation and farm mechanisation.

Sathyanarayana and Bhaskaram (1971) stated that knowledge and skills of farmers needed to be improved in the subject matter areas such as determination of fertilizer and their application, soil sampling, use of plant protection chemicals and appliances, identification of pests and diseases, soil and water management, chemical control of weeds and rat control.

Singh (1971) located the areas of training for: (i) knowledge about new inputs such as seeds, fertilizers, pesticides, farm implements and machineries, (ii) new techniques of production such as time and techniques of planting and harvesting, depth of sowing, irrigation, drainage, protection of crop, weeding, time of fertilizer application, crop rotation and soil conservation.

Patil and Kole (1972) stated that farmers needed training in the following order of preference: use of fertilizers, pests and diseases, their control measures, soil analysis, preparatory cultivation, nutrient components of fertilizers, horticulture and irrigation methods.

Gopal (1974) studied the training needs of cotton growers and found that the two topics, namely, plant protection measures and use of chemical fertilizers were frequently cited as most important for inclusion in the farmers' training programmes. The different specific items representing all the major topics in which farmers preferred training were : i) identification of various pests, ii) identification of various pesticides, iii) preparation of different concentration of pesticides, iv) calculating unit cost of fertilizers and doses, v) improved varieties in grain crops, vi) identification of improved

fertilizers, vii) schedule of different plant protection chemicals, viii) reclamation of soil salinity and alkalinity, ix) pre-treatment of seeds and x) knowledge of horticultural crops.

Jha (1974) identified the training needs of small farmers in the following order of importance : Plant protection, high yielding varieties of paddy, fertilizer application, seed treatment, storage, credit, nursery raising, transplanting, irrigation, water management and marketing.

Pandey and Singh (1976) reported that small farmers of both irrigated and un-irrigated tracts identified the subjects such as high yielding varieties of wheat, plant protection and fertilizer application as most needed for training. They further reported that the small farmers of irrigated tract cultivating wheat perceived water management also as most needed while the farmers of non-irrigated tract considered it to the least needed.

Sinha and Verma (1976) found that a high percentage of small and marginal farmers demanded intensive training in plant protection, manures, management during adverse climatic conditions and fertilizer application techniques, while a moderate level of training was demanded on care and management of agricultural implements and for method of sowing.

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 condition, optimum doses of fertilizers, schedule of different plant

protection chemicals, reclamation of acidity and alkalinity of soils, methods of soil conservation, marketing of produce through formal institutions, 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.

Gangaram (1979) concluded that some of the important sub-areas in which farmers wanted training include knowledge about high yielding varieties, implements used in land preparation techniques of seed treatment, time of sowing, nursery beds, seed rate, age of seedling at transplanting, time of application of nitrogenous fertilizers, methods of drainage, use of weedicides, preparation of spray solution for the control of pests and diseases and implements used in harvesting and threshing of grains.

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

Savarimuthu (1981) found out 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 was 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 are in the order of plant protection, soil and leaf sampling, and planting and maintenance.

2.3.3 Types of training

Vidyarthi (1969) opined that peripatetic team should conduct training camps to which farmers within walking and cycling distance will attend without difficulty.

Sathyanarayana and Bhaskaram (1971) stated that majority of adult farmers and young farmers indicated preference for non-institutional (peripatetic) training. Similar results were reported by Gopal (1974) and Sabarathanam (1976).

Anantharaman (1977) found that small and marginal farmers gave top priority to peripatetic training and least preference was for correspondence course. Others such as institutional training programme and farm school on AIR were placed as second and third 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 (43.36 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.

2.3.4 Duration of the training

Sohal and Singh (1960) recommended organization of general courses (institutional) dealing with crop husbandry twice a year.

Sathyanarayana and Bhaskaram (1971) stated that adult farmers preferred one or two days training while young farmers preferred seven to ten days as optimum for institutional training. In respect of non-institutional training, majority of the adult and young farmers and farmwomen preferred one or two days of training.

Vittal and Bhaskaram (1971) reported that a day's duration was preferred by majority of farmers to undergo training.

Roy (1972) reported that first rank was given to one day training camp by farmer-trainees and two days training camp by trainers.

Jha (1974) confirmed Roy's report, which also stated that most of the small farmers preferred only one or two days of camp for training.

Pandey and Singh (1976) reported that most of the small farmers preferred two or three days' training.

Sabarathanam (1976) found that the small farmers favoured a week's training programme. Similar result was reported by Vashitestha (1978) in his study on the training needs of orchardists.

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

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

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

2.3.5 Frequency of the training

The frequency of training programme has much to do with the effectiveness of the training programme as well as the participation by farmers. It is highly essential to see that the farmers were having regular contacts with the training agencies, so that the cultivators can be exposed to

the latest developments in medicinal plant cultivation. Only one study regarding the perception of farmers to the frequency of training could be reviewed. However it is essential to study the opinion of the medicinal plant cultivators about the frequency of the training they prefer.

Sathyanarayana and Bhaskaram (1970) in their study on the training needs of farmers in Hyderabad district of Andhra Pradesh had stated that farmers preferred to have training once in a year.

2.3.6 Method of training

Batten (1962) stated that there are several methods of training and it is important to recognize that no one method is inherently better than other. A method or combination of methods found suitable for training purposes in one place may not be suitable in another.

Johnson (1967) recommended that teaching a group of farmers with common interest in the organised classes was the most effective method of disseminating new knowledge on dairy practices.

Rao (1969) found that trained farmers and experts greatly agreed in assigning high rank to field trips, discussion and demonstrations.

Sastry (1970) recommended the use of group discussion and audio-visual aids in institutional training and the use of films and exhibitions in peripatetic training camps.

Roy (1972) stated that training methods formed the key to effective communication with the participant in any training situation. More respondents preferred demonstration, field trip and discussion.

Gopal (1974) stated that from farmers' point of view the training methods such as demonstrations, exhibitions and field trips were found to be effective.

Sinha and Verma (1976) stated that farmers' training programme could be made effective if the field trials were shown to the trainees. They further reported that the training could be made skill oriented rather than knowledge oriented alone. They also observed that small and marginal farmers desired lecture followed by demonstrations to be given by a combined team of both experts and progressive farmers.

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

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

Chandrasekaran (1981) reported that majority of the trained small tea growers felt that demonstration was the best suited training 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 most preferred by farmwomen. The second method preferred was training through demonstration.

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

2.4 Market orientation

Market orientation in this study has been operationally defined as the degree to which a farmer is oriented towards the market in terms of the demand and price of his produce.

No closely related study to this variable could be reviewed. Identifying marketing channels and analysis of the cost - benefit relationship of medicinal plant cultivation is included under market orientation.

2.4.1 Marketing channels

Marketing channels are the routes through which the produces reach the ultimate consumer. The review of literatures pertaining to marketing channels is presented in the tabulated form that is given below:

Table 11 Review of literatures illustrating the marketing channels

Author	Year	Crops	Marketing channels
Singh and Mann	1971	Fruits	Producer - wholesaler - Retailer - Consumer

Author	Year	Crops	Marketing channels
Govardhana	1979	Dry chillies	Producer-Trader
Suryaprakash *et al.*	1979	Plantation crops	No unique marketing channels
Ramasamy	1981	Brinjal and Bhindi	Producer - Commission agent - wholesaler - retailer - consumer
John D'silva	1982	Coorg Mandarin orange	Producer - pre harvest contractor - retailer consumer
Hugar *et al.*	1983	Brinjal	Producer - seller - Commission agent - Retailer - Consumer
Nagaraj *et al.*	1985	Fruits and vegetables	Producer - Commission agent - Retailer - Consumer
Saikia	1986	Vegetables	1. Producer - Wholesaler / Commission agent - Retailer, consumer 2. Producer – Retailer - Consumer
Subrahamanyan	1988	Vegetables	Producer - Commission agent
Gill *et al.*	1989	Vegetables	Producer - wholesaler - Retailer - Consumer
Sandhya	1992	Bittergourd Ash gourd	Producer - Commission agent - Wholesaler - Retailer - Consumer
Wadkar *et al.*	1994	Mango	1. Producer -Consumer 2. Producer -Wholesaler / Commission agent-Retailer - Consumer 3. Producer -Pre-harvest Contractor -Wholesaler-Commission agent-Retailer-Consumer 4. Producer-Cooperative-Consumer

Author	Year	Crops	Marketing channels
Kumar and Tripathi	1994	Mushroom	1. Producer-Consumer 2. Producer-Retailer-Consumer 3. Producer-Big grower-Retailer-Consumer 4. Producer-Wholesaler-Retailer-Consumer
Mayadevi	1996	Medicinal plants (Kacholam and Koduveli)	1. Producer-Dealer-Ayurvedic medicine manufacturers 2. Producer-Amrutha-Ayurvedic medicine manufacturers 3. Producer-Ayurvedic medicine manufacturers

2.4.2 Cost - benefit relationship in crop production

Based on the review of literature the following studies were reported for the cost - benefit relationship in medicinal plant production.

Mittal (1969) examined the economics of ginger cultivation in Sirmur district of Himachal Pradesh. The study was undertaken in two stages during 1963-64 and 1965-66. The results showed that human and bullock labour accounted for 7.9 per cent of the total cost and seed, which was the main item of cost, accounted for 70 per cent of the total cost. The study suggested that use of better seeds, irrigation and improved implements would increase the revenue.

Rathori *et al.* (1973) analysed the economics of vegetable crops like potato, ginger, tomato, French beans and chilli in temperate regions. The per

hectare total cost of cultivation was found to be Rs. 6,165, Rs. 7,667, Rs. 7,867 and Rs. 5,989 respectively. It was also found that over one third of total cost of cultivation was claimed by imputed rental value of land. The ratio of marginal value product to factor cost for different variables indicated vast scope for the allocation of resources.

Mital and Srivastava (1975) reported that the cost of production of bulb crop union was Rs. 4,700 per hectare. Among cost components, irrigation charges accounted for the highest share followed by cost of manures and fertilizers. Gross income and net profit per hectare were Rs. 7,500 and Rs. 2,800 respectively. They also estimated that the per hectare output of onion was 300 quintals.

Naidu and Rao (1977) conducted a study on costs, returns and marketing of brinjal crop 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 and manures with Rs. 100.00. Gross income form brinjal was estimated at Rs. 1,968 and net income Rs. 831.33. Yield of brinjal was 60 quintals per acre.

Ashturkar *et al* (1980) made an attempt to examine the performance of turmeric crop in Maharashtra state over a period of 14 years i.e.., form 1960-61 to 1974-75 in respect of area and production and to investigate the profitability of the crop. The area under the crop did not show any significant increase. Per

hectare cost of cultivation on cost A basis amounted to Rs. 5,458 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.

Nadda *et al.* (1981) attempted to find out cost and returns for different farm sizes and examined resource use efficiency for ginger production using data from a sample of 108 growers in eight villages in Soomur district of Himachal Pradesh. Seed alone accounted for 38 per cent of the total cost. Average cost of cultivation per hectare was Rs. 13,005 and gross income Rs. 19,321. One rupee spent on ginger production gave an average net return of forty-nine paise. Cost of cultivation of ginger did not vary significantly among different farm sizes. Net profit was the highest for large farmers and lowest for small farmers.

Singh *et al.* (1981) worked out the cost of cultivation of ginger in Himachal Pradesh and it was found to be Rs. 14,250 per ha, inclusive of family labour, fertilizer and other inputs. Net income was estimated as Rs. 8,500 per hectare.

Subrahmanyam and Doss (1981) estimated cost of cultivation of vegetables in Malur and Chickballapur taluks of Kolar district of Karnataka. It was fount that the 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 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 sale price of Rs. 1,100 per quintal. Gross income per hectare was Rs. 12,012.00 and net income Rs.4,316.00.

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 is 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.

Inamdar and Diskalkar (1987) in their study described the cultivation practices for obtaining good yield of turmeric (*Curcuma longa)* in Sangli district of Maharashtra. They have suggested that steps should be taken to increase the area under turmeric cultivation. More intensive methods of cultivation should be introduced to increase the yield as well as to make the crop more remunerative.

Shubha (1990) in her study on effect of spacing and planting material on the growth, yield and active principle in *Plumbago resea* worked out the economics of cultivation of *Plumbago resea* L. for one hectare under experiment conditions and showed that the total cost of cultivation was Rs. 23,646, yield of dry roots was 2.56 tonnes and total income generated was Rs. 38,400. Net income was found to be Rs. 14,754 and cost benefit ration 1 : 1.62 (at cost A_1 level).

Venkatanarayanan (1990) analysis the economics 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 ratios 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 proposition.

Sandhya (1992) in her study on economics of production and marketing of vegetables in Ollukkara block in Thrissur district, calculated total cost of cultivation for bittergourd and ashgourd on per hectare basis on various cost concepts. Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2 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 188-99) have estimated costs and returns. The cultivation's received the net returns of Rs. 65,322, Rs. 62,320, Rs. 69,324 and Rs. 59,527 per hectare respectively. The price oscillated from Rs. 1 to 3 per kilogram.

Nayar (1992) in his study on domestication of wild medicinal plants of Ayurvedic importance recommended some plants for cultivation on remunerative basis. The plants are *Holostemma annulare, Indigofera tinctoria, Aloe vera, Withania somnifera, Acorus calamus, Adathoda barbadens, Kaempferia galanga, Kaempferia rotunda.* Package of cultivation practices and processing techniques have been standardized in the case of *Holostemma annulare.*

Brahmaiah and Naidu (1993) in their studies on chillies 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 chillies 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.

Latha (1994) in her study on evaluation of Kacholam (*Kaempferia galanga* L.) types for morphological variability and yield showed that fresh rhizome yield per hectare varied from 9.11 tonnes and the dry rhizome yield varied from 2.44 tonnes to 3.68 tonnes under open conditions. Under shaded conditions the yield varied from 5.82 tonnes to 9.6 tonnes per hectare and dry rhizome yield 1.9 tonnes per hectare to 3.31 tonnes per hectare.

Jayesh (1994) in his study on economics of production and marketing of ginger in Kerala with special reference to Idukki district reported that average yield of ginger was 13,783.08 kilogram per hectare and average cost of cultivation per hectare Rs. 20,088.10. Input-wise cost of cultivation per hectare of ginger showed that human labour was the largest single item of expenditure accounting for 45.60 per cent of total cost. Operation-wise cost followed by fertilizers, manures and manuring, preparatory cultivation, harvesting, weeding and earthing-up and mulching.

2.5 Problems and solutions

Pandya and Trivedi (1988) defined constraints as 'those items of difficulties or problems faced by individuals in the adoption of technology. Prakash (1989) defined constraints as a limiting factor, which stands in the way of accomplishing potential productivity.

In the present study, constraint is defined as a restraining from the enterprise.

2.5.1 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 farmer's productivity of crops into agro-economic, socio-physiological and extension variables.

Panghal *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 nonavailability of new varieties high art of planting materials etc.

A technological constraint implies to the restraining factor, which limits the adoption of production practices and includes lack of systematic research, absence of practical training etc.

Marketing constraints refers to the restraining factors, which limit the growers to obtain profit by the sale of cutflowers, and it includes unorganized marketing channel, competition among growers etc.

2.5.2 Constraints in agricultural production

Innumerable studies have been undertaken regarding the constraints in agricultural production.

2.5.3 Constraints

Tripathy *et al.* (1982) while analysis the constraints in the adoption of high yielding rice technology reported that poor germination percentage of government supplied seeds and not demonstrating the improved techniques sufficiently were the main hurdles faced by farmers.

Waghmare and Pandit (1982) found that lack of knowledge, lack of technical guidance, unawareness in the use of plant protection chemicals and high cost of chemicals fertilizers are the important constraints faced by the farmers.

Arya and Shah (1984) identified small and skewedly distributed holdings, fragmented and scattered holdings, shortage of labour, lack of availability of inputs and funds and lack of education and training were the most felt constraints by women to adopt new technology of rainfed agriculture.

Table 12 Research studies showing constraints in horticultural production

Sl No.	Author	Year	Crop	Constraints
1	Palaniswamy	1978	Flowers	Lack of credit, marketing, storage, transport facilities, non-availability of labour, exploitation of middle men, fluctuation in market price
2	Krishnan	1980	Apple	Lack of storage, high percentage of losses due to spoilage, inadequate marketing facilities and finance.
3	Seshachar	1980	Chilli	Lack of knowledge regarding application of farmyard manure, fertilizers and duration of plant protection chemical.
4	Gokulraj	1981	Tomato	Fluctuating market price, inadequate fund, no technical guidance, lack of knowledge regarding improved practice.
5	Alagarraja	1982	Flowers	Scarcity of labour and incidence of pests and diseases
6	Kumbar	1983	Grapes	Lack of knowledge, lack of finance, lack of irrigation facilities.
7	Pillai and Prasad	1983	Muduvas	Non- availability of good quality seeds and seeding. Lack of technical guidance on improved farming, low price of the produce

Sl No.	Author	Year	Crop	Constraints
8	Chadha	1984	Grapes	Flower and Flower bud drop, cluster tips wilting, pink berry formation, poor bud burst, premature defoliation, poor cane maturity, dead area and trunk splitting.
9	Pillaiar	1985	Paddy	Lack of intensive extension service, inadequate supply of inputs, lack of knowledge, lack of credit availability
10	Ramanathan *et al.*	1987	Cassava	Lack of marketing system, high cost of cultivation, non-availability of planting material on time, low cost of tubers of HYV
11	Hew	1989	Cutflower	Shortage of good quality planting material, lack of production and post-harvest handling technology, lack of market innovation and insufficient government support
12	Prakash	1989	Paddy	Lack of co-operation among farmers, low adoption of HYV, lack of irrigation
13	Sajeevachandran	1989	Pepper	Inadequate timely supply of inputs, large scale distribution of planting materials affected by quick wilt and slow wilt, high cost of plant protection equipments, high cost of fertilizers, lack of adequate financial support

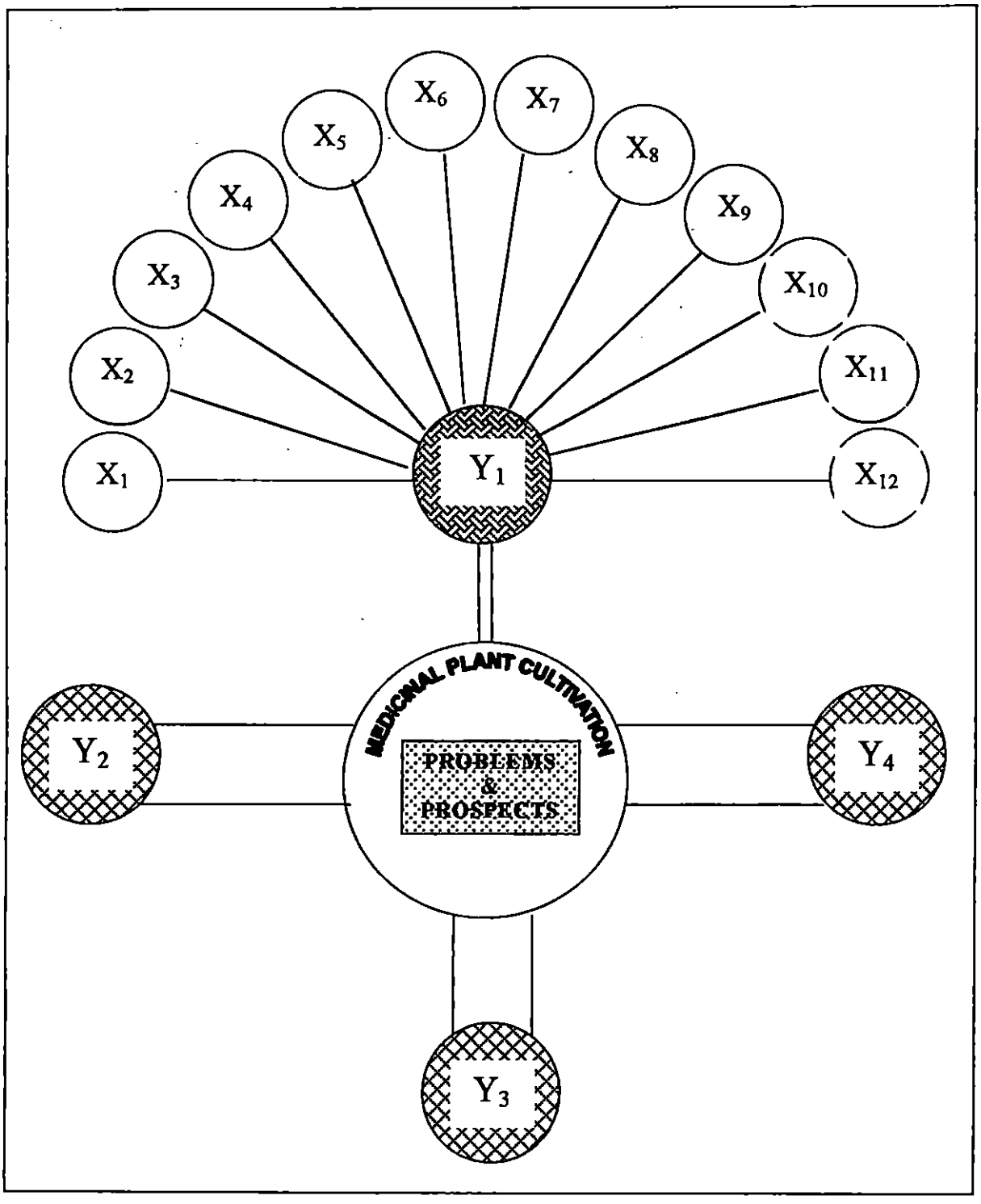
Sl No.	Author	Year	Crop	Constraints
14	Rao	1990	Cutflower	Limited availability of good quality seeds including F_1 seeds or bulbs. Prohibitive import cost, no incentives to use modern technology like green house facilities, use of sophisticated research facilities such as tissue culture and improved farming technology
15	Anantharaman	1991	Cassava	Uncertainty in resource mobilisation, production and marketing, shortage of labour during peak periods, lack of timely and accurate information
16	John	1991	Pepper	Lack of assistance of government agency in organizing the farmers and providing proper guidance, lack of knowledge and awareness
17	Pandey	1991	Cut flower	Green house technology at low price, delay in quarantine and inspection of imported seed and planting material, non-availability of the quality planting materials, lack of infrastructural facilities like cold rooms. AC trucks and cold room facilities at airport, heavy airfreight, no guarantee for cargo space by Air India.
18	Jnanadevan	1993	Coconut	High labour cost, non-availability of labourers in time, inadequate and timely supply of seedlings, lack of adequate financial assistance and subsidies
19	Pandey	1994	Cut flower	Lack of technical information, non-availability of good quality planting materials, expensive affair of plant quarantine, lack of infrastructural facilities like modern green house technology and cold room for cooling of cut flower.

Sl No.	Author	Year	Crop	Constraints
20	Singh	1994	Cut flower	Poor infrastructure, lack of appropriate planting materials, production technology, basic inputs like standard media/growing media and quality packing materials and no proven post-harvest handling technologies to increase.
21	Uppal	1994	Cut flower	Poor infrastructure and poor production technology for growing floriculture crops for export. Ornamental plant in soil-based container, medium is not allowed for import in European countries.
22	Thekkayam and Nair	1995	Cut flower	High cost of planting material, import restrictions and quarantine procedures discourage small growers from importing varieties
23	Sindhu	1995	Cut flower	Capital-intensive industry requires technologically advanced infrastructure to ensure quality product, lack or insufficient availability of good quality planting materials, lack of technical expertise and lack of transporting facilities.
24	Bose	1998	Jasmine	Fluctuation of market price, exploitation of middle men, non-availability of credit, inadequate irrigation facilities and lack of storage facility

2.6 Conceptual framework for the study

The main objective of the conceptual framework attempted in this section is to provide an effective backdrop against which the theoretical conclusion and the relationships predicted with the selected characteristics of this study could be empirically verified (Fig. 1).

Fig. 1 Conceptual model for the study



X1. Age
X2. Education
X3. Farming experience
X4. Experience in medicinal plant cultivation
X5. Farm size
X6. Area under medicinal plant cultivation
X7. Annual income
X8.Income from medicinal plant cultivation
X9. Extension contact
X10. Extension participation
X11 Mass media exposure
X12. Information seeking behaviour

Y1 – Knowledge Y2 – Training need Y3 - Market orientation Y4 – Problems and solutions

METHODOLOGY

CHAPTER III

METHODOLOGY

The general description of the methods and procedures employed in the present study are explained in this chapter. These are presented under the following heads.

3.1 Location of the study

3.2 Sampling procedure and selection of respondents

3.3 Selection of variables and their measurement

3.4 Construction of interview schedule and method of data collection

3.5 Statistical methods used

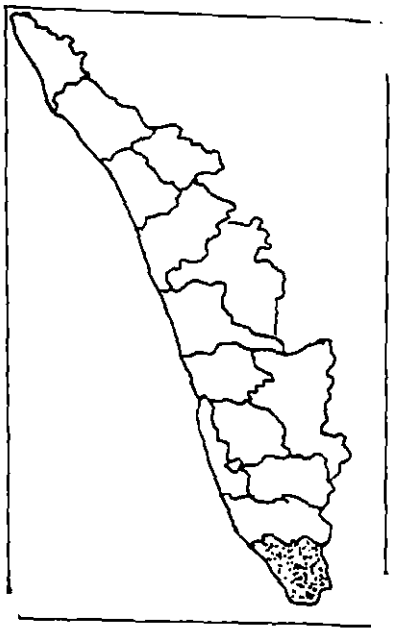
3.1 Location of the study

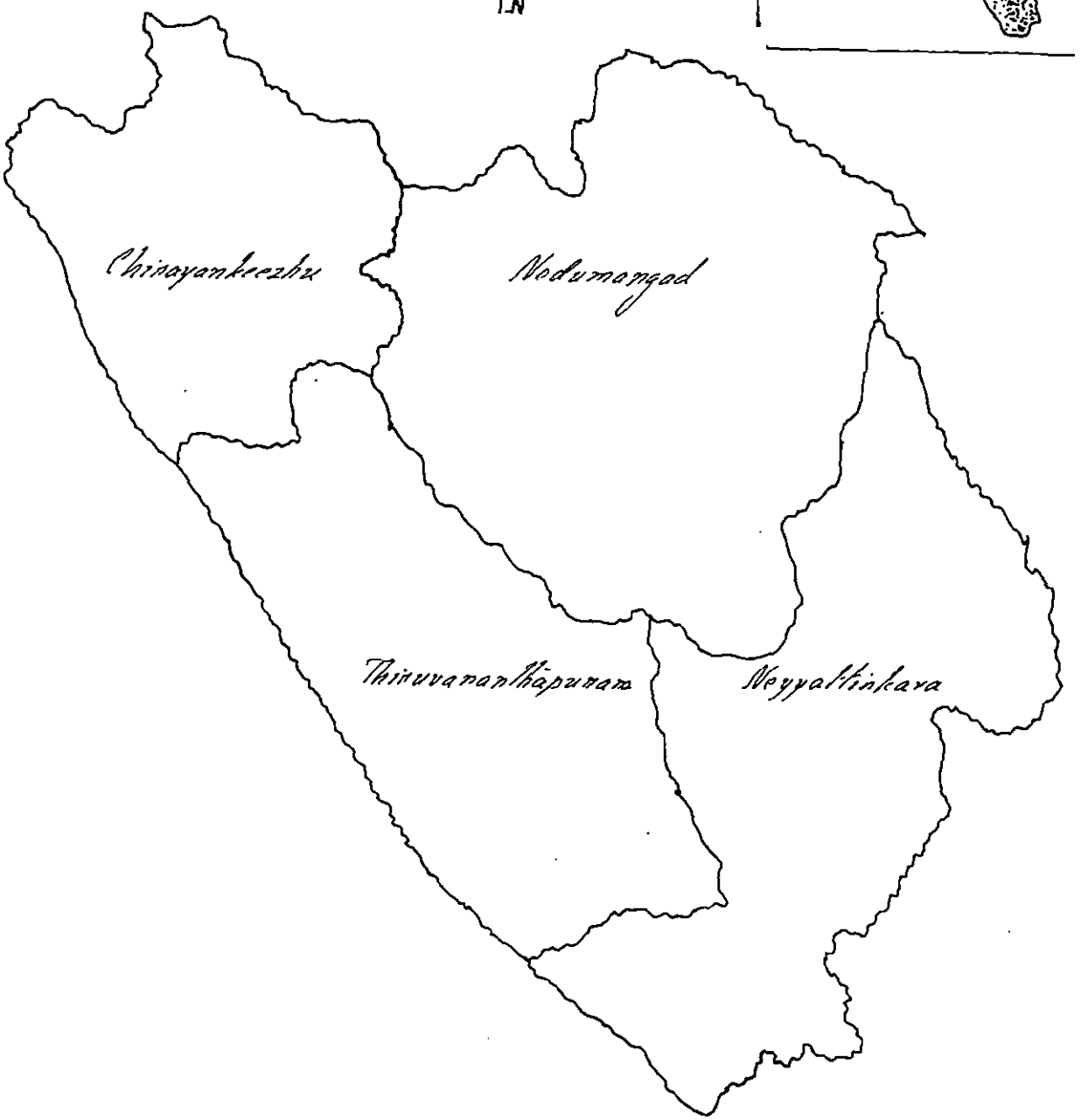
The study was undertaken in Thiruvananthapuram district of Kerala state. The location of the study area is shown in Fig. 2. The researcher is familiar with the situation and socio-cultural status of the medicinal plant cultivators of the district, so that collection of data could be accomplished without much difficulty.

3.2 Sampling procedure and selection of respondents

The medicinal plant cultivators in Thiruvananthapuram district were selected as respondents for the study.

Fig. 2




N
Chirayankeezhu
Nedumangad
Thiruvananthapuram
Neyyattinkara

Stratified random sampling technique with proportionate allocation was adopted for the selection of respondents. The four taluks in Thiruvananthapuram district, namely, Nedumangadu, Neyyattinkara, Thiruvananthapuram and Chiriayinkeezhu were considered as the strata. Through proportionate allocation procedure, the number of medicinal plant cultivators to be selected from each stratum was calculated. From the list of medicinal plant cultivators in each taluk the required number of respondents were selected randomly. From the four taluks namely, Nedumangadu, Neyyatinkara, Thiruvananthapuram and Chirayinkeezhu, 40, 37, 13 and 10 numbers of respondents were selected respectively. Thus, altogether 100 medicinal plant cultivators were selected as respondents .

3.3 Selection of variables and their measurement

The objectives of the study necessitated knowledge of medicinal plant cultivators on the medicinal value of the crops they grow, training need of cultivators in medicinal plant cultivation, market orientation, cost-benefit relationship of medicinal plant cultivation, problems and solutions as perceived by the farmers, procurers and retailers in the field of medicinal plant cultivation as the variables for the study.

3.3.1 Knowledge

Knowledge was referred to the quantum of scientific information possessed on the subject, namely, medicinal value of the medicinal plants cultivated by the respondents.

Sankariah and Singh (1967) measured knowledge of farmers on improved methods of vegetable cultivation based on teacher-made test.

Meera (1981) computed the knowledge score of farmwomen about improved agricultural practices as the total number of items answered correctly by the respondents. Anantharaman (1991) also calculated the total knowledge score of farmers on scientific management in crop enterprise by adding the number of items answered correctly by each respondent.

The procedure followed in the present study to measure the knowledge of the farmers on the medicinal value of the medicinal plants they cultivated is described below.

The farmers were asked to tell the medicinal values known to them of the medicinal plants cultivated by them. Their answers were then cross- checked with the literature published by Kerala Agricultural University and those, which were not available through literature, were crosschecked with the help of expert scientists from the Department of Medicinal and Aromatic Plants. Each right answer was given a score of one and each wrong answer was given a score of 'zero'. Thus the average knowledge score of the respondent was calculated.

3.3.2 Training needs assessment

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

Training need was operationally defined, as the perceived needed level of training of medicinal plant cultivators in relation to the different cultivation practices suitable to them in Thiruvananthapuram district.

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

3.3.2.1 Weighted mean score

Anantharaman (1977) in his study on the training needs of small and marginal farmers measured the training needs on each major subject matter area and the specific items 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 were found out and the score allotted to it multiplied with the respective frequencies. The scores were summed up and divided by the total weights so as to get weighted mean score for each subject matter area. Similar procedures were followed by Ahamed (1981), Chandrasekaran (1981), Savarimuthu (1981), Arumugam (1983) and Alexander (1985) in their studies on effectiveness of training programmes for farmers, the training needs of small tea growers, training needs of farm women, training needs of sericulturists and training needs of small rubber growers respectively.

3.3.2.2 Miller's method

Miller (1979) had given a formula for the identification of training need.

Miller's formula

$$M - I = D$$

Where M - Mastery of all necessary behaviour

I - Inventory or common behaviour to both old and new way

D - Deficiency or training need

3.3.2.3 Index of consensus (Cq)

When the training needs are collected on different tasks and activities from the trainees, the supervisors and the supervisees (clients) on the same item and when each respondent makes but one choice, only then, the consensus index can be worked out for each category of respondents. This index was recommended by Davis (1962) for use on nominal and ordinal categories. According to him this is a simple tool for quantifying consensus. Its value ranges from 0 to 1. The value will be zero where the frequencies are equal to all categories indicating a complete lack of consensus and a maximum unit, if there is but one zero, frequency in the distribution indicating complete consensus.

The formula given by Davis (1962) for calculating Index of consensus is

$$Cq = \frac{f^{l} - c^{l}f}{f(c - 1)}$$

Cq = Consensus index

f = Mean frequencies of persons preferring each category

c^{l} = Number of categories with frequencies exceeding f.

f^{l} = Category frequency larger than f.

3.3.2.4 Training need quotient (TNQ)

Another simple statistical tool for assessment of training need developed by Sharma and Singh (1966) is a ratio scale called Training Need Quotient, which accommodates variation in a number of items checked and ranged from zero to 100. The formula for computation of TNQ is as follows.

$$TNQ = \frac{OSij}{MSij} \times 100$$

Where OSij = Sum of observed scores of J^{th} individual for the I^{th} item

MSij = Maximum score attributable to the I^{th} item rated by J^{th} individual

The relationship between various factors and TNQ of the respondents can be further examined by Chi-square test.

3.3.2.5 Training needs score

Gill and Sadhu (1981) worked out the training needs of prospective poultry farmers of Punjab by using the following formula.

Training need score = 1 - Average knowledge score

where

$$\text{The average knowledge score} = \frac{\text{Total knowledge score}}{\text{No. of questions x No. of respondents}}$$

In this study the training needs of medicinal plant cultivators on medicinal plant cultivation in respect of knowledge and skill under each subject matter area were measured on the three-point continuum. The frequencies of each response

categories were found out and the score allotted to it was multiplied by the respective frequencies of choices and Average Choice Score was found out.

3.3.2.6 Choice scores (ACS and TCS)

On the basis of the responses of the people on the proforma given earlier, priorities based on the I, II and III choices can be tabulated and identified as training needs. Following their, total choice scores (TCS) and Average Choice Scores (ACS) can be worked out by the following formula developed by Bhatnagar (1987).

$$ACS = \frac{(CI \times 3) + (C\,II \times 2) + (C\,III \times 1)}{3}$$

where ACS = Average choice scores

CI = First choice

CII = Second choice

CIII = Third choice

3.3.3 *Market orientation*

Market orientation in this study has been operationally defined as the degree to which a farmer is oriented towards the market in terms of the demand and price of his produce.

Identifying the marketing channels and analysing the cost - benefit relationship of medicinal plant cultivation, helps to find out market orientation.

3.3.3.1 Marketing channels

In the present study, marketing channel was operationally defined as the route through which medicinal plant produce travels from the producer to the ultimate customer.

Based on the review of literature and discussions with medicinal plant cultivators and extension functionaries, marketing channels, which were found to be most prevalent in the area of study, were listed. The respondents were asked to mention the channel through which their produce was marketed. The frequencies of the respondents mentioning each marketing channel were recorded. The marketing channel with highest frequency was considered as the most common marketing channel of medicinal plants in that area followed by others in the order of decreasing frequencies.

3.3.3.2 Cost-benefit relationship

The method developed by Mayadevi (1996) was used by the researcher to assess the cost-benefit relationship in medicinal plant cultivation with respect of the Benefit and Cost in terms of input and output. The details to analyse the cost-benefit relationship for the study is as follows.

Parameters used to calculate input wise cost of medicinal plants (assessment of cost - benefit ratio)

Sl. No.	Particulars	Amount (Rs. ha^{-1})
1.	Labour	
2.	Seed/planting material	

Sl. No.	Particulars	Amount (Rs. ha^{-1})
3.	Manures and fertilizers	
4.	Rental value of own land	
5.	Interest on working capital	
6.	Land revenue	
	Grand Total	

Output analysis

Medicinal plants	Yield (kg ha^{-1})	Returns (Rs. ha^{-1})

Net returns

Total returns - Total cost = Net returns

$$\textit{Cost-benefit} = \frac{\text{Total cost}}{\text{Net returns}}$$

3.3.4 Problems and solutions as perceived by the farmers, procedures and retail shop dealers in medicinal plant cultivation

Problem was operationally defined as the difficulty encountered in medicinal plant cultivation.

Solution was operationally defined as the proposals to overcome the difficulty encountered in medicinal plant cultivation.

In this study the researcher identified the problems and solutions using the two steps as illustrated below.

Step I

In this phase, 100 numbers of the sampled respondents were asked to list those major problems, which they felt important and the solutions as perceived by them, which they felt that were of importance with regard to medicinal plant cultivation and the prospect they perceived in adopting it. Personal interview was conducted with medicinal plant cultivators, procurers and retail shop dealers.

Step II

The problems and solutions 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 problem and solution were found out and its percentage was calculated. The problem and the solution 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 problems identified and prospect of medicinal plant cultivation.

3.3.5 Independent variables

The independent variables in the study refer to the personal, socio and traditional and economic factors of growers. Based on the review of literature, pilot study discussion with experts and judges' relevancy rating the following 12 independent variables were selected for the study.

Age

Education

Farming experience

Experience in medicinal plant cultivation

Farm size

Area under medicinal plant cultivation

Annual income

Income from medicinal plant cultivation

Extension contact

Extension participation

Mass media exposure

Information seeking behaviour

3.3.5.1 Age

Age was operationally defined as the number of completed years of the medicinal plant cultivators at the time of interview and the chronological age was taken as the measure.

According to Wolman (1973) age means the period of time from birth to any given time in life or chronological age.

According to Singh and Verma (1987) age determines maturity that a person attains and thereby his capacity to understand, analyse and respond to various stimuli in the environment.

The respondents were asked to mention their age in terms of completed years at the time of interview.

3.3.5.2 Education

Education refers to the extent of literacy obtained by the respondent at the time of the study. The level of education was measured with the help of socio-economic status scale developed by Trivedi (1963) and used by Sindhu (1997) with slight modification. The scoring procedure was as follows.

Sl. No.	Level of education	Score
1.	Illiterate	0
2.	Literate	1
3.	Primary level	2
4.	Secondary level	3
5.	Collegiate	4

3.3.5.3 Farming experience

3.3.5.4 Experience in medicinal plant cultivation

It was operationally defined as the number of years since the grower is actively involved in medicinal plant cultivation.

Padmanabhan (1981), Senthil (1983), Rajababu (1984), Rajagopal (1986), Jaleel (1992), Nizamudeen (1996), Sindhu (1997) measured farming experience as the actual completed years of experience of the respondent in Agriculture.

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

Sl. No.	Years of experience	Score
1.	Upto 5 years	1
2.	5.01 to 10 years	2
3.	Above 10 years	3

Chandran (1988) adopted the following scoring system.

Sl. No.	Years of experience	Degree of experience	Score
1.	Upto 10 years	Low	1
2.	11 to 20 years	Medium	2
3.	Above 20 years	High	3

In the present study farming experience was measured directly by assigning a score of one for each completed year of experience the farmer had in cultivation of medicinal plants at the time of investigation as followed by Jaleel (1992).

3.3.5.5 *Farm size*

3.3.5.6 Area under medicinal plant cultivation

Farm size refers to the cultivable area in cents possessed by the medicinal plant cultivators. Different researchers have tried to measure farm size in different ways.

Trivedi (1964) while constructing a socio-economic status scale used item analysis for different size of holding groups. In their scale, the following scores were assigned.

Sl. No.	Land area	Score
1.	No land	1
2.	Upto 5 acres	2
3.	Upto 10 acres	3
4.	Upto 15 acres	4
5.	Upto 20 acres	5
6.	Above 20 acres	6

Roy *et al.* (1963) chose value of agricultural products raised as a measure of farm size.

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

3.3.5.7 Annual income

3.3.5.8 Income from medicinal plant cultivation

This refers of the income generated per year by the various activities of the grower in the farm and other than farm.

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

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

3.3.5.9 Extension contact

It was operationally defined as the degree to which the respondent contacts the extension agency and gets information on agricultural or non-agricultural aspects.

In the present study this was measured in terms of frequency of visit made by the respondents. The scoring procedure is given below.

Extension worker	Frequency of contact		
	Often (2)	Occasionally (1)	Never (0)
VLW AA/AO Others (specify)			

3.3.5.10 Extension participation

Extension participation is defined as the extent of involvement of medicinal plant cultivators in different extension activities. This was measured using the procedure suggested by Sindhu (1997) with slight modification. The respondent's participation in each of the extension activities was recorded in a three-point continuum 'often', 'occasionally' and 'never' with scores of 2, 1 and zero respectively. The total score of a respondent was obtained by summing up the scores obtained for each extension activities. The score ranges from zero to 12. The scoring procedure was as follows.

Extension activities	Extent of participation		
	Often (2)	Occasionally (1)	Never (0)
a) Group meetings b) Demonstrations c) Seminars d) Exhibitions / festivals e) Training programmes f) Field visit / study tour			

3.3.5.11 Mass media exposure

It refers to the degree to which the grower respondent used mass media information sources. The measurement procedure followed by Sindhu (1987) with slight modification was used to quantify this variable. The score range is zero to 25.

Sl. No.	Medium	Frequency with score					
		Never 0	Rarely 1	Once a fortnight 2	Once a week 3	2-6 days a week 4	Daily 5
a	Radio						
b	Newspaper						
c	Magazines						
d	Leaflets						
e	Films/related medicinal plant						

The scores on each item are added to get the final score.

3.3.5.12 Information seeking behaviour

Information seeking behaviour measures the extent to which the respondent is seeking information from different communication sources. Gaikwad (1957) has developed the scale for measuring this variable. In the present study the scale was utilized with slight modification made by Sindhu (1997). Scale was rated over a three-point continuum ranging from 'always', 'sometimes' and 'never'. The score ranges from zero-24. The following procedure was adopted for the studies.

Sl. No.	Source	Always (2)	Sometimes (1)	Never (0)
1.	Dy. Director / Principal Agricultural officer			
2.	Agricultural Officers			
3.	Agricultural Assistant			
4.	Agricultural Scientist			
5.	Fertilizer agent			
6.	Relatives			
7.	Newspaper			
8.	Radio			
9.	Television			
10.	Agricultural Publications			
11.	Fellow growers			
12.	Others (specify)			

The score on each item is added together for the final score.

3.4 Construction of interview schedule and method of data collection

An interview schedule was prepared in conformity with the objectives of the study. The schedule was prepared in English and then translated into Malayalam before administering it to the respondents. The interview schedule was pre-tested in a non-sample area before finalisation. Adequate caution was exercised to make the schedule unambiguous, clear, complete, comprehensive and understandable. The final format of the interview schedule in its English version is given in Appendix II.

The final format of the interview schedule was administered to the respondent farmers in the four taluks of Thiruvananthapuram district, namely, Nedumangadu, Neyyattinkara, Thiruvananthapuram and Chirayinkeezhu. The data collection was carried out during March 2000 to June 2000.

3.5 Statistical tools employed

The data collected from the respondents were scored, tabulated and analysed using suitable statistical methods. The statistical analysis was done using computer facilities available at the College of Agriculture, Vellayani.

The following statistical methods were used in this study based on the nature of the data and related information required.

3.5.1 Mean

The mean scores for all the variables were worked out to make suitable comparisons wherever necessary.

3.5.2 Percentage analysis

The percentage analysis was done to make simple comparison wherever necessary.

3.5.3 Simple correlation analysis

Simple correlation analysis was done to study the relationship between each of the independent variables and the dependent variable namely knowledge on medicinal value of the plants cultivated by the respondents.

RESULTS AND DISCUSSION

CHAPTER IV

RESULTS AND DISCUSSION

The results and discussion of the study in accordance with the objectives set earlier are presented in this chapter under the following sections.

4.1 Characteristic profile of medicinal plant cultivators

4.2 Knowledge on medicinal value of the medicinal plant cultivators

4.3 Training needs

4.4 Market orientation

4.5 Problems and solutions as perceived by the farmers, procurers and retail shop dealers

4.6 Prospects of medicinal plant cultivation

4.7 Some medicinal plants that could be grown in Kerala

4.1 Characteristic profile of medicinal plant cultivators

4.1.1 Age

Table 13 Distribution of medicinal plant cultivators according to their age

Category	Mean score	Frequency	Percentage
Low	≤ 46.16	54	54
High	> 46.16	46	46

From Table 13 it is understood that more than half the medicinal plant cultivators (54 per cent) belonged to low category with respect to age.

Recent emphasis and prospects of medicinal plant cultivation might be the reason for low age category respondents being attracted to this field.

4.1.2 Education

Table 14 Distribution of medicinal plant cultivators according to their education

Category	Mean score	Frequency	Percentage
Low	≤ 2.23	57	57
High	> 2.23	43	43

It is observed from Table 14 that the educational status of 57 per cent of the respondents fell in low category whereas 43 per cent belonged to higher category.

Cultivators with higher educational status might have engaged themselves in activities related with their high academic qualifications whereas cultivators with low educational status might have confined themselves to the cultivation of novel crops like medicinal plants.

4.1.3 Farming experience

Table 15 Distribution of medicinal plant cultivators according to their farming experience

Category	Mean score	Frequency	Percentage
Low	≤ 15.98	59	59
High	> 15.98	41	41

It is found from Table 15 that most of the medicinal plant cultivators (59 per cent) had low farming experience.

Majority of the medicinal plant cultivators belonged to low category with respect to age. This might have been the reason for their limited farming experience.

4.1.4 Experience in medicinal plant cultivation

Table 16 Distribution of medicinal plant cultivators according to their experience in medicinal plant cultivation

Category	Mean score	Frequency	Percentage
Low	≤ 6.47	68	68
High	> 6.47	32	32

From Table 16 it is observed that majority of the medicinal plant cultivators (68 per cent) were having less experience in the medicinal plant cultivation because of the reason that farmers had recently adopted medicinal plant cultivation as an enterprise of income generation. Moreover, recent the introduction of an enterprise, lesser would be the experience in the field.

4.1.5 Farm size

Table 17 Distribution of medicinal plant cultivators according to their farm size

Category	Mean score	Frequency	Percentage
Low	≤ 75.95	54	54
High	> 75.95	46	46

It is noted from Table 17 that most of the medicinal plant cultivators belonged to the low category (54 per cent) with respect to the total farm size and the rest of the growers belonged to the higher category

4.1.6 Area under medicinal plant cultivation

Table 18 Distribution of medicinal plant cultivators according to their area under medicinal plant cultivation

Category	Mean score	Frequency	Percentage
Low	≤ 25.35	70	70
High	> 25.35	30	30

It is clear from Table 18 that majority of the medicinal plant cultivators (70 per cent) belonged to the low category with respect to area under medicinal plant cultivation and only 30 per cent belonged to the higher category. This was because medicinal plant cultivation is very recent in terms of commercial cultivation. Also low per capita land holding has made the farmer to go in for other crops like vegetable, etc. Lower knowledge level of farmer on medicinal plants and their uses is also a cause for small area under medicinal plant cultivation.

4.1.7 Annual income

Table 19 Distribution of medicinal plant cultivators according to their annual income

Category	Mean score	Frequency	Percentage
Low	≤ 73350	54	54
High	> 73350	46	46

It is observed from Table 19 that 54 per cent of the medicinal plant cultivators belonged to the lower category and 46 per cent belonged to higher category with respect to total annual income.

4.1.8 Income from medicinal plant cultivation

Table 20 Distribution of medicinal plant cultivators according to their income from medicinal plant cultivation

Category	Mean score	Frequency	Percentage
Low	≤ 25620	59	59
High	> 25620	41	41

From Table 20 it is seen that majority of the medicinal plant cultivators (59 per cent) belonged to low category with respect to income from medicinal plant cultivation and the rest (41 per cent) belonged to the higher group. This is because the land area used for medicinal plant cultivation is very less when compared to the use of land for other crops.

4.1.9 Extension contact

Table 21 Distribution of medicinal plant cultivators according to their extension contact

Category	Mean score	Frequency	Percentage
Low	≤ 2.29	51	51
High	> 2.29	49	49

It is interesting to note from Table 21 that almost equal percentage of the respondents had high and low contact with the extension agency. The reason might have been due to the decentralisation approach of Panchayats and Krishi Bhavans in the development activities. Moreover medicinal plants being recently introduced and since the crop is highly remunerative, it is natural that farmers contact the extension personnel for knowing about different aspects of medicinal plant cultivation, right from land preparation to marketing of the produce.

4.1.10 Extension participation

Table 22 Distribution of medicinal plant cultivators according to their extension participation

Category	Mean score	Frequency	Percentage
Low	≤ 4.73	49	49
High	> 4.73	51	51

It is observed that 51 percent of the medicinal plant cultivators had high extension participation (Table 22). This was because the decentralised approach have made the farming community more powerful in decision-making.

4.1.11 Mass media exposure

Table 23 Distribution of medicinal plant cultivators according to their mass media exposure

Category	Mean score	Frequency	Percentage
Low	≤ 11.91	51	51
High	> 11.91	49	49

Fifty one per cent of the medicinal plant cultivators had low mass media exposure due to the fact that the farmers were less educated (Table 23). Since medicinal plant cultivation is of recent in nature, lack of programmes related to medicinal plant cultivation and its use in television, radio and films, and also lack of awareness regarding the positive aspects of medicinal plant cultivation have put them to the lower category with respect to mass media exposure.

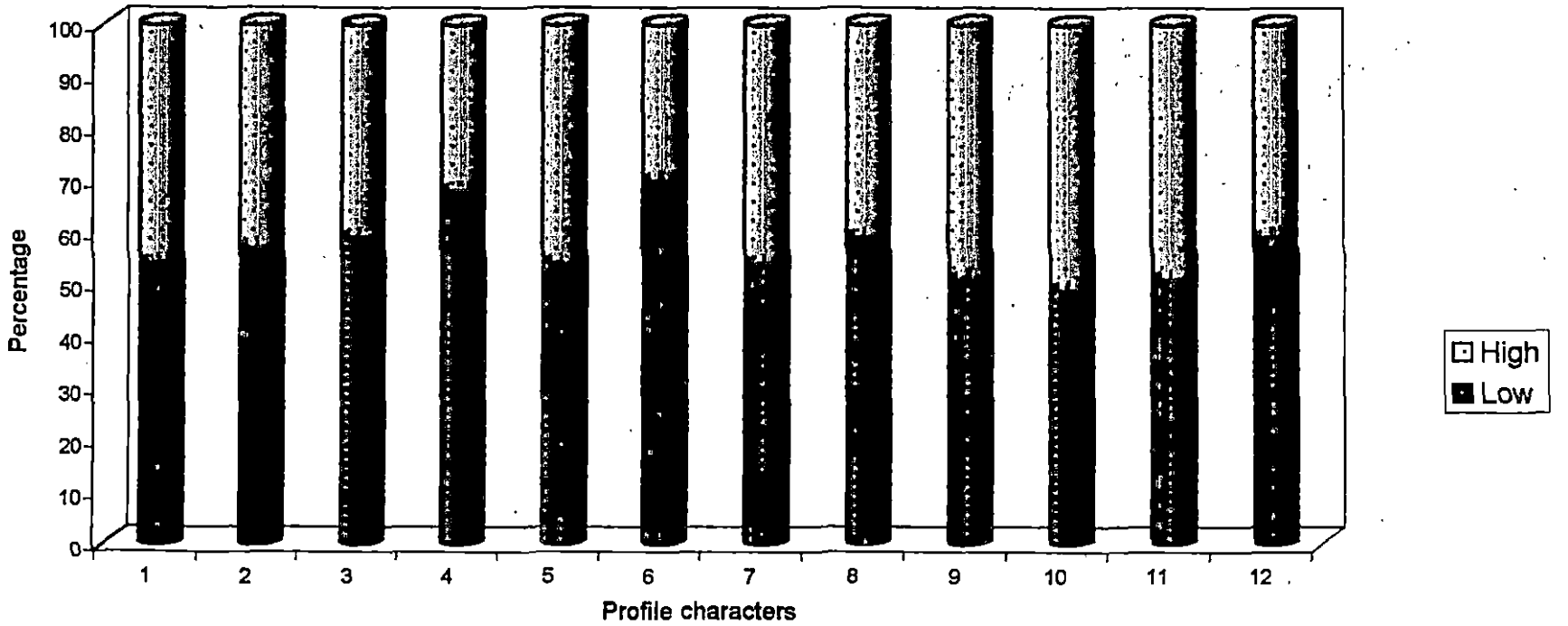
4.1.12 Information seeking behaviour

Table 24 Distribution of medicinal plant cultivators according to their information seeking behaviour

Category	Mean score	Frequency	Percentage
Low	≤ 11.92	59	59
High	> 11.92	41	41

It is observed from Table 24 that the information seeking behaviour of medicinal plant cultivators was low (59 per cent). This might have been due to low education, low farming experience, low extension participation and low mass media exposure. As it was a new enterprise in the field of agriculture, the farmers were not aware of the information regarding the medicinal plant cultivation.

Fig. 3 Characteristic profile of medicinal plant cultivators



1. Age
2. Education
3. Farming experience
4. Experience in medicinal plant cultivation
5. Farm size
6. Area under medicinal plant cultivation
7. Annual income
8. Income from medicinal plant cultivation
9. Extension contact
10. Extension participation
11. Mass media exposure
12. Information seeking behaviour

4.2 Knowledge on medicinal value of the medicinal plants cultivated

The average knowledge score of the respondents obtained for medicinal value of the medicinal plants cultivated by them are given in Table 25.

Table 25 Distribution of medicinal plant cultivators according to their extent of knowledge on medicinal value of the crops cultivated by the respondents

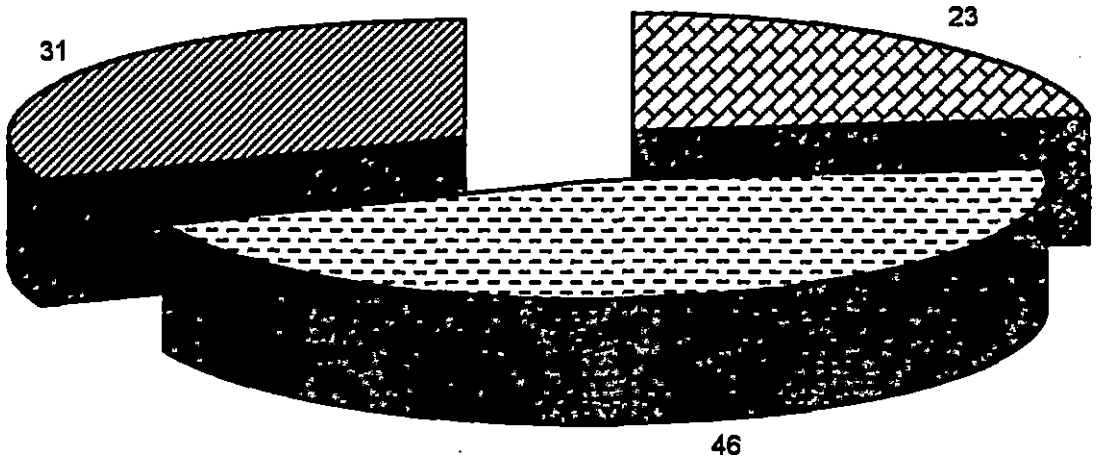
Knowledge score	Category	Frequency	Percentage
< 0.3	Low level	23	23
≥ 0.3 to < 0.6	Medium level	46	46
≥ 0.6	High level	31	31
Total	100	100	100

Mean = 0.4933 Standard deviation = 0.2232

Table 25 reveals that greater number of medicinal plant cultivators (46 per cent) had medium level of knowledge followed by 31 per cent with high and 23 per cent with low level of knowledge on medicinal value of medicinal plants. Hence it is inferred that majority of medicinal plant cultivator's had medium to high-level knowledge about medicinal value of the crops they cultivated.

The modern communication technologies available and the recent positive support given in this field by the government and its agencies might have helped the medicinal plant cultivators to know more about medicinal value of the crops they grew. The contact with the extension agencies and exposure to mass media sources might have broadened their knowledge on medicinal value. Educated farmers are likely to make a better use of mass media channel about the uses of medicinal plants in the day-to-day life. Medicinal plants can be

Fig. 4 Distribution of medicinal plant cultivators according to their extent of knowledge on medicinal value of the crops cultivated by them



cultivated as an intercrop with very less attention and management, which enables them to grow most of these crops and indirectly force them to acquire better knowledge about the medicinal value of medicinal plants.

It can be seen from the Table 26 that out of 12 variables, 11 variables namely, age, farming experience, experience in medicinal plant cultivation, farm size, area under medicinal plant cultivation, annual income, income from medicinal plant cultivation, extension contact, extension participation, mass media exposure and information seeking behaviour were found to have significant and positive relationship with knowledge on medicinal value of the medicinal plants cultivated by the respondents. Education of the respondents had no relationship with knowledge on medicinal value.

Variable age was found to have significant relationship with knowledge level of the respondents on the medicinal value of the medicinal plant cultivated. Due to more experience among old aged farmers in cultivation aspects and more practical knowledge on traditional health care systems, knowledge on the medicinal value is more among the old farmers than in young farmers. This finding contradicts the findings of Sindhu (1996).

The present study establishes a no significant relationship of education with knowledge. Farmers who have more experience in farming come under high age group. They may not be educated but because of their more experience they have more knowledge on medicinal value of the plants. Hence education cannot be considered as a deciding factor for knowledge on medicinal value. This finding contradicts the findings of Khaleel (1978) and Balachandran (1983).

Table 26 Correlation between independent variables and average knowledge score of medicinal values of crops cultivated by medicinal plant cultivators

Sl. No.	Variables	Correlation coefficient (r)
01	Age	0.4578 **
02	Education	-0.0108
03	Farming experience	0.2573**
04	Experience under medicinal plant cultivation	0.3699**
05	Farm size	0.7330**
06	Area under medicinal plant cultivation	0.7382**
07	Annual income	0.7300**
08	Income from medicinal plant cultivation	0.7697**
09	Extension contact	0.6958**
10	Extension participation	0.7363**
11	Mass media exposure	0.6428**
12	Information seeking behaviour	0.6751**

** Significant at 1 % level

Farming experience and experience in medicinal plant cultivation were found to have significant and positive relationship with knowledge on medicinal value of the plants. This might be due to he reason that more the experience in the cultivation aspects the more will be the knowledge level of the growers.

Annual income and income from medicinal plant cultivation were found to have significant and positive relationship with knowledge. It could be concluded that with increased income, the farmers had the resource potential to

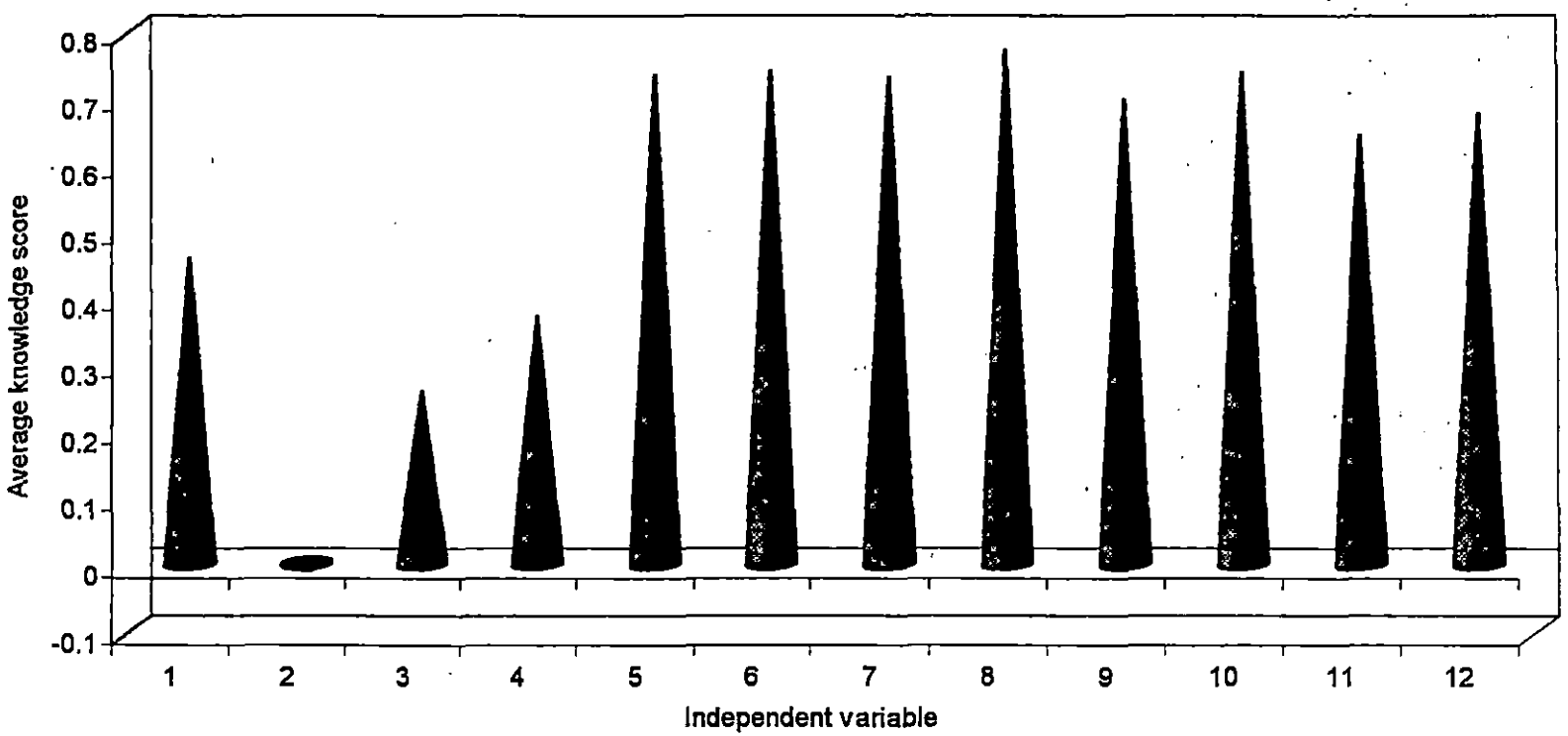
invest money on cultivation, which motivate item to acquire more knowledge about medicinal value of the plants and hence the observed significant and positive relation between annual income, income from medicinal plant cultivation and level of knowledge is quite logical. This finding is on par with the findings of Manjusha (2000).

Contact with extension agency was found to have significant and positive relationship with knowledge about medicinal value of the medicinal plants.. This might be due to the reason that medicinal plant growers having frequent contact with extension agencies are likely to acquire more knowledge on medicinal value of the plants. This result is in conformity with the findings of Khaleel (1978) and Gangadharan (1993).

Extension participation was found to have significant and positive relationship with knowledge. Extension participation is quite important is determining the individual cognition, where in objects, situations and people are evaluated based on collective thinking. Moreover, greater participation of farmers in various organisations will provide them with opportunity for better exposure to interpersonal channels of communication and innovative ideas. It could be inferred that as a result of extension participation farmer might have established more contact with other people, which might result in improving their knowledge level. Hence the observed significant and positive relationship of extension participation with knowledge is quite logical.

In the present era of technological explosion, it is quite logical that a person who has better access to the different mass media and sources of information gain higher level of knowledge. The positive correlation between

Fig. 5 Correlation between independent variables and average knowledge score of cultivators on the medicinal value of the crops they cultivate



1. Age
2. Education
3. Farming experience
4. Experience in medicinal plant cultivation
5. Farm size
6. Area under medicinal plant cultivation
7. Annual income
8. Income from medicinal plant cultivation
9. Extension contact
10. Extension participation
11. Mass media exposure
12. Information seeking behaviour

the mass media exposure and information seeking behaviour means more the mass media exposure and information seeking behaviour more would be the knowledge level due to the reason that exposure to different mass media, different innovations/success stories/motivational features would have increased the knowledge level of farmers on the medicinal value of the plants. The results are in confirmation with the findings of Nizamudeen (1996) and Manjusha (2000).

4.3 Training need analysis

With respect to the identification of training need of medicinal plant cultivators in medicinal plant cultivation, following were the results obtained.

4.3.1 Agency preferred by medicinal plant cultivators to undergo training

Table 27 Results showing agency preferred by the respondents to undergo training

(n = 100)

Sl. No.	Agency	Score	Preference index	Rank
1	Training by TBGRI, Palode	280	0.93	1
2	Training by Krishibhavans	277	0.92	2
3	Training by Ayurveda Research Institute	210	0.70	3
4	Training by College of Agriculture, Vellayani	132	0.44	4
5	Training by KVK	116	0.39	5

Table 27 revealed that the medicinal plant cultivators preferred training given by Tropical Botanical Garden and Research Institute (PI = 0.93). Next in the order of preference was training by Krishibhavans (PI = 0.92) and training by Ayurveda Research Institute (PI = 0.70). Training given by Agricultural College and Krishi Vigyan Kendra (KVK) were ranked only fourth, and fifth respectively.

TBGRI, Palode being a resourceful place in medicinal plant cultivation and the free training programme given to the medicinal plant cultivators by them makes the farmers more attracted to the training programme. The nearness with regard to the venue and also the decentralised approach of Krishibhavans has empowered farmers to take training according to their choice. Hence they preferred training by Krishibhavns as the second choice. Ayurveda Research Institute at Poojapura is famous for imparting training mainly on the uses of medicinal plants. This might be a reason for assigning third rank for training by Ayurveda Research Institute. The preference indices for training by College of Agriculture, Vellayani and Krishi Vigyan Kendra were preferred only as fourth and fifth choices which revealed that their preference to these two were only minimum. This finding is in agreement with the earlier findings of Alexander (1985) and Kanagasabapathi (1988).

4.3.2 *Method of training preferred by medicinal plant cultivators*

Table 28 Results showing preference of training methods by the respondents

(n = 100)

Sl. No.	Methods	Score	Preference index	Rank
1	Film show	282	0.94	1
2	Exhibitions	270	0.90	2
3	Demonstrations	253	0.84	3
4	Field trips	210	0.70	4
5	Study tour	201	0.67	5
6	Case study	197	0.66	6
7	Group discussion	150	0.50	7
8	Lecture	105	0.35	8
9	Campaign	99	0.33	9

Table 28 revealed that film show was the most preferred method of training. This was followed by exhibitions (PI = 0.90), demonstrations (PI = 0.84), field trips (PI = 0.70), study tour (PI = 0.67), case study (PI = 0.66), group discussions (PI = 0.50), lecture (PI 0.35) and campaign (PI = 0.33).

The farmers have a great fascination towards movie films. They participate in film shows organised anywhere in their villages. The novelty of the medium and the persistent vision contained there in are added attractions in the movies. Their interest in film show can be effectively exploited if educational efforts are made utilizing the film medium. Video being a powerful and potential extension of the movie film, there is a great scope to picturise tele-films and video documentaries on medicinal plants – its cultivation and uses, to effectively influence the farmers.

Exhibitions and demonstrations can be arranged for teaching the farmers as medicinal plant cultivation and its prospect considering their perception of the second and third preferences to these methods of training. Next in the order of preference come field trips, study tour and case study. This might be because they believe in the concept by seeing in believing. The seventh preference in the method of training is group discussion. This is because it will facilitate interaction and inter-relation that in turn will enable the farmers to share their experience and transfer the knowledge and skill among them. Lecture and campaigns are ranked only at the end as the last preferences.

4.3.3 Duration of training preferred by medicinal plant cultivators

Table 29 Results showing preference of the training duration by the respondents

(n = 100)

Sl. No.	Duration	Score	Preference index	Rank
1	One day	272	0.91	1
2	Two days	268	0.89	2
3	Three to six days	192	0.64	3
4	One week	180	0.60	4
5	Two weeks	141	0.47	5
6	One month	60	0.20	6

Table 29 points out that one day duration of training was preferred more by the respondents (PI = 0.91). This was immediately followed by two days programme (PI = 0.89). Next in the order of preference of duration were three to six days (PI = 0.64), one week (PI = 0.60), two weeks (PI = 0.47) and one month (PI = 0.20). Generally the farmers prefer only short term training programme as they cannot stay away from their homes for long. This is the reason why one-day duration was perceived to be the most suitable (Rank 1) closely followed by two days training (Rank 2). Hence while formulating training programmes, training institutions have to consider this important point of short-term capsule training programmes. This findings is in conformity with the findings of Alexander (1985) and Kanagasabapathy (1988) who stated that training programmes must be organised only for one or two days for the farmers.

4.3.4 Frequency of training preferred by medicinal plant cultivators

Table 30 Results showing frequency of training preferred by the respondents

(n = 100)

Sl. No.	Frequency	Score	Preference index	Rank
1	Once in six months	240	0.80	1
2	Once in a year	219	0.73	2
3	Once in two years	213	0.71	3
4	Once in three years	180	0.60	4
5	Once in four years	153	0.51	5
6	Once in five years	135	0.45	6
7	Once in two months	126	0.42	7
8	Once in a month	105	0.35	8
9	Once in life time	93	0.31	9

From Table 30 it is seen that training programmes conducted once in six months were the best preferred (PI = 0.80). Next in the order of preference were once in a year (PI = 0.73), once in two years (PI = 0.71), once in three years (PI = 0.60), once in four years (PI = 0.51), once in five years (PI = 0.45), once in two months (PI = 0.42), once in a month (PI = 0.35) and once in the life time (PI = 0.31). This was an indication that the respondents do not want very frequent training. They want training twice or once in a year, or once in two years. Since maximum preference index is for once in six months, half-yearly training programmes could be thought of, to educate the medicinal plant cultivators.

4.3.5 Training need

Training need analysis was in knowledge and skill with respect to major operations conducted by the medicinal plant cultivators from land preparation to marketing.

Training need for major operations was found out by calculating average choice scores (ACS) for a particular operation in all the crops cultivated by the respondents. Then the major operations were ranked based on the training need assessed through average choice score at both knowledge level and skill level.

Table 31 Results showing Average choice scores for assessment of training need at knowledge level (n = 100)

Sl. No.	Major operations	ACS	Rank
1.	Marketing	79.33	1
2.	Processing	73.67	2
3.	Storing	72.67	3
4.	Seed and sowing	62.00	4
5.	Harvesting	60.67	5
6.	Land preparation	57.67	6
7.	Manuring	44.00	7
8.	Weeding	39.33	8
9.	Plant protection	38.00	9
10.	Irrigation	36.00	10

It is revealed from Table 31 that marketing were perceived as the area having most training need at knowledge level (ACS = 79.33). Processing (ACS = 73.67), storing (ACS = 72.67), seed and sowing (ACS = 62.00), harvesting (ACS = 60.67), land preparation (ACS = 57.67), manuring (ACS = 44.00), weeding (CS = 39.33), plant protection 9 ACS = 38.00) and irrigation (ACS = 36.00) are perceived in the descending order of importance of training at the knowledge level.

Table 32 Results showing average choice scores for assessment of training need at skill level

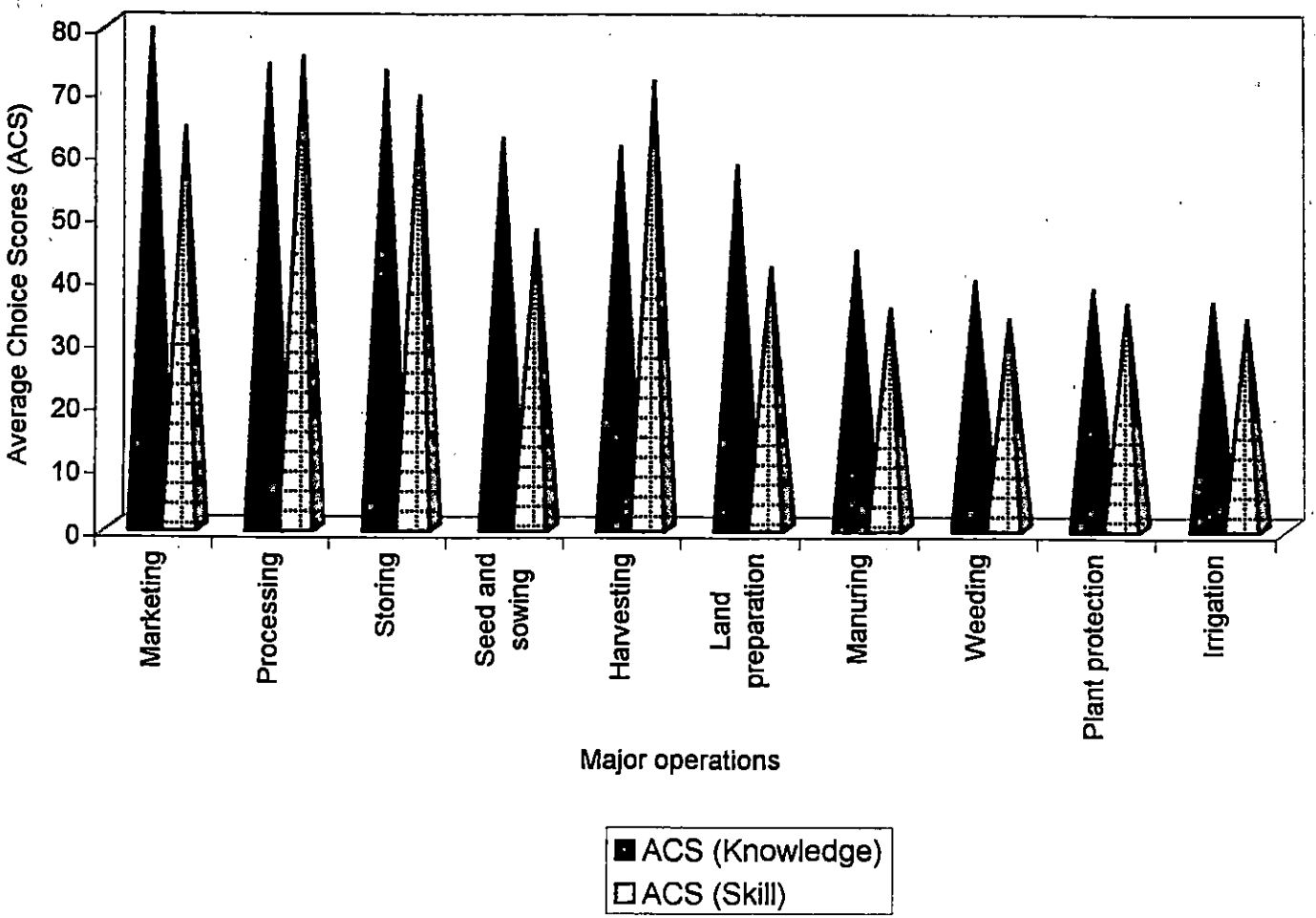
(n = 100)

Sl. No.	Major operations	ACS	Rank
1.	Processing	75.00	1
2.	Harvesting	71.00	2
3.	Storing	68.67	3
4.	Marketing	63.67	4
5.	Seed and sowing	47.33	5
6.	Land preparation	41.33	6
7.	Plant protection	35.67	7
8.	Manuring	35.00	8
9.	Weeding	33.33	9
10.	Irrigation	33.33	9

It is revealed from Table 32 that processing was perceived as the area having most training need (ACS = 75.00) and both weeding and irrigation were perceived as area having least training need (ACS = 33.33) at skill level. Harvesting (ACS = 71.00), storing (ACS = 68.67), marketing (ACS = 63.67), seed and sowing (ACS = 47.33), land preparation (ACS = 41.33), plant protection (ACS = 35.67) and manuring (ACS = 35.00) were perceived in the descending order of importance of training need at the skill level.

From the Table 31 and 32 it is clear that the average choice score was very high with respect to training need both at knowledge level and skill level in marketing, processing, storing and harvesting. This is because majority of the farmers were having less experience in medicinal plant cultivation. Moreover this being a new enterprise, farmers lacked the knowledge in identifying the correct destination with respect to the place of marketing and the price structure

Fig. 6 Results illustrating the training need on various operations in medicinal plant cultivation



in the actual market. Harvesting, processing and storage at the right time using appropriate and recent technology is essential for deriving maximum economically important essential oil that is rich in medicinal properties. This might have been the reason for higher preference of training need in harvesting, processing and storing more, with respect to skill than that of knowledge level.

It can be observed that at knowledge level, training need requirement was high (ACS = 62.00) in seed and sowing but was low (ACS = 47.33) at skill level. This might be due to the season that training was required for various aspects like the knowledge about the source and availability of genuine quality planting materials of economically important medicinal plants, time and method of sowing. The low requirement of training and land preparation, manuring, weeding, plant protection and irrigation at both knowledge and skill level could be due to reasons like higher farming experience in other crops. Medicinal properties of the plants exhibit their true quality when they grow under natural and stress conditions. The irrigation requirement is very low. Since medicinal plants do not require constant attention and are rarely attacked by pests and diseases, plant protection is not of that importance.

4.4 Market orientation

Marketing is of utmost importance in agriculture because the effort to increase production may go waste unless the product is efficiently marketed. Marketing system as a whole is divided into three broad segments such as producers, consumers and middleman, each with apparently conflicting interests. The producer's interests are to derive maximum possible price by marketing the produce without loss of time. Consumer interest is to get

required quantities of goods of proper quality at the lowest possible price. The middleman aims at harvesting maximum profit from the deal. All these segments have become indispensable to the society and therefore only an efficient marketing system can balance this apparently conflicting interest in such a way that each segment will get a fair deal. In the present study an attempt has been made to identify the marketing channels and work out the benefit-cost of important medicinal plants grown by the cultivators through input-output analysis so as to persuade more of farmers to medicinal plant cultivation.

4.4.1 Marketing channels

Table 33 Results showing distribution of the farmer respondents according to the type of buyers

(n = 100)

Product sold to (Buyer)	Frequency of respondents selling	Percentage
Dealers	58	58
Amrutha / Oushadhi (voluntary agencies dealing with medicinal plants)	20	20
Ayurvedic medicinal manufactures	16	16
Small retail shop dealers (Angadikadakal)	6	6

The different marketing channels identified in the marketing of medicinal plants were :

1. Producer - Dealer - Ayurvedic medicine manufacturers
2. Producer - Voluntary agencies - Ayurvedic medicine manufacturer
3. Producer - Retail shop dealer - Ayurvedic medicine manufacturer
4. Producers - Ayurvedic medicine manufacturer

Among the channels identified the producer - dealer - ayurvedic medicine manufacturer is the channel through which bulk of the produce is marketed. From Table 33 it is clear that out of the total sample farmers of medicinal plant cultivation 58 per cent sold their produce to medicinal plant dealers, 20 per cent sold to voluntary agencies like Amrutha, 16 per cent sold their produce directly to Ayurvedic medicine manufacturers like Vaidhyarathnam Oushada Sala, Kottaykkal Arya Vaidyasala and the rest six per cent sold their produce directly to small scale retail shop dealers (Angadikkadakal).

4.4.2 Cost-benefit relationship of medicinal plant cultivation

Cost-benefit relationship of some important medicinal plants was analysed in order to identify the prospects of medicinal plant cultivation and thereby enable the farmers to undertake this enterprise on a commercial basis. The results regarding the cost-benefit analysis is presented in the Tables given below:

Table 34 Results showing input-wise cost of Kacholam

Sl. No.	Particulars	Amount (Rs. ha^{-1})
1.	Labour	13750.00
2.	Seed/planting material	30000.00
3.	Manures and fertilizers	2100.00
4.	Rental value of own land	25000.00
5.	Interest on working capital	4160.00
6.	Land revenue	50.00
	Grand Total	65060.00

Output analysis

Medicinal plants	Yield (kg ha^{-1})	Returns (Rs. ha^{-1})
Kacholam	1862	130400.00

Net returns

Total returns - Total cost = 130400 - 65060

= 65340.00 Rs. ha^{-1}

$$\text{Cost-benefit} = \frac{65340.00}{65060} = 1.00$$

Table 35 Results showing input-wise cost of Koduveli

Sl. No.	Particulars	Amount (Rs. ha-1)
1.	Labour	20000.00
2.	Seed/planting material	1000.00
3.	Manures and fertilizers	2400.00
4.	Rental value of own land	25000.00
5.	Interest on working capital	3100.00
6.	Land revenue	50.00
	Grand Total	41550.00

Output analysis

Medicinal plants	Yield (kg ha^{-1})	Returns (Rs. ha^{-1})
Koduveli	6480	136000.00

Net returns

Total returns - Total cost = 136000 - 41550

= 94450.00 Rs. ha^{-1}

$$\text{Cost-benefit} = \frac{94450}{41550} = 2.27$$

Table 36 Results showing input-wise cost of Rauvolfia

Sl. No.	Particulars	Amount (Rs. ha^{-1})
1.	Labour	14375.00
2.	Seed/planting material	70000.00
3.	Manures and fertilizers	2100.00
4.	Rental value of own land	15000.00
5.	Interest on working capital	4100.00
6.	Land revenue	50.00
	Grand Total	105625.00

Output analysis

Medicinal plants	Yield (kg ha^{-1})	Returns (Rs. ha^{-1})
Rawvolfia	2000	300000.00

Net returns

Total returns - Total cost = 300000 - 105625

= 194375 Rs. ha^{-1}

$$\text{Cost-benefit} = \frac{194375}{105625} = 1.84$$

Table 37 Results showing input-wise cost of Solanum

Sl. No.	Particulars	Amount (Rs. ha-1)
1.	Labour	22500.00
2.	Seed/planting material	1000.00
3.	Manures and fertilizers	2700.00
4.	Rental value of own land	15000.00
5.	Interest on working capital	4100.00
6.	Land revenue	50.00
	Grand Total	45350.00

Output analysis

Medicinal plants	Yield (kg ha^{-1})	Returns (Rs. ha^{-1})
Solanum	8000	80000.00

Net returns

Total returns - Total cost = 80000 - 45350

= 34650.00 Rs. ha^{-1}

$$\text{Cost-benefit} = \frac{34650}{45350} = 0.76$$

Table 38 Results showing input-wise cost of Catharanthus

Sl. No.	Particulars	Amount (Rs. ha^{-1})
1.	Labour	20000.00
2.	Seed/planting material	10000.00
3.	Manures and fertilizers	3000.00
4.	Rental value of own land	15000.00
5.	Interest on working capital	4100.00
6.	Land revenue	50.00
	Grand Total	52150.00

Output analysis

Medicinal plants	Yield (kg ha^{-1})	Returns (Rs. ha^{-1})
Catharanthus		
Roots	800	90000
Leaves	1800	18000

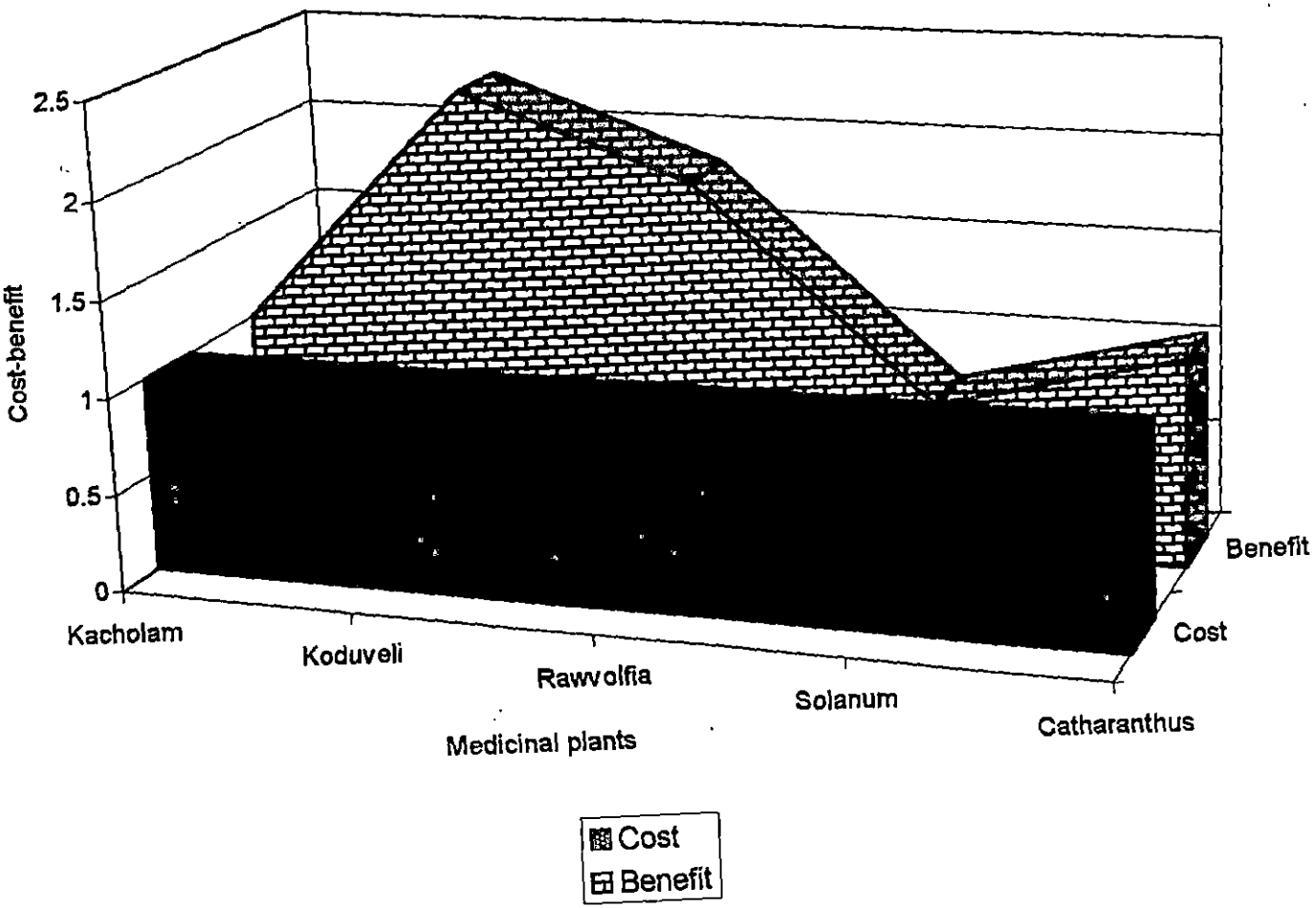
Net returns

Total returns - Total cost = 108000-52150

= 55850.00 Rs. ha^{-1}

$$\text{Cost-benefit} = \frac{55850}{52150} = 1.07$$

Fig. 7 Results showing the benefit-cost relationship of medicinal plant cultivation with respect to selected important crops



It can be observed from the Tables 34, 35, 36, 37 and 38 that for every one rupee spend on the crop, the net returns was found to be 1.00, 2.27, 1.84, 0.76 and 1.07 rupees respectively. Thus the cost - benefit relationship of the crops clearly suggests that medicinal plant cultivation is a profitable enterprise and farmers in a commercial basis can adopt it.

4.5 Problems and solutions as perceived by the farmers, procurers and retailers

Broadly, the following problems are to be tackled in order to obtain an economic yield of good quality in respect of every product of medicinal plants.

Table 39 Results showing problems and solutions as perceived by the farmers, procurers and retailers

(n = 125)

Sl. No.	Problems	Percentage	Rank
1.	Pre-harvest and past harvest handling	94.28	I
2.	Lack of storage facilities	91.43	II
3.	Unorganised marketing	88.57	III
4.	Non availability of genuine planting materials	88.00	IV
5.	Lack of developmental and extension service	85.71	V
6.	Lack of research work for developing new varieties	82.85	VI
7.	Lack of credit/loan facilities	81.00	VII
8.	Lack of cultivators package of practices	79.00	VIII
9.	Over exploitation of wild medicinal plants	77.14	IX
10.	Fluctuations in market price	74.00	X
11.	Substitution and adulteration	71.00	XI
12.	Confusion with respect to identification of the species	69.00	XII
13.	Inexorable monetisation and commercialisation of the medicinal plant economy	54.28	XIII
14.	Absence of practical training	41.00	XIV
15.	Climate and soil	38.00	XV
16.	Lack of coordination among medicinal plant cultivators	23.00	XVI

The Table 39 clearly indicates following are the problems to be tackled in order to obtain an economic yield of good quality in respect to every product of medicinal plants. 94.28 per cent of the total respondents perceived pre-harvest and post-harvest handling as the major problem. The second major problem identified is lack of storage facilities where 91.43 per cent respondents was of this view and followed by unorganised marketing (88.57 per cent); non availability of genuine planting materials (88.00 per cent); lack of credit facilities/loan facilities (81.00 per cent); lack of cultivators package of practices (79.00 per cent); over exploitation of wild medicinal plants (77.14 per cent); fluctuations in market price (74.00 per cent); substitution and adulteration (71.00 per cent) ; confusion with respect to identification of the species (69.00 per cent) ; inexorable monetisation of medicinal plant economy (54.28 per cent) ; absence of practical training (41.00 per cent) ; climate and soil (38.00 per cent) and lack of coordination among medicinal plant cultivators.

4.5.1 Pre-harvest and post-harvest handling

Pre-harvest and post-harvest handling aspects like partial harvesting of roots and barks without damaging the perennial tree species have to be standardised. Post-harvest handling can drastically influence the economy of many crops such as Senna, mint etc. Sizeable losses still occur in drying and subsequent post-harvest handling.

In Senna, anthracene derivatives are synthesized in leaves and trigger a photo control mechanism. The produce should be dried fast at 70^0 C as slow drying in the sun induces blackening (Srivastava *et al.*, 1980). There is yet no organised efforts made for any systematic research in reducing post-harvest

losses in these crops at any research institutes in India and this should receive attention. This finding is in par with the findings of Shankar (1998).

4.5.2 Lack of storage facilities

It is well known that plants generally owe their virtue as medicinal agents due to the presence of many volatile chemical substances. Therefore, after harvest and before processing it should be stored appropriately so has to reduce the loss of medicinal inadequate storage facilities at present is the reason for feeling among farmers that lack of storage facilities is a major problem and providing suitable storage facility is the only suitable solution.

4.5.3 Unorganised marketing

Inadequate marketing is one of the major constraints on the expansion of cultivars. There is no organised union-wide or statewide marketing infrastructure for most medicinal plants in India or Kerala respectively. The market and the prices for most of the phytochemicals are not steady, with the result that there is not much attention for the cultivation of medicinal plants. The cultivator should be guaranteed reasonable minimum prices. This finding is in conformity with the findings of Sreekantan Nair and Reghunath (1999).

4.5.4 Non-availability of genuine planting materials

Production of quality planting materials is an area of priority. Micro propagation techniques need to be standardised for the medicinal plants for their mass clonal propagation. Use of micro propagation system will help in eliminating the virus and pathogens, thus producing quality-planting materials. Regeneration of meristem tips (apical meristems are free from virus and pathogen) on suitable media into whole plants has already been achieved (Shah and Dalal, 1980).

4.5.5 Lack of developmental and extension services

There are no specific agencies dealing with speedy production and distribution, on farm demonstration and quality testing for the benefit of small growers, supply of extension literature, supply of loans for raising new plantation etc. The afore-said aspects are all needed to facilitate production and improve quality and its marketing.

4.5.6 Lack of research work for developing new varieties

The research works in medicinal plants are inadequate and emphasis should be given in this area for the overall development of medicinal plants in Kerala.

4.5.7 Lack of credit / loan facilities

Non-availability of credit was a major technological constraints experienced by medicinal plant cultivators. No credit is given for medicinal plant cultivation by institutionalised credit agencies. Moreover, the non-availability or less effective functioning of cooperatives by big land lords and procedural difficulties in getting credits from commercial banks might have been the reason for the respondents of report this as a major constraint. This finding is in conformity with findings of Cherian (1984); Jnanadevan (1993); Nizamudeen (1996); Sindhu (1997).

4.5.8 Lack of cultivators' package of practices

The cultural practices adopted in different localities vary to a great extent, with the result that the outputs are not the same. Package of practices recommendations have to be evolved for the major, potential medicinal plants, based on growth and yield analysis under different shade and crop combination

situations. This will facilitate the speedy formulation of manurial requirement and standardising the optimum harvesting time.

4.5.9 Over exploitation of wild medicinal plants

Most of the medicinal plants, especially those used in traditional medicine have been collected from wild sources to meet the demand and only a couple of species used in larger quantities are cultivated systematically (Franz, 1993). Due to over exploitation, a number of wild medicinal plants are presently facing constant threat of extinction.

Nair (1993) recommended demonstration of eight wild medicinal plants of Ayurvedic importance for remunerative purpose. They are *Holostemma annulare, Indigofera tinctoria, Aloe vera, Withania somnifera, Acorus calmaus, Adathoda vasica, Kaempferia galanga* and *Kaempferia rotunda.*

4.5.10 Fluctuations in market price

Unorganised marketing channel led to wide fluctuations in the market price. The sink to which the growers give the produce fix the price of the medicinal plant produce. Sometimes the dealers join together, thereby depriving the farmers a reasonable price. Because of this existing situations the farmers could be have given this as one of the problems. This result is in line with Anantharaman (1991) and Nizamudeen (1996).

4.5.11 Substitution and adulteration

In recent years, cheaper natural and synthetic sources of phytochemicals in demand have been developed with comparable results. These cheaper synthetic sources both reduce the cost and improve availability but results in the low quality of products.

For example,

Sida rhombifolia for *Sida acuta*

Polyalthia for *Saraca indica*

Catharanthus roseus for *Rauvolfia serpentina*

Introduction of standardised practices to follow and formulation of an apex authentic expertise body to frame uniform guidelines for produces of medicinal plants can solve this problem.

4.5.12 Confusion with respect to identification of the species

Yield is determined by the potentiality of the species and variety of the crop. Without identifying the correct species, sometimes large-scale plantations are raised with heavy monitory inputs and ultimately when the production stage comes, the error is noticed. The major problem is confusion in the proper identification of the plants in different states.

For example, in South India, Brahmi is actually *Bacopa monieri*. But in North India it is *Centella asiatica*. To overcome this difficulty government is now organising seminars, exhibitions and symposiums on medicinal plants.

4.5.13 Inexorable monetisation and commercialisation of the medicinal plant economy

In recent years, the growing demand for herbal products has led to a quantum jump in volumes of plant material traded within and across countries. Conservative estimates put the economic value of medicinal plants related to India to be of the order of 1000 crores/year and world trade to be over U.S. $ 60 billion (Shankar, 1998). And this is growing, infact, apprehension are being expressed that with the trend pointing towards an inexorable monetisation and

commercialisation of the medicinal plant economy, we could have an emerging and future scenario where the rich alone would have to afford herbal products while the poor would have to make do with cheap, mass produced synthetic, chemical drug.

4.5.14 Absence of practical training

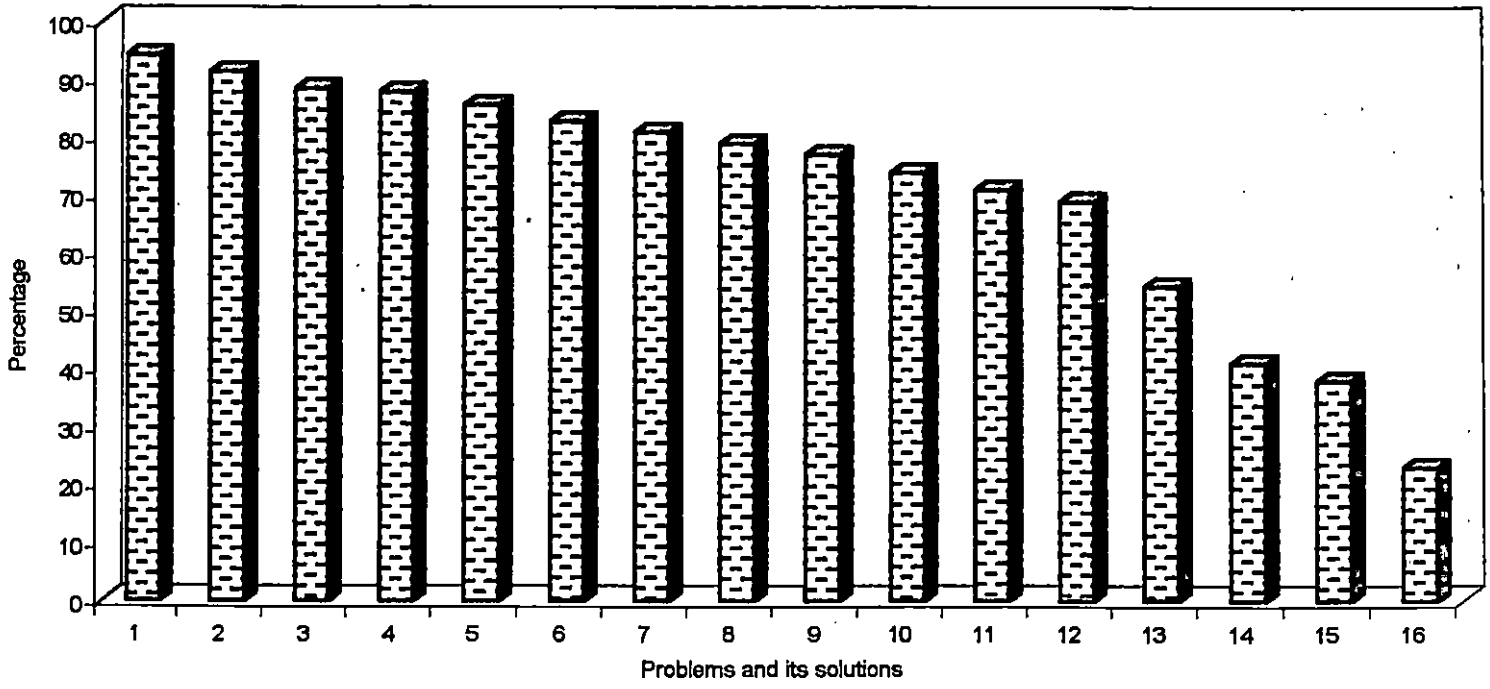
Absence of practical training was also a problem encountered by growers. This may be due to the two information seeking behaviour. Hence the growers were not able to get practical training and adequate technical help. As there was no separate staff for doing extension work in medicinal plant cultivation, there respondents could have given this as one of the problem. This is in line with Bose (1988) and John (1991). Providing adequate extension staff and training for the farmers is the only solution to this problem.

4.5.15 Climate and soil

Agro climate and ecological conditions must be suitable for the successful cultivation of medicinal plants. Different crops require different climatic pattern and the growers who propose to cultivate a particular crop should seriously take into accounts the normal and abnormal climate likely in the area. Preventive measures have to be taken to guard the crops against natural calamities. The kind of soil, its depth and its capacity to retain moisture are important factors to be considered.

It is well known that plants generally owe their virtues as medicinal agents due to certain characteristic constituents like alkaloids, glycosides, saponins, flavanoids, tannins, volatile oils, steroids, resins and mucilage present in them. The nature and amount of these chemical substances vary according to the agro climatic conditions and growth stage of plant (Chopra *et al.*, 1958).

Fig. 8 Results showing problems and solutions of medicinal plant cultivation



1. Pre-harvest and past harvest handling
2. Lack of storage facilities
3. Unorganised marketing
4. Non-availability of genuine planting materials
5. Lack of developmental and extension service
6. Lack of research work for developing new varieties
7. Lack of credit/loan facilities
8. Lack of cultivators package of practices
9. Over exploitation of wild medicinal plants
10. Fluctuations in market price
11. Substitution and adulteration
12. Confusion with respect to identification of the species
13. Inexorable monetisation and commercialisation of the medicinal plant economy
14. Absence of practical training
15. Climate and soil
16. Lack of coordination among medicinal plant cultivators

4.5.16 Lack of coordination among medicinal plant cultivators

Unhealthy competition among farmers like selling ones produce at a low price than the market price so as to get his produce disposed will create disinterest in other farmers and they again will resort to the same practice. This might be the reason for lack of cooperation and coordination among medicinal plant cultivators. This finding receives support from Prakash (1989). Bringing there farmers together by motivating them for development through cooperation and making them aware of the advantage of remaining incited through proper extension activity can solve this problem.

4.6 Prospect of medicinal plant cultivation in Kerala

Today, given the growing demands for the plants and the shrinking of forests, there is no option but to deliberately cultivate medicinal plants. Unless immediate steps are taken in India to put plants used commercially under cultivation the Indian traditional medicines industry based on medicinal plants is likely to crash in the next 10 years.

Kerala state blessed with its unique bioecographic position, hills, valleys, mountains and favourable monsoon patterns, are best suited for the cultivation of a wide variety of tropical medicinal plants. It is estimated that the agro climatic conditions of Kerala is congenial for the growth of about 1000 species of medicinal plants. Out of these, about 500 species are in great demand by the different systems of medicine like ayurveda, sidha, unani etc., which require whole plants like Brahmi, Centella, Coleus, tulsi, bark-asoka, neem, root-bael, eucalyptus etc.

TBGRI has carried out detailed investigation on the medicinal plants used in traditional medicine in Southern India and recommended species urgently required for cultivation to meet the ever-increasing demand of these by the herbal medicine sector.

The annual demand of some of the important medicinal plants is as follows

(Shankar, 1998)

Common name	Scientific name	Demand (tonnes)
Asoka	*Saraca indica*	3000
Bael	*Aegle marmelos*	18600
Asparagus	*Asparagus racemosus*	14700
Thippali	*Piper longum*	3000
Plumbago	*Plumbago roseus*	11000
Kumari	*Aloe vera*	4600
Coleus	*Coleus zeylanicus*	1500
Adathoda	*Adathoda beddomei*	35800
Caesalpinia	*Caesalpinia sapens*	6600

In order to provide regular and substantial supply of these plants, it is essential now to develop commercial cultivation methods of these plants. Only 10 per cent of the demand is met by way of cultivation in our state. Due to lack of availability of the required species wide spread use of adulterants by the drug manufactures have resulted in the reduction of quality of the drugs prepared out on them.

It has become very important to frame suitable strategies for growing medicinal plants in an extensive basis. In Kerala, the per capita land holding is very low and as cropping intensity is very high there is a limited scope for

monocropping of medicinal plants. However, there is ample scope to introduce them as intercrops in coconut and rubber plantations, which occupy about 46.94 per cent of total cropped area in the state.

The herbal medicine business in European union countries is worth US $ 4 billion a year. The trade centre is Hamburg, Germany and main suppliers are in the Indian subcontinent and eastern Europe. As long as 1980, the eight countries then in the EEC imported an estimated 80,738 tonnes of medicinal plants (Lewington, 1990).

Knowing the prospects of medicinal plant cultivation China, which usually collected wild species for medicine manufacturing is now promoting cultivators of medicinal plants and has a total area of 330,000 ha under production (WHO, 1993).

The following prospect in medicinal plant cultivation in Kerala is discussed below after consultation with technical experts in this field.

4.6.1 In the field of nutraceuticals

The new field in which medical plants could be of prospects is in the form of Nutraceuticals.

Nutraceuticals are nothing but the 'FOOD THAT HEALS'.

Any food or food ingredient considered providing medicinal or health benefits including the prevention and treatment of disease (Bel and Dave, 1999).

Eg. : Glyconutritionals that produce Glycoproteins in our bodies.

4.6.2 Intercropping medicinal plants in coconut garden

Total area under coconut cultivation in Kerala is 7.0 lakh ha out of which

30 per cent can be brought under medicinal plants. Depending upon the light infiltration intercropping in coconut is recommended only up to eight years and after 20 years of growth period. During the eighth to twentieth year of growth, the interspace between the palms and the available solar energy are wasted (Nelliat *et al.*, 1974). A study conducted by intercropping 13 medicinal plants in a 12-year-old coconut plantation with no other intercrops showed that the shade did not adversely affect the growth of the plants under study (Nair, *et al.*, 1991).

The plant species suitable for cultivation in coconut gardens are

Sarpagandhi	(*Rauvolfia serpentina*)
Thippeli	(*Piper longum*)
Neelaamari	(*Indigofera tinctoria*
Kacholam	(*Kaempferia galanga*)
Koduveli	(*Plumbago rosea*)
Kumari	(*Aloe vera*)
Periwinkle	(*Catharanthus roseus*)
Coleus	(*Coleus zeylanicus*)
Adathoda	(*Adathoda beddomei*
Holostemma	(*Holostemma adakodiyan*)

4.6.3 Intercropping medicinal plants in rubber plantation

About 10 to15 per cent of the total rubber plantations (5.0 lakh ha) can also be used for the purpose. Studies at the RRII, Kottayam during 1987-88 revealed that certain shade tolerant medicinal plants could be cultivated as intercrops in the rubber plantation. They are :

Adalodakam	(*Adathoda beddomei*)
Valiya adalodakam	(*Adathoda vasica*)
Sarpagandhi	(*Rauvolfia serpentina*)

Kacholam	(*Kaempferia galanga*)
Adapathiyan	(*Holestemma annulare*)
Aratha	(*Alpinia galanga*)
Kurumthotti	(*Sida rhombifolia*)
Karimkurinji	(*Strobilanthes haeniannus*)

(Vijayakumar, *et al.*, 1989)

4.6.4 Cultivation of medicinal plants in waste lands

The plenty of wastelands available could be utilised for the cultivation of remunerative medicinal plants. The crops suitable for wasteland areas are :

(a) Rocky areas	-	Kumari	- *Aloe vera*
		Coleus	- *Coleus aromaticus*
(b) Marshy areas	-	Brahmi	- *Bacopa monieri*
		Kaempferia	- *Kaempferia rotunda*
		Vayambu	- *Acorus calamus*
(c) Sandy tracts	-	Vetiver	- *Vettiveria zizanoides*
		Calotropis	- *Calotropis gigantea*
		Periwinkle	- *Catharanthus roseus*
		Asparagus	- *Asparagus plumosus*

(Nair and Reghunath, 1999)

4.6.5 Cultivation of short duration medicinal plants in the paddy field

Cultivation of short duration of medicinal plants can be practiced where irrigation facilities are scanty during the third crop season. eg., *Coleus* sp.

4.6.6 Cultivation of medicinal plants (Herbal gardens) in schools, hospitals, public sector undertakings

Since medicinal plants do not require constant attention and are rarely attacked by pests and diseases and are generally unpalatable to cattles there is no need of protective fences or compound walls. Various ornamental medicinal plants and trees can be grown in public park, avenues, school and hospital campounds etc., for their beautification and at the same time to serve as sources of many valuable drugs.

4.6.7 Medicinal plants suitable for social forestry programmes

Social forestry programmes undertaken by various organisations should be included with perennial medicinal crops. Some of the medicinal plant that could be suitable for the social forestry programmes is listed below.

Ungu	-	*Pongamia glabara*
Gooseberry	-	*Phyllanthus emblica*
Bael	-	*Aegle marmelos*
Ashokam	-	*Saraca indica*
Neem	-	*Azadiracta indica*
Cassia	-	*Cassia fistula*
Kanjiram	-	*Strychonos nuxvornica*
Caesalpinia	-	*Caesalpinia sapens*

4.6.8 Medicinal plants in worship places

Vacant areas attached to temples, churches, and mosques is also another prosperous are where suitable plant species can be grown. Bael, Asoka, Thusli, Plumaria, Calotropis,

Tabernaemontana	- *I. Cororaria*
Hibiscus	- *H. rosasinensis*
Nerium	- *N. oleander*

4.6.9 Medicinal plants in homesteads

In Kerala, the per capita land holding is very low and as cropping intensity is very high there is a limited scope for monocropping of medicinal plants. Hence medicinal plants should be taken as an intercrop in homesteads. Some important medicinal plants suitable for homestead is listed below.

Bael	*Aegle marmelos*
Asoka	*Saraca indica*
Neem	*Azadiracta indica*
Karinotchi	*Vitex negundo*
Periwinkle	*Catharanthus roseus*
Koduveli	*Plumbago rosea*
Brahmi	*Bacopa monieri*
Henna	*Lawsonia inermis*
Coleus	*Coleus aromaticus*
Asparagus	*Asparagus plumosus*
Thulsi	*Ocimum sanctum*
Sangupushpam	*Clitoria ternata*

4.7 Some medicinal plants that could be grown in Kerala (Plate 1)

4.7.1 Kattar vazha (*Aloe barbadensis*)

Distinct features : A herb with fleshy elongated leaves with medicinal properties for cough, respiratory problems and skin disease.

To improve complexion : Fleshy parts of the leaves are applied on face (5 g) with turmeric powder (Local Health Traditions).

4.7.2 Mathalam (*Punica granatum*)

Distinct features: A deciduous shrub or a small tree growing upto 3 m, with yellowish red fruit and reddish flower. Fruit pulp, fruit bark, flowers are used medicinally. It is good for promoting digestion and taste. It is useful in diarrhoea and fatigue.

For diarrhoea: Fruit shell of daadima is powdered (20 g) and boiled with (120 ml) buttermilk to be taken internally 3-4 times (Saarngadhara).

4.7.3 Moringa (*Moringa oleifera*)

Distinct features : A middle sized tree cultivated for its fruits (Drumstick) as vegetable. Flowers are yellowish white. Fruit, bark, root, leaves and flowers are medicinally used. This is useful in hard swellings, intestinal worms, tumours, disorders of spleen, poisonous bites and it is beneficial for eyes.

For anaemia : Tender leaves (150 g) and flowers (100 g) are cooked in less salt and water can be taken as a side dish (Local Health Traditions).

4.7.4 Amukkuram (*Withania somnifera*)

Distinct features : 2 - 3 feet high, grows in drier parts of India, the bright orange-red berries are covered with calyx. Parts used are roots and rarely leaves. It gives strength and increases semen. Amukkuram, popularly known as Aswagandha, is a rejuvenative and aphrodisiac.

To increase body weight/strength : Powder of aswagandha root boiled in a glass of milk is taken twice a day after food (Susrutha Samhita).

4.7.5 Chittamruth (*Tinospora cordifolia*)

Distinct features : A climbing shrub with grey bark and fleshy tender stem with hanging tendrils. Leaves are smooth and heart shaped, and with rounded red berries. Stem and leaves are medicinally used. It cures fever, diabetes, thirst, cough, anaemic disorders, jaundice, skin diseases, arthritis, worms and vomiting. It promotes digestion, gives strength and acts as rejuvenative.

For headache, cold and sinusitis : Oil prepared with paste and juice of amruth is applied on the head (5-10 ml) (Vaidyamanorama).

4.7.6 Nellikka (*Phyllanthus emblica*)

Distinct features : A medium sized deciduous tree with edible fruits known as gooseberry. It is a mild laxative, aphrodisiac, rejuvenative and good for eyes.

As an aphorodisiac, rejuvenative and general health tonic : Punch numerous holes in a gooseberry fruit with a pin and keep it in honey for a minimum of 30 days, known as Muraba in the North. To be eaten daily (Local Health Traditions).

4.7.7 Brahmi (*Bacopa monnieri*)

Distinct features : A glabrous creeping shrub found throughout wet areas. Leaves are fleshy and dark green, flowers yellowish white. This is useful as a brain tonic and rejuvenative. It is used in skin diseases, anaemic disorders, poison, swelling, fever, cough and diabetes (Bhavaprakasa Nighantu).

To increase intelligence and memory power : Leaf juice of Brahmi (5 ml) is given with honey (1 tsp) for children daily morning after breakfast (Charakasamhita).

Aloe

Moringa

Withania

Tinospora

Bacopa

Clitoria

Punica

Phyllanthus

Ocimum

Plate 1

4.7.8 Sanghupushpam (*Clitoria ternatea*)

Distinct features : Occurs hedges as a climber. Two varieties one with bluish flowers and the other with whitish. Flowers are counch shaped. It is an aphrodisiac, rejuvenative, increases memory power, body texture, appetite and useful in mental disorders.

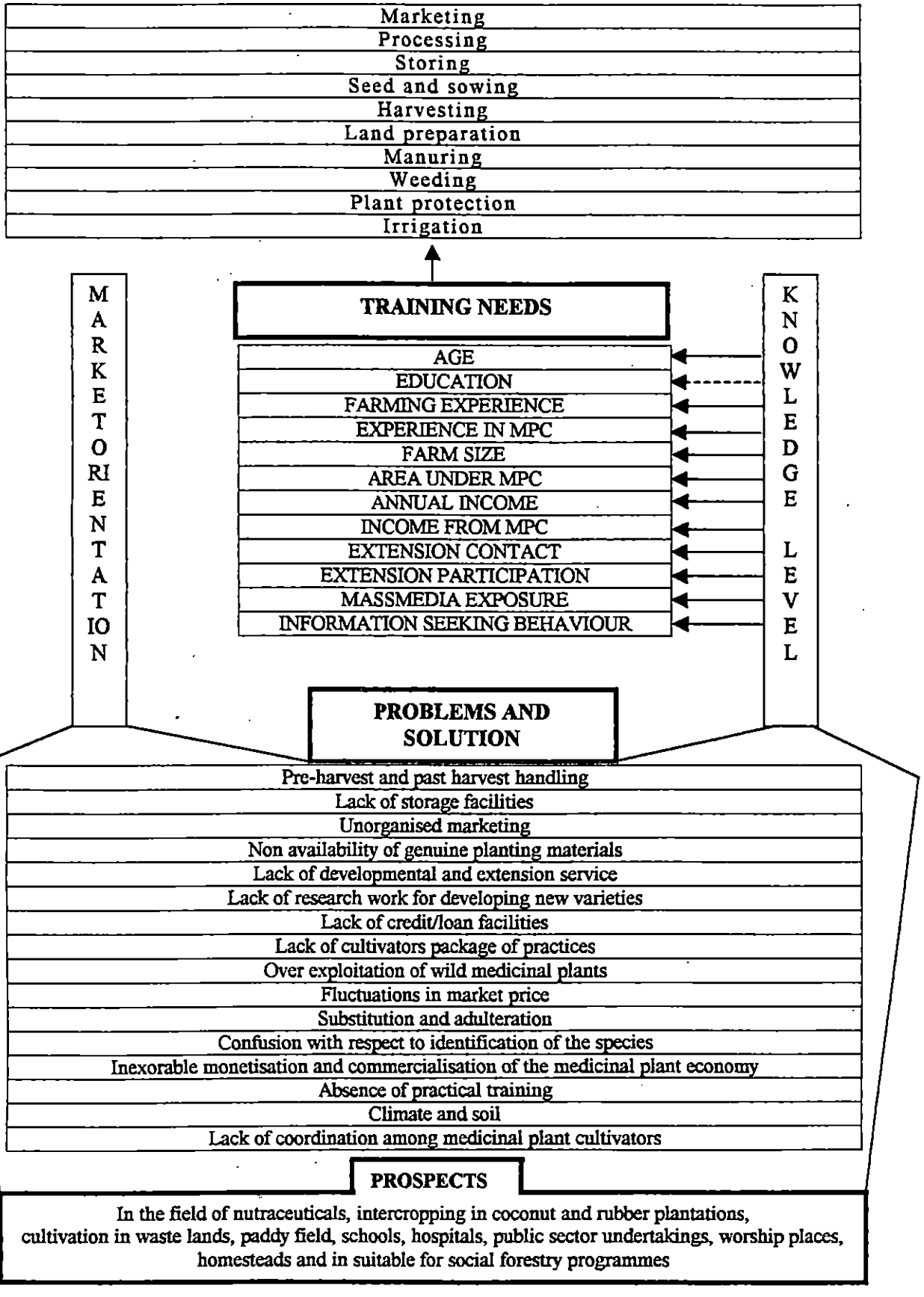
In case of mental retardation : Whole plant is dried and made into powder, and ghee is prepared. Ten to 15 ml of the ghee is given twice a day on empty stomach (Chakradattam).

4.7.9 Thulsi (*Ocimum sanctum*)

Distinct features : Commonly grown in front of houses, temples and cultivated for commercial purposes. White, violet varieties are medicinally used. It cures cough, poisonous bites, asthma, body pain and used to decrease unpleasant body odour.

For cold/Sinusitis : Dried leaves are made into a cigar and smoke is inhaled (Local Health Traditions).

Fig. 9 Empirical model of the study



SUMMARY

CHAPTER V

SUMMARY

India is a varietal emporium of medicinal plants. Nearly three fourth of the drugs mentioned in the various pharmacopoeia are grown here in nature. Indian system of medicine uses over 1100 medicinal plants and most of them are collected from forests. Most of the plants used today in medicines are exploited from the wild sources. Increase in population, rapid expansion of area under food and commercial crops, deforestation, extension of urban area, establishment of industries in rural areas etc gave rise to considerable depletion of our herbal wealth. It is high time to adopt new practices for conserving our natural habitat and also to start commercial cultivation to meet the demands of our state. The present study was an attempt to understand the problems and prospects of medicinal plant cultivation.

The specific objectives of the study were :

(1) To assess the knowledge of the medicinal plant cultivators on the medicinal value of the plants cultivated by them,

(2) To identify the training need of the cultivators in medicinal plant cultivation,

(3) To study the market orientation of the cultivators,

(4) To analyse the cost - benefit relationship of medicinal plant cultivation and

(5) To identify the problems and solutions in medicinal plant cultivation.

The investigation was carried out in Thiruvananthapuram district. From each of the four taluks farmers were selected using stratified random sampling technique with proportionate allocation. The study had a total sample size of 100 respondents.

Age, education, farming experience, experience in medicinal plant cultivation, farm size, area under medicinal plant cultivation, annual income, income from medicinal plant cultivation, extension contact, extension participation, mass media exposure and information seeking behavior were selected as independent variables based on judges relevancy rating. Knowledge of farmers on medicinal value of medicinal plants, training need analysis, market orientation and problems and solutions as perceived by the farmers, procures and retailers were the other areas of the study. Knowledge was assessed by developing a knowledge test for the study. Training need was identified using the method developed by Bhatnagar (1987) and as used by Kanagasabapathi (1988). Market orientation was studied by using the method developed by Anantharaman (1991). Cost-benefit relationship of medicinal plant cultivation by using input - output analysis in terms of economic aspects of medicinal plant cultivation. Problems and solutions in medicinal *plant* cultivation perceived by the cultivators, procurers and retail shop dealers of medicinal plants was found out using open-end questions and ranking was done to identify the importance of the problems and solutions.

5.1 Salient findings

1. More than fifty per cent the medicinal plant cultivators belonged to low category with respect to age.
2. Majority of the respondents had low level of education
3. Most of the farmers were having low farming experience and very low experience in medicinal plant cultivation.
4. More than fifty per cent the respondents belonged to the low category with respect to total farm size and more than two third of the farmers belonged to low category with respect to area under medicinal plant cultivation.
5. When fifty four per cent of the growers belonged to low category with respect to total annual income around 60 per cent belonged to the low category with respect to income from medicinal plant cultivation.
6. More than one fourth of the respondents had low extension contact.
7. More than half of the respondents had high extension participation.
8. Majority of the respondents were having low mass media exposure.
9. Almost sixty per cent of the respondents were having low information seeking behaviour.
10. Majority of the medicinal plant cultivators had medium to high level knowledge with respect to medicinal value of the crop they cultivated.
11. Out of the 12 variables, 11 variables, namely, age, farming experience, experience in medicinal plant cultivation, farm size, area under medicinal plant cultivation, annual income, income from medicinal plant cultivation, extension contact, extension participation, mass media exposure and information seeking behaviour were having significant and positive

relationship with knowledge on medicinal value. Education was found to have no relationship with knowledge on medicinal value.

12. Marketing was perceived as the area of highest importance with respect to training need at knowledge level followed by processing, storing, seeds and sowing, harvesting, land preparation, manuring, weeding, plant protection and irrigation in the descending order of importance whereas for training need at skill level, processing was holding first preference followed by harvesting, storing, marketing, seeds and sowing, land preparation, plant protection, manuring, weeding and irrigation.
13. Among the marketing channels identified the producer-dealer-ayurvedic medicine manufacturer was the channel through which bulk of the produce was marketed.
14. The problems identified in the descending order of importance by the medicinal plant cultivators were pre-harvest and post-harvest handling, lack of storage facilities, unorganised marketing, non-availability of genuine planting materials, lack of developmental and extension service, lack of research work for developing new varieties, lack of credit/loan facilities, lack of cultivators' package of practices, over-exploitation of wild medicinal plants, fluctuations in market price, substitution and adulteration, confusion with respect to identification of the species, inexorable monetisation of medicinal plant economy, absence of practical training, climate and soil and lack of coordination among medicinal plant cultivators.

Training of farmers in pre-harvest and post-harvest handling of medicinal plant produce, providing suitable storage facilities, creating a regulated market for the medicinal plant produces, ensuring regular and timely supply of genuine planting materials through government and service agencies, initiating more research for developing new varieties of improved medicinal properties, providing credit or loans through institutionalised agencies at low interest rates, providing the farming community with a unique and standardised package of practices recommendations of an authentic expertise body, conserving the wild economically important medicinal plant species and initiating participatory and group approaches in medicinal plant cultivation only can help the farmers to solve the aforesaid problems.

The population explosion coupled with improved standard of living led to the exploitation of medicinal plants resulting in the imminent danger of extinction of these plants. Therefore *in situ* and *ex situ* conservation, domestication and propagation on large scale, preservation of local wisdom/knowledge and traditions and protection of regional heritage are the vital components of national policy/strategy on plant genetic resources. Thus, not only protecting intellectual property rights is warranted, but also a national policy for protecting the cultural property right and regional property right are equally important.

Medicinal plants are a national treasure. Preventing extinction and preserving the great Indian medicinal heritage is of much importance. With the advent of 21st century due to global search for "alternatives" in health care,

there is a tremendous resurgence of interests in traditional system of medicines by popularising medicinal plant cultivation.

5.2 Suggestions for future research

1) For generalistaion of findings, similar studies could be conducted in other districts also as the present study was confined to only one district.
2) A multi-disciplinary research team must explore the prospects of developing farmer's practices in medicinal plant cultivation as a major component in all research priorities.
3) In-depth studies should be pursued for individual crops with respect to the training need aspects of its cultivation.
4) The indigenous knowledge on medicinal value of many medicinal plants is known to many, especially to the older generation. The transfer of this knowledge to the near and dear is through oral-folklore. Studies can be undertaken in that direction which will enable the researcher to know the indigenous uses of the medicinal plants that are prevailing even today.
5) An evaluative research on the role of the different implementing agencies in the popularisation of this enterprise could be taken up to study the extent of extension efforts to popularise this enterprise.
6) Conduct similar studies with respect to other crops like spices and condiments and aromatic plants.
7) Include more number of independent variables.

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* Original not seen

APPENDICES

APPENDIX – I

Appendix showing the distribution of medicinal plant cultivators in different taluks of Thiruvananthapuram district

Sl. No.	Name of the taluk	Population	Number of respondents
1	Nedumangad	130	40
2	Neyyattinkara	107	33
3	Thiruvananthapuram	55	17
4	Chirayankeezhu	33	10

APPENDIX – II

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI

PROBLEMS AND PROSPECTS OF MEDICINAL PLANT CULTIVATION IN THIRUVANANTHAPURAM DISTRICT

INTERVIEW SCHEDULE

1. Name and Address of the respondent :
2. Age in Completed Years :
3. Educational Status :
4. Farming Experience : Years
5. Experience in the cultivation of medicinal plants: Years

6. a) Total farm size:
   b) Area under cultivation of medical plants :
7. (a) Annual income (in Rupees) :
   (b) Income from cultivation of medicinal plants:
8. Extension Contact

   Please mention your frequency of contact with each of the following extension worker

Extension worker	Frequency of contact		
	Often	Occasionally	Never
b) VLW b) AA/AO c) Others. (specify)			

9. Extension Participation

Please mention your extent of participation with each of the following extension activities.

Extension activities	Extent of participation		
	Often	Occasionally	Never
b) Group meeting b) Demonstrations b) Seminars b) Exhibitions / festivals b) Training programme f) Field visit / study tour			

10. Mass media exposure

Please indicate the frequency of utilization of mass media

Sl. No.	Medium	Never	Rarely	Once a fortnight	Once a week	2-6 day a week	Daily
a	Radio						
b	Newspaper						
c	Magazines						
d	Leaflets						
e	Films (related of medicinal plant)						

11. Information seek in a behaviour

To what extent do you make use of following information sources regarding advice for medicinal plant cultivation. Please tick (✓) in appropriate column.

Sl. No.	Source	Always	Sometimes	Never
1.	Dy. Director / Principal Agricultural officer			
2.	Agricultural Officers			
3.	Agricultural Assistant			
4.	Agricultural Scientist			
5.	Fertilizer agent			
6.	Relatives			
7.	Newspaper			
8.	Radio			
9.	Television			
10.	Agricultural Publications			
11.	Fellow growers			
12.	Others (specify)			

12. Knowledge test (Knowledge of the farmers on the medicinal values of the plants cultivated by him)

Please mention the medicinal value of the medicinal plants cultivated by you.

Sl No.	Name of the Medicinal plants cultivated	Medicinal values
1		
2		
3		
4		
5		

13. Training Need Analysis

a) Agency of training

Please indicate your extent of preference with respect to each of the following agency offering training programme for farmers in medicinal plant cultivation.

Sl. No.	Agency of training	Most preferred	Somewhat preferred	Least preferred
1.	Training by TBGRI			
2.	Training by KVK			
3.	Training by Krishi Bhavan			
4.	Training by College of Agriculture, Vellayani			
5.	Training by Ayurveda Research Institute			

b) Methods of training

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

Sl. No.	Method of training	Most Preferred 3	Somewhat preferred 2	Least preferred 1
1.	Lecture			
2.	Group discussion			
3.	Exhibition			
4.	Field trip			
5.	Case study			
6.	Study tour			
7.	Campaigns			
8.	Film shows			
9.	Demonstration			
10.	Others (specify)			

c) Duration of training

Please mention your content of preference towards each of the following duration of training.

Sl. No.	Duration of training	Most Preferred 3	Somewhat preferred 2	Least preferred 1
1.	One day			
2.	Two days			
3.	Three to six days			
4.	One week			
5.	Two week			
6.	One month			

d) Frequency of the training

Please indicate your extent of preference towards each of the following frequency of training

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

e) Identification of training need

Please indicate the perception of your training need in following subject matter areas related to the cultivation of following important medicinal plant.

Sl No.	Major area	Training needs					
I	The crop name	Knowledge			Skill		
		Much needed	Some what needed	Not at all needed	Much needed	Some what needed	Not at all needed
		3	2	1	3	2	1
1	Land preparation						
2	Seed and sowing						
3	Manuring						
4	Weeding						
5.	Irrigation						
6.	Plant protection						
7.	Harvesting						
8.	Processing						
9.	Storing						
10.	Marketing						

14. Market orientation

a) Marketing Channel

Please indicate how your products are marketed

Sl No.	Name of the channel	Quantum of produce marketed (kg)			
		Up to 25	26-50	51-75	>75
1	P – C				
2	P – R				
3	P – CC – C				
4	P – CC – R - C				
5	P – CA – R – C				
6	P – CC – CA – R – C				

P – Producer ; **C** – Consumer ; **R** – Retail shop ; **CC** – Collection □enter ; **CA** – Commission Agent

b) Cost-benefit relationship

Input wise cost of medicinal plants

Sl. No.	Particulars	Amount (Rs. Ha^{-1})
1.	Labour	
2.	Seed/planting material	
3.	Manures and fertilizers	
4.	Rental value of own land	
5.	Interest on working capital	
6.	Land revenue	
	Grand Total	

Output analysis

Medicinal plants	Yield (kg ha^{-1})	Returns (Rs. Ha^{-1})

Net returns

Total returns - Total cost = Net returns

$$\text{Cost-benefit} = \frac{\text{Total cost}}{\text{Net returns}}$$

15. Problems and solutions as perceived by the farmers, procures and retailers on various aspects of medicinal plant cultivation

a) Kindly mention the problems and the solutions for each problems in the field of medicinal plant cultivation as perceived by you

Sl No.	Problems	Solutions

b) Kindly rank the problems and their solutions in order of importance

Sl No.	Rank no.	Problems	Solutions

PROBLEMS AND PROSPECTS OF MEDICINAL PLANT CULTIVATION IN THIRUVANANTHAPURAM DISTRICT

By

ALLAN THOMAS

ABSTRACT OF THE THESIS
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DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE
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ABSTRACT

A research study entitled "Problems and prospects of medicinal plant cultivation in Thiruvananthapuram district" was undertaken with a view to assess the knowledge of the medicinal plant cultivators on the medicinal value of the plants cultivated by them, to identify the training need of the cultivators in medicinal plant cultivation, to study the market orientation of the cultivators, to analyse the cost-benefit relationship of medicinal plant cultivation and to identify the problems and solutions in medicinal plant cultivation.

One hundred medicinal plant cultivators were selected from the four taluks of Thiruvananthapuram district using stratified random sampling technique with proportionate allocation. Data were collected by using a structured interview schedule.

Knowledge was assessed by developing a knowledge test for the study. Training need was identified using the method developed by Bhatnagar (1987). Market orientation was studied by using the method developed by Anantharaman (1991), which included identification of marketing channels and analysis of cost-benefit relationship of medicinal plant cultivation by using input-output analysis in terms of economic aspects of medicinal plant cultivation. Problems and solutions in medicinal plant cultivation as perceived by the cultivators, procurers and retail shop dealers were identified by using open-end questions. Ranking was done to identify the importance of the problems and solutions.

Majority of the medicinal plant cultivators had medium to high-level knowledge on the medicinal value of the plants cultivated by them. The independent variables, namely, age, farming experience, experience in medicinal plant cultivation, farm size, area under medicinal plant cultivation, annual income, income from medicinal plant cultivation, extension contact, extension participation, mass media exposure and information seeking behaviour were having significant and positive relationship with knowledge. The variable education was found to have no relationship with knowledge on medicinal value of plants cultivated by them.

Marketing was perceived as the most important area of training at knowledge level followed by processing, storing, seeds and sowing, harvesting, land preparation, manuring, weeding, plant protection and irrigation in the descending order of importance whereas for training need at skill level, processing was holding first preference followed by harvesting, storing, marketing, seeds and sowing, land preparation, plant protection, manuring, weeding and irrigation.

Market orientation of the cultivators was studied under two heads, namely, identification of marketing channels and analysis of cost-benefit relationship of medicinal plant cultivation. Among the marketing channels identified, the producer-dealer-ayurvedic medicine manufactures was the channel through which bulk of the produces were marketed. The cost-benefit relationship of medicinal plant cultivation revealed that it was a profitable enterprise.

The problems identified in the descending order of importance by medicinal plant cultivators, procurers and retailers were, pre-harvest and

post-harvest handling, lack of storage facilities unorganised marketing, non availability of genuine planting materials, lack of developmental and extension service, lack of research work for developing new varieties, lack of credit/loan facilities, lack of cultivators package of practices, over- exploitation of wild medicinal plants, fluctuations in market price, substitution and adulteration, confusion with respect to identification of the species, inexorable monetisation of medicinal plant economy, absence of practical training, climate and soil and lack of co-ordination among medicinal plant cultivators.

Training of farmers in pre-harvest and post-harvest handling of medicinal plant produce, providing suitable storage facilities, creating a regulated market for the medicinal plant produces, ensuring regular and timely supply of genuine planting materials through government and service agencies, initiating more research for developing new varieties of improved medicinal properties, providing credit or loans through institutionalised agencies at low interest rates, providing the farming community with a unique and standardised package of practices recommendations of an authentic expertise body, conserving the wild economically important medicinal plant species and initiating participatory and group approaches in medicinal plant cultivation only can help the farmers to solve the aforesaid problems.

Medicinal plants are a national treasure. Preventing extinction and preserving the great Indian medicinal heritage is of much importance. With the advent of 21st century due to global search for "alternatives" in health care, there is a tremendous resurgence of interests in traditional system of medicines by popularising medicinal plant cultivation.