CHAPTER 1

Introduction
INTRODUCTION

Medicinal plants are plants or plant parts, which contains chemicals that yield medicinal properties. Medicinal plants gain significance because of their contribution to local health support systems, generation of local income, foreign exchange earning and contribution to bio-diversity. They also have expanding economic opportunities through trade, and commercial development of medicines derived from natural resources, and increased production through cultivation, particularly in developing countries. Medicinal plants, if developed properly, can contribute significantly to the economic development rurally and healthcare methods globally. The ecological, bio-technological, and the socio-economic aspects of medicinal plants are increasingly getting the attention of researchers all over the world.

Medicinal plants can contribute to the development of primary as well as secondary sector and it is very crucial in the case of Kerala where traditional medicines are becoming more and more popular. There is untapped potential for strong forward linkage to processing and backward linkage to cultivation of these plants, especially since the manufacturers of the traditional medicines are complaining about the absence of a stable supply of raw materials. In the absence of such linkages, many of the important medicinal plants are facing extinction
from their natural sources. The forest dwellers, who are the primary collectors of wild medicinal plants, are becoming marginalised and they in turn rely on over-harvesting the resources, accentuating the problem of extinction. Unavailability of important medicinal plants will affect the survival of the tribes and the traditional medicine industry. Sustainability is the key to future availability of natural resources. The present study attempts to address the question of sustainability of medicinal plants in Kerala.

**Importance of medicinal plants**

About 35000 to 70000 plant species have at one time or other been used in some culture or other for medicinal purposes. They are used in both traditional and modern systems of medicine. At least 25 per cent of the drugs in the modern pharmacopoeia are derived from plants. Around 75 percent of the global population and more than 80 per cent of the people in South Asia rely on medicinal plants for their primary health care needs (Nickel and Sennhauser). 75 to 80 per cent of people in the developing world depend on traditional medicines derived from plants, insects and animal produces with an estimated value of about US $ 35 to 40 billion (Chandrashekharan,2000a). Thanks to the “Back to Nature” campaign, people in the developed nations are increasingly turning to the traditional medicinal systems.
The total value of the traditional medicinal products worldwide is estimated to be as large as that of modern medicines—about US $80-90 billions (Karki, 2000).

Interest in medicinal plants has been fuelled by the rising cost of prescription medicine, the bio prospecting of new plant-derived drugs and the absence of side effects by plant-based medicines. The WHO has recognised that its goal of health for all is not going to be realized without giving proper attention to medicinal plants.

**Role of medicinal plants in income generation**

Apart from their contribution to health care, medicinal plants also provide a source of income for growers, collectors, traders and manufacturers of plant-based medicine. Millions of rural people depend on medicinal plants and other Non-wood Forest Products (NWFPs) for their sustenance. NWFPs, majority of which are medicinal plants provide opportunity for employment and income and have comparative advantage to support development in backward areas. Nearly 400 million people living in and around forests in India depend on NWFPs for their sustenance and supplemental income. They provide as much as 50 per cent of income of 30 per cent rural people. In India, collection and processing of medicinal plants contribute to at least 35 million workdays of employment annually to
the poor and underemployed workforce, majority of whom are women, tribal people, and the very poor (Chandrashekharan, 2000b).

Studies have revealed the existence of a trend of (a) collection of NTFPs by those with lower wage earning opportunities –women, children, and elderly people; (b) greater dependence of lower income group families on NTFPs income and (c) greater incidence of collection in agricultural lean seasons and drought years (Saigal, Agarwal & Campbell1997).

**Industrial utilisation of medicinal plants**

The total turnover of the herbal drug industry is estimated to be around US $500 millions and is estimated to reach US $ one billion by the year 2000. The global market for herbal medicines is 150000 crores of rupees, as estimated by a United Nations Development Programme (UNDP) study. It is expected to grow to ten times in the near future (Karki, 2000). There are estimated to be over 5000 plant-based medicine-manufacturing units in India with an annual turnover of over Rs. 2000 crores per year (Malayala Manorama, 2000). The herbal cosmetic industry also uses these plants. The annual turnover of the Indian Herbal Industry is estimated to be around 2300 crores per year (FRLHT,1999). The annual turnover of Kerala's Ayurvedic Medicine Manufacturing Units (AMMUs) is around Rs. 150 Crores.
and the share of Ayurveda in the global market for herbal medicines is below one per cent. This is due to the failure of the manufacturers to maintain the WHO standards in quality (FAMMI, 2001).

**Trade in medicinal plants**

With the recent upsurge of preference for natural products, there has been a revival of interest in medicinal and aromatic plants in the international markets. Trade in medicinal plants is growing in volume and it is estimated that the global trade in medicinal plants is U.S. $800 million per year (Hoareaw & Dasilva, 1999). China with exports of over 120,000 tones per annum and India with 32,000 tones per annum dominate the international markets (Nickel and Sennhauser). Apart from medicinal plants themselves, the market for plant-based medicines is also growing phenomenally. However, their global competitiveness is constrained by poor harvesting and post harvest treatments, inefficient processing techniques, poor quality control procedures etc. Quality specifications, packaging standards etc. often act as non-tariff barriers (Chandrashekharan, 2000b).

**Prospects for the development of medicinal plants**

The opening up of global markets is bringing in expanding opportunities and demand for new resources, materials and products. Increasing awareness regarding the protection of the interests of the
disadvantaged people and bio-diversity conservation is also leading to renewed interest in medicinal plants. Search for new medicines for the prevention and cure of deadly diseases also provides prospects for developing medicinal plants. Medicinal plants are among the few developing country natural resources that sell at premium prices. Thus global clamor for more herbal ingredients creates possibilities for the local cultivation of medicinal plants as well as for the regulated and sustainable harvest of wild stands. Such endeavors could help in raising rural employment in the developing countries, boost commerce around the world, and perhaps contribute to the health of many people.

The use of plant-based medicines is expanding rapidly worldwide and any economic activity relating to the growing of medicinal plants for commercial purpose is bound to be a viable enterprise. The entire scheme is low-cost and provides an effective way of treating illness without consuming costly medicines (FRLHT, 1999). As a large amount of private sector investment is possible in this sector, medicinal plants can be developed as a mean for sustainable economic development, safe and affordable health care and conservation of biodiversity.
**Constraints in the development of medicinal plant-based activities**

The rising global demand for medicinal plants has resulted in over exploitation of these natural resources and genetic bio-diversity of traditional medicinal herbs and plants is under threat of extinction. This is bound to happen since 90 per cent of the medicinal plants collected for industrial utilisation are from the wild. Conservation is possible only through controlled harvesting. This can be ensured only if the collectors get a fair return. The poor collectors and producers sell raw materials to different types of markets, viz, dealers, weakly village markets, industrial market, etc. The system is quite disorganised and inequitable in that collectors are paid the lowest share of the market price.

The development and commercialization of medicinal plant-based bio-industries in the developing countries is dependent upon availability of facilities and information concerning upstream and downstream bio-processing, extraction, purification and marketing of the industrial potential of medicinal plants. Absence of such infrastructure compounded by lack of governmental interest and financial support restricts the evolution of traditional herbal extracts into authenticated market products (Hoareaw & Dasilva, 1999).
The process from plant to pharmacy shelf takes up to 20 years involving their toxicological, pharmacological, and clinical tests and requires heavy capital investments, in the case of modern medicines. Even after these processes, the search for new medicines may not come to fruition in all cases.

Cultivation of medicinal plants may meet conservation and income goals, but when grown as mono crops could reduce local biodiversity, and it could have a negative impact on the availability and the range of medicinal plants. Moreover, it is observed that cultivation of medicinal plants in mono cropping system is not viable.

There are also some social and environmental costs associated with the utilisation of NTFPs by industries. The increased importance of some NTFPs in industry reduces the consumption of these items as food and medicine for the tribes especially when the total supply from forests has declined because of deforestation. Apart from that, destructive harvesting is being fuelled by the existence of large-scale private trade in NWFPs in India. All non-reserved and many reserved NTFPs are being sold to private middlemen rather than to government agencies, by the tribes. Even some non-tribes illegally collect these products from the forests. Private trade is often exploitative and the intermediaries take the major share of the value of the product, leaving
only one sixth to one fifth of the final price to the primary collector. Since there is little or no value addition and storage facility at the primary collector-level, these functions are often carried out by the intermediaries (Saigal, Agarwal & Campbell, 1997).

**Domestication of medicinal plants**

Domestication of medicinal plants involves their manipulation and cultivation for specific uses. During the domestication process, wild plants are first brought to some form of management. In a later stage of the process, wild plants are actively cultivated. In the final phase, the process involves the selection and breeding of selected genotypes resulting in rather uniform plant populations with a narrow genetic base (Wiersum, 1995). Broadly speaking, it is the process of increasing human-plant interactions. Domestication has several advantages: a consistent, predictable supply; an opportunity to select for desirable genetic traits; and protection of diminishing wild resources.

The first stage of domestication of medicinal plants, viz. gathering wild plants and managing them is already under way in many countries. The second stage, namely cultivation of medicinal plants has not gained momentum. Systematic cultivation of these plants could be initiated only if there is a continuous demand for the raw materials. It
is therefore necessary to establish processing facilities in the vicinity of cultivation in order to create a demand and assure the farmers of the sale of raw materials (Desilva, 1995).

If developed properly, the domestication of medicinal plants has the features of providing the poor with a route out of poverty, saving a heritage of human knowledge and putting it to global use, revitalizing the economies of many developing countries, saving natural biodiversity and improving the output from natural forests and tree plantations.

**Sustainable Development**

Sustainable development refers to a state in which there is a steady improvement in productivity and benefits of a system, in such a way that posterity can continue to receive the benefits at least at the same level as being enjoyed by the present generation. Sustainable Development, a Neo-Malthusian concept, intertwines social and economic goals with the argument that with increased population there is less wealth per person (Brady & Greets, 1994). The concept of sustainable development as applied to the Third World is directly concerned with increasing the material standard of living of the poor at the grass roots level.
The human element in sustainable development can be seen as: A continuing process of management and mediation among social, economic and biophysical needs which results in positive socio-economic change which does not undermine the ecological and social systems upon which communities and societies are dependent. Its successful implementation requires integrated policy, planning and social learning processes; its political viability depends on the full support of the people it affects through their governments, social institutions and private activities linked together in participative action.

**Adaptive management**

The working definition for the British Columbia Forest Service Adaptive Management initiative is that it is a systematic process for continually improving management policies and practices by learning from the outcomes of the operational programmes (Govt. of British Columbia). Adaptive management tries to incorporate the views and knowledge of all interested parties. It accepts the fact that management must proceed even if we do not have all the information we would like, or we are not sure what all the effects of management might be. It views management not only as a way to achieve objectives, but also as a process for probing to learn more about the resource or system being managed. Thus, learning is an inherent objective of adaptive
management. As we learn more, we can adapt our policies to improve management success and to be more responsive to future conditions (Johnson, 1999). In adaptive management, we start with one strategy and based on the results new strategy is formulated. The key to this type of management is that the system should be kept rolling.

**Review of Literature**

Most of the relevant literatures in the field are related to Non-Wood Forest Products [NWFPs], especially on the income generation aspect and the industrial utilisation of these products. They are reviewed first and the review of studies, which deal with medicinal plants, follows.

Saigal, Agarwal and Campbell (1997) emphasize the importance of NWFPs as important sources of cash income for many groups. Collection, processing and marketing of these products provide employment to the tribal communities. In the tribal areas, agriculture is mostly rain-fed and monocropping is practiced. For many months in a year, people remain unemployed and have to depend on forest produce for their daily subsistence. These products are available almost throughout the year and many of these can be harvested at low levels using simple technologies. Forests provide food for the tribes and rural poor. In the study, they also review literature on the
importance of NWFPs in the rural livelihood. Some important points are cited here. 30 per cent of the diet of tribal groups living near forests in Maharashtra is derived from forest products [World Bank, 1993]. In the Andamans and Nicobar Islands several tribes wholly subsist on the food derived from forests and the sea. In Orissa, tribal households having an annual income of less than Rs. 3000 derived 50 per cent from NTFPs and those earning over Rs. 6000 derived 21 per cent from NTFPs.

Saxena (1998) found that the average annual income realised through the sale of NTFPs by rural households in the state of Madhya Pradesh constitute 34 to 55 per cent of their total income.

In Kerala, according to Thomas (1989), different NTFPs are used as food, toiletries, construction materials, etc. by the local people. The average contribution of NTFPs to total income by the tribals engaged in collection of these products is 58 per cent and NTFPs collection is the main occupation of 68 per cent of the tribals.

All these studies emphasis the socio-economic significance of various NTFPs in the context of subsistence, providing employment and income generation for some of the disadvantaged sections of the society. Now we turn to the literature on the industrial utilization of NWFPs.
Chandrashekharan (1997) found that primary processing ranges from local processing to processing by big units. Processing for local use generally takes place in units which are small, numerous, dispersed, financially weak, primitive in technology and managerially poorly served. They are low-return activities and tend to be abandoned as wages rise or alternative opportunities arise.

A study by Banergee, et al (1997) has revealed that forest based industries (FBIs) have contributed significantly to rural development and ecology. Many FBIs like ply wood and paper pulp industries have started cultivation of raw materials. This prevents over exploitation of forests as well as increases the forest cover by utilising wastelands. This provides employment in activities like logging, clearing, etc. and in processing. The plantation activities also have demonstration effect with local people taking up production of raw materials for which the FBIs are ready buyers.

Chipeta (1995) attempted to identify the key factors influencing the growth prospects of the forest-based small-scale enterprises. These factors are existence of demand for their products, whether the macro-economic environment favours the development of small enterprises, whether the Forest Based Small Scale Enterprises have access to infrastructure and finance, the availability of raw materials, and the
most important factor-entrepreneurial skill. The ability of the proprietor is placed as the most important factor by the author because the efficiency and productivity of the enterprise is not enhanced by labour-saving technology or specialised skills and adequate funding, and the weaknesses are worsened by lack of supportive aids.

Nair (1990) identified three important aspects that must be considered in the future for the sustainability of NWFPs in India. 1) Sustainability of forests: cultivation of commercially important species in monoculture affects the quality of the forests and therefore cultivation of more species in the present plantations must be encouraged. 2) Products in inter culturing may not yield in all cases the quantity of raw materials required by the enterprises. For such products, specified areas of forests should be set aside. 3) The social benefit of proposed development: past development of forests leading to deforestation, replacement of natural mixed forests with monoculture plantations, diversion of some of the non-timber products to industries etc. have adversely affected people’s access to forests for meeting their basic subsistence needs.

Singh (1996) discussed the problems of plant diversity conservation under the present management systems. Besides establishing protected areas, need for reorienting management of other
forests for plant diversity conservation is stressed. People’s participation is necessary for plant diversity conservation in the forests irrespective of their degree of degradation.

As against managing the forests for ensuring adequate supply of raw materials to the industry there are researchers who argue that it is not the duty of the forests to provide raw materials to the industry. They suggest domestication of non-wood forest products.

Arnold (1995) analysed the economic factors affecting farmer adoption of non timber species: one is the rapid change that is occurring in the use of NTFPs. Concentrating in some tree products may limit the opportunity to respond to more favourable options when they arise. For some products, the scale or nature of the product or process may not lend itself to domestication at the farm level. In addition to these issues, there are the common problems such as lack of market information, poorly functioning trading systems serving small producers, competition from subsidized supplies from state forests and plantations.

Such problems can be tackled by forming producer groups. Issar (1994) found that through collective movement, the tree growers could gain 30 to 40 per cent higher returns than what they could get individually. Based on the study on the Agroforestry Federation of
Maharashtra, consisting of 25 district level tree growers’ co-operatives, Issar says that the members could gain market information, lower transportation costs, technical advice, economies of scale in storage, collective bargaining strength, and greater responsiveness to changes in regulations. The members get a higher price than the individual operators. It also benefits retail consumers, while the wholesale traders have slowly adjusted to the reduced profit margins.

Thomas (1989) studied the impact of monopoly procurement and marketing of NTFPs by GSCS. He found that GSCS accepts only those items, which have a ready market [61 per cent of the total NTFPs collection], and that the private traders still play a significant role in marketing NTFPs. However, the extent of exploitation of the collectors is reduced since there exist floor prices for the NTFPs. Federation collects regularly only less than 35 items. Out of these, about 10 items constitute 90 per cent of the total value realised by the Federation. These items are cheevakkai, kunthirikkam, honey, pathiripoo, kurumthotti, orila, karinkurinji, moovila, nelli, and maramanjal.

A study by Kerala Forest Research Institute (Muraleedharan, Seethalakshmi & Sasidharan,) revealed that the collection charge paid to the gatherers may be considered as the cost of labour involved in the
collection of NTFPs. What they receive is a nominal amount compared to the consumer price of these products and the difference constitutes the marketing margin and cost incurred by different marketing agencies. Due to reasons such as lack of adequate storage facilities, marketing set up and perishability of the products, the Federation is not in a position to have the fruits of its monopoly power in the sale of these products. Thus the exploitation by the middlemen is still there.

Peters (1996) spread light on the following points. The commercial exploitation of NTFPs is considered to be of negligible ecological importance because local people have been harvesting NTFPs for thousands of years and still the tropical forest exploited for NTFPs remains seemingly undisturbed. However, it should be noted that the intensity of subsistence harvesting as traditionally practiced by forest people is usually quite a bit lower than that of commercial extraction. Also, the gradual extinction of plant species overtime is rarely a visible phenomenon. Unless the harvest levels are maintained at sustainable levels, the plant population as well as the animals that depend on them all will be adversely affected.

The author recommends management activities that ensure a truly sustainable system of exploiting non-timber resources in which
fruits, nuts, latexes, gums and other plant products can be harvested indefinitely from a limited area of forest with negligible impact on the structure and function of the plant population being exploited. Other than the source of supply, the NWFPs have very little in common. Hence generalization, especially with regard to social and economic aspects, becomes meaningless. Let us now look at the literature on the socio-economics of medicinal plants.

Kuipers (1995) examined the trade in medicinal plants, identifying the major sources of demand and supply. The biggest importer of raw medicines is Germany and the biggest exporter is China. Conservation of medicinal plants is called for since 70-90 percent of the materials imported to Germany and 75 per cent of the materials collected in China are wild harvested.

From the experiences of China and India, Lambert and others (1997) found that medicinal plants constitute one of the important overlooked areas of international development. They already contribute substantially to the poor people’s welfare and without recourse to medicinal plants it is unlikely that the vast majority of people in the developing countries will ever be able to meet their healthcare needs. Formal and informal markets co-exist in medicinal plants, formal markets provide processed products while the informal
formal and informal markets co-exist in medicinal plants, formal markets provide processed products while the informal markets provide basic healthcare to the majority of people in many developing countries without consumer protection. It is found that returns from bioprospecting are insufficient and the incentives for habitat conservation are low. The author suggests the need for an education programme developed in collaboration with local collectors, dispensaries, and beneficiaries, identifying the value, the reasons for conserving the habitats, the close link to individual and family health needs, and the long-term economic returns that can be accrued from protecting plants.

Bbenkele (1998) examined the problems of extinction of medicinal plant resources and the marginalisation of actors in the traditional medicinal sector. Based on the qualitative data collected from a sample of traditional medicine markets in South Africa, he suggested establishing strong backward and forward linkages in the sector as solution to the problems. While backward linkages in terms
of identifying and sourcing herbs are very common in the industry, those in terms of developing cultivation as a source of supply of raw materials were not found. He has identified forward market linkage in which involved using a black businessman playing the role of a middleman in selling traditional medicines from the manufacturing companies to people who rely primarily on the traditional healers. The author has stressed the importance of forming a unified group of gatherers and traditional healers, as well as the role of manufacturing companies in creating trust between them and the traditional healers for the knowledge of traditional medicines to be provided for product development to take place. He calls for the Government to provide land for providing medicinal plants and different institutions to transfer technology regarding cultivation of plants. While the study has identified the existing and potential linkages in the sector it has the limitation of not inquiring the reasons for the lack of proper development of linkage to cultivation.

The review of literature brings into attention the scarcity of studies dealing exclusively medicinal plants. Even the studies on NWFPs deal mostly with issues in the collection and marketing of wild harvested materials. There is near absence of literature on economic issues in the sustainability of medicinal plants, especially in the context
of Kerala. The present study seeks to inquire the means for ensuring sustainability of the medicinal plants.

**The research problem**

Controlled harvesting of forest resources and domestication of medicinal plants through active cultivation are very crucial for their sustainability. Any fall in raw material availability resulting from checking over-exploitation should be compensated by cultivated plants. At the same time, cultivated plants become saleable only if there is a reduction in supply of wild plants. Therefore these two activities are complementary and should go hand in hand. How the exploitation of forest resources can be reduced without affecting the tribal economy and how cultivation of medicinal plants can be promoted are the focus issues in the present study. Local returns from wild medicinal plants, the profitability of cultivation, the marketing structure for medicinal plants, as well as the institutional set up are addressed.

**The theoretical framework**

Two theories have been used to set the background for the present analysis. One is the work-leisure decision model in the supply of labour. The model suggests that for a specific person, hours of work may for a time increase as wage rates rise but beyond some point,
further wage increases may lead to fewer hours of labour being supplied. Whether one respond by increasing or decreasing supply of labour depends on the magnitudes of two effects of a wage hike viz, income effect and substitution effect (McConnel & Brue, 1986). In income effect, higher wage rate means larger money income and the person can buy more goods and services and more leisure too. In substitution effect, higher wage rate means higher opportunity cost of leisure, and people buy less of an expensive good, provided it is a normal good. In the present study, we want to explore the relationship between collection charges and harvesting intensity and whether a rise in collection charges could lead to more controlled harvesting by these people.

Second theory is the concept of **Linkages** introduced by A. Hirschman (1958). Linkage effect is a more or less compelling sequence of investment decisions occurring in the course of economic development. In the present context, backward linkage is particularly relevant. It is said to occur, if the development of an existing operation cause the upsurge in the production of inputs used in that operation. In the medicinal plant sector, as the demand for medicinal plants are growing, backward linkages could occur through increased activities in their
cultivation. Establishing such linkages could lead to a situation conducive to the conservation of wild plants and the sustainability of the sector. An attempt is made in the present study to understand the potential for such linkages and to find out means for establishing linkages to cultivation.

**Significance of the study**

Sustainability of medicinal plants is important for the following reasons: a) Availability of these plants can determine the long-term maintenance of the traditional health care systems on which around three fourth of the planet's human population depends. b) The global demand for the medicinal plants is growing phenomenally, thanks to the up surging green consumerism and these plants have potential for contributing significantly to the foreign exchange earnings of many developing countries including India. c) Most of these plant species are typical of the forest ecosystems and their extinction can affect the environment. d) These plants are used by some of the most disadvantaged people of the society for their sustenance and for medicinal purposes. e) Conserving these plants means conserving a heritage of human knowledge that can be put into global use.

The relevance of medicinal plants in Kerala is being felt with the increasing number of people turning towards the traditional medicines,
especially Ayurveda. Through promoting the medicinal plant sector, the cost of health care can be reduced considerably. There is widespread consensus that the traditional system should be developed not as an alternative to the modern system, but it should complement the latter. Such an interest in the Indian System of Medicines (ISM) has resulted in the mushrooming of the Ayurvedic Medicine Manufacturing Units (AMMUs) in Kerala, leading to the over-exploitation of the wild medicinal plants. This is causing the extinction of some of the important resources and in the disturbance of ecological balance. The availability of quality raw materials has become difficult, raising serious doubt about the safety and efficacy of the medicines sold in the market. Moreover, the tribes, who are among the weakest sections of our society, depend on medicinal plants for healthcare and sustenance. Thus the case for protecting medicinal plants arises.

The sustainable production and conservation of medicinal plants are influenced by a number of factors, especially of socioeconomic and institutional in nature. A clear understanding of these factors is required for policy prescription.

**Objectives of the study**

1) To deal with the production-distribution chain in medicinal plants and to assess returns at each stage
2) To find means for reducing over-exploitation of forest resources

3) To assess the profitability of cultivation of medicinal plants

4) To examine the prospects of adaptive management in medicinal plants and to suggest the institutional restructuring required for ensuring sustainability.

**Methodology**

The study is basically qualitative in nature and attempts at a quantitative analysis have been made wherever necessary. A sample of 20 medicinal plants was taken based on their industrial and medicinal importance.

To analyse the demand for these medicinal plants, the Ayurvedic medicine manufacturing industry alone is taken. A 10 per cent sample of 750 registered units operating for the past five years was selected for the study. Data on the total demand and the sources of supply were collected by interviewing the purchase managers of these units.

To analyse the production-distribution-utilisation chain, data were collected from a sample of people involved in the activities based on medicinal plants. They were collected through unstructured interviews with the help of questionnaire. A sample of tribal people who gather the products from the wild, the people who cultivate medicinal plants, private dealers of medicinal plants, officials of the
Girijan Service Cooperative Societies, and Ayurvedic Medicine manufactures were interviewed.

In order to assess the profitability of cultivation data on the costs and returns in growing medicinal plants were collected from cultivators selected from Trissur district.

The institutions responsible for the management of medicinal plants in Kerala are the Forest Department and the Federation of SC/ST Co-operative Societies. To get an idea on the present management system, informal discussions with the officials of these institutions were conducted. Samples of people involved in the collection/production-distribution-utilisation chain were also interviewed.

More detailed notes on the methodologies and tools used for pursuing each of the objectives are given in the chapters where the results are presented.

**Scheme of the study**

The results of the research work are presented in the following four chapters. A profile of the medicinal plant economy of Kerala is given in chapter 2. The stages in the activities based on medicinal plants are dealt with in the third chapter and means for enhancing local returns are inquired in the fourth chapter. Issues in the domestication of
medicinal plants are presented in the fifth chapter. The present management system of medicinal plants is assessed in the sixth chapter and the prospects of adaptive management are discussed. Seventh chapter is the concluding one, it summerises the results.
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