

**SUSTAINABILITY OF MEDICINAL PLANTS IN KERALA
-ECONOMIC CONSIDERATIONS IN DOMESTICATION AND
CONSERVATION OF FOREST RESOURCES**

*Thesis submitted to
The Cochin University of Science and Technology
in fulfillment of the requirements
for the degree of*

DOCTOR OF PHILOSOPHY

**IN
ECONOMICS**

under the Faculty of Social Sciences

by
**ANNIE ABRAHAM S.
Reg.no.1896**



**DEPARTMENT OF APPLIED ECONOMICS
COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY
KOCHI-682022
march 2003**

CERTIFICATE

Certified that the thesis “Sustainability of Medicinal Plants in Kerala – Economic Considerations in Domestication and Conservations of Forest Resources” is a bonafide piece of research carried out by Mrs. Annie Abraham S. under my supervision and that the thesis is worth submitting for the degree of Doctor of Philosophy in Economics



Dr. M. Meera Bai

Senior Lecturer
Department of Applied Economics
Cochin University of Science & Technology
(**Supervising Guide**)

12-3-03
Kochi. 22



CONTENTS

	Page
List of Abbreviations	6
List of Tables	7
Chapter	Title
1	INTRODUCTION 11
2	THE MEDICINAL PLANT ECONOMY OF KERALA 44
3	ANALYSIS OF TRANSACTION CHANNELS IN WILD MEDICINAL PLANTS 65
4	LOCAL RETURNS AND EXPLOITATION OF FOREST RESOURCES – A QUALITATIVE EXPLORATION 96
5	ECONOMIC CONSIDERATIONS IN DOMESTICATION OF MEDICINAL PLANTS 113
6	SUSTAINABILITY OF MEDICINAL PLANTS THROUGH ADAPTIVE MANAGEMENT 138
7	CONCLUSION 152
Bibliography	159
APPENDIX – I	164
APPENDIX – II	169
APPENDIX – III	182

LIST OF ABBREVIATIONS

AMMUs	Ayurvedic Medicine Manufacturing Units
FAMMI	Federation of Ayurvedic Medicine Manufacturers in India
FAO	Food and Agricultural Organisation
FDs	Forest Departments
FRLHT	Foundation for Revitalisation of Local Health Traditions
GSCSs	Girijan Service Co-operative Societies
ISM	Indian System of Medicine
ISM&H	Indian System of Medicine and Homeopathy
KFRI	Kerala Forest Research Institute
MFP	Minor Forest produce
NTFPs	Non-Timber Forest Products
NWFPs	Non-Wood Forest Products
SC	Scheduled Caste
ST	Scheduled Tribe
TBGRI	Tropical Botanical Garden and Research Institute
WHO	World Health Organisation

LIST OF TABLES

No.	Title	Page
2.1	The Status of Ayurveda in Kerala	46
2.2	Plants Selected for the Study	48
2.3	Profile of the Selected AMMUs	50
2.4	Demand for Medicinal Plants	52
2.5	Source-wise Supply of Medicinal Plants	54
3.1	Sample of Tribal Gatherers of Medicinal Plants	69
3.2	Number of Items Collected by the GSCSs	76
3.3	Comparison of Collection Charges Paid by GSCSs and Private Dealers	77
3.4	Price Spread for Channel-I	83
3.5	Price Spread for Channel-II	84
3.6	Price Spread for Channel-III	85
3.7	Price Spread for Channel-IV	86
3.8	Share of each Marketing Agent in the Market Value of Medicinal Plants (Channel-I)	90
3.9	Share of each Marketing Agent in the Market Value of Medicinal Plants (Channel-II)	91

3.10	Share of each Marketing Agent in the Market	92
	Value of Medicinal Plants (Channel-III)	
3.11	Share of each Marketing Agent in the Market	93
	Value of Medicinal Plants (Channel-IV)	
4.1	Importance of Medicinal Plants in the Health Care of Adivasis	102
4.2	Motive for Visiting Forests	104
5.1	The Sample of Small-scale Cultivators – A Profile	119
5.2	Profitability of Cultivation of Medicinal Plants	124
5.3	Selling outlets of Cultivated Medicinal Plants	133

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 NTFPs 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 Banerjee, 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 maramanjil*.

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

markets provide basic healthcare to the majority of people in many developing countries without consumer protection. It is found that the returns from bioprospecting are insufficient and the incentives for habitat conservation 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 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 responds by increasing or decreasing supply of labour depends on the magnitudes of two effects of a wage hike viz, income effect and substitution effect (McConnell & 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 causes the upsurge in the production of inputs used in that operation. In the medicinal plant sector, as the demand for medicinal plants is 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 Co operative 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.

References

Arnold, J.E.M., 1995, "Economic Factors in Farmer Adoption of Forest Product Activities", in Domestication and commercialization of Non-timber forest products in agro forestry systems, NWFPs- 9, FAO, Rome.

Banerjee, Sujoy, Ramanathan, B, Sudin, K & Sharma, Archana, 1997, Wasteland News, Vol. XII, No. 3

Bbenkele, B.C. 1998, "Enhancing Economic Development by Fostering Business Linkages between the Pharmaceutical Companies and the Traditional Medicines Sector", Source: www.eagerproject.com/southafrica.shtml#_1_2

Brady, G.L. & Geets, P.C.F. 1994, "Sustainable Development: The challenge of Implementation", Journal of Sustainable Development Economics, 189-97.

Chipeta, M.E. 1995, "Making Non-Wood Forest Products Programmes Succeed: Lessons from Small-Scale Forest-Based Enterprises", In Report of the expert consultation on non-wood forest products, Indonesia, Jan. 1995. NWFPs 3. FAO, Rome.

Chandrashekharan, C. 1996 "NTFPs-Potentials and Challenges", in M. P. Shiva & R.B.Mathur, eds, "Management of Minor Forest Products for Sustainability" Oxford & Ibh Publishing Co. Pvt. Ltd, New Delhi.

Chandrasekharan, C. 2000a, The Keynote Address delivered at the national Seminar on Sustainable Management of Non-Timber Forest Products, conducted by Kerala Forest Department, 25-26, May, 2000.

Chandrasekharan, C. 2000b, "An Overview of the Situation and Potentials of Non-Wood Forest Products in Asia", Paper presented in the National seminar on Sustainable Management of NWFPs of Western and Eastern Ghats, conducted by Kerala Forest Department, 25-26, May. 2000.

DeSilva, Tuley 1995, "Industrial Utilisation of Medicinal Plants in Developing Countries" in Non-Wood Forest Products-11, "Medicinal Plants for Forest conservation and Health Care". FAO, Rome.

Federation of Ayurvedic Medicine Manufacturers of India. (FAMMI),2001

Foundation for Revitalisation of Local Health Traditions (FRLHT), 1999, "The Key Role of Forestry Sector in Conserving India's Medicinal Plants".

Government of British Colombia, Source:

www.for.gov.bc.ca/hfp/amhome/amdefs.htm

Hirschman, A.O. (1958), "The Strategy of Economic Development", New Haven, Yale University Press.

Hoareaw, Lucy & DaSilva, Edgen J. 1999, "Medicinal Plants, A Re-emerging Health Aid"

www.ejb.org/content/vol.2/issue2/full/2/bip/index.html

Issar, Ranjit 1994, Source: NWFPs 7, 1995, "NWFPs for Rural income and Sustainable Forestry" pg. 88 FAO, 1995, Rome

Johnson, Barry L 1999, "Role of Adaptive Management as an Operational Approach for Resource Management Agencies";

www.consecol.org/vol3/iss2/art8

Karki, Madhav; 2000, "Development of Bio-partnerships for sustainable Management of Medicinal and Aromatic Plants in South Asia", Paper presented in the 21st Congress of the International Union of Forestry Research Organizations(IUFRO); Source:

<http://iufro.boku.ac.at/iufro/iufro.net/d5/wu51102/pub2-5.11.htm>

Kuipers, Sophie Emma. 1995, "Trade in Medicinal Plants", in NWFPs-11, "Medicinal plants for Forest conservation and health care" FAO, Rome.

Lambert, John; Shrivastava, Jithendra and Vietmeyer, Noel. 1997, “Medicinal Plants, Rescuing a Global Heritage”, World Bank Technical Paper No. 355.

Malayala Manorama, daily, 26/7/2000

McConnel, Campbell R. & Brue, Stanly L.,1986; “Contemporary Labour Economics” McGraw-Hill Book Co. ,Singapore.

Muraleedharan, P. K., Seethalakshmi, N. & Shashidharan, K.K. 1997
“Biodiversity in Tropical Moist Forests: A Study of Sustainable Use of NWFPs in the Western Ghats, Kerala, KFRI.Research Report-133, Kerala Forest Research Institute, Pecchi.

Nair, K.K.S.,1990, “Status and Potential of Non-Timber Products in the Sustainable Development of Tropical Forests”, In Proceedings of the international seminar on tropical forest management held in Kamakura, Japan, 1990

Nickel, William & Sennhauser, Ethel “Medicinal Plants: Local Heritage with Global Importance”;

www.worldbank.org/html/extdr/offrep/sas/ruralbrf/medplant.htm

Peters, Charles M.1996, “The Ecology And Management of Non-Timber Forest Resources”, World Bank Technical Paper no. 322

Saigal, Sushil; Agarwal, Chettan & Campbell, Jeffrey Y. 1997, “Food, Fodder, Fuel...NTFPs can sustain Joint Forest Management”. Wasteland News, Vol.13 No. 1

Singh, R V. 1996, “Participatory Forest Management for Conservation and Sustainable Utilisation of Plant diversity in India”. In M.P. Shiva & R.B. Mathur, eds, “Management of MFP for sustainability”, Oxford &IBH Publishing Co., pvt. Ltd, New Delhi.

Suxena, N.C. “Non-Timber Forest Product- Policy Issues”, In M.P. Shiva & R.B. Mathur, eds, “Management of MFP for sustainability”, Oxford &IBH Publishing Co., pvt. Ltd, New Delhi.

Thomas, Philip. 1989 “Collection and Marketing of NTFPs by the Kerala Girijans”, Paper published by Centre for MFPs, Dehradun

Wiersum, K. F. 1995, “Domestication of valuable Tree Species in Agroforestry Systems:Evolutionary Stages from gathering to Breeding”, in Non-Wood Forest Products-9(FAO): “Domestication and Commercialisation of NTFPs in Agroforestry Systems”.

CHAPTER - 2

The Medicinal Plant Economy of Kerala

THE MEDICINAL PLANT ECONOMY OF KERALA

The worldwide up-surge in green consumerism observed in recent years has created waves in Kerala also. The global demand for plant-based medicines and remedies are on the rise and the researchers are looking at the Indian System of Medicine (ISM) for cure of deadly diseases such as Cancer and AIDS. This is happening especially because of the growing number of people suffering from side effects and allergies caused by modern medicines. An initial observation gives the impression that the impact of all these on Kerala is the mushrooming of Ayurvedic Medicine Manufacturing Units [AMMUs]. But such a boom in the manufacturing sector is complemented by growing popularity of Ayurvedic medicines. During the last 15 years the number of Ayurvedic hospitals, the number of hospital beds, the number of practitioners in Ayurveda, and the number of patients turning towards Ayurveda are all rising. [See table no. 2.1] Clearly Ayurveda is increasingly becoming as important as allopathic treatment in the health care of the urban community. Apart from Ayurveda, the popularity of Homeopathy, Sidha, etc. are also rising. The growing demand for traditional medicines means growing demand for medicinal plants. This is leading to over-harvesting of the natural resources and threatening their sustainability.

Table no. 2.1 The status of Ayurveda in Kerala

year	No. of medical practitioners	No.of hospitals	No.of dispensaries	No. of beds
85-86	11835	94	473	1689
86-87	11902	97	497	1769
87-88	12047	107	496	1869
88-89	12250	101	498	1929
89-90	12431	101	506	1979
90-91	12573	105	529	2229
91-92	12748	105	550	2229
92-93	12894	106	566	2259
93-94	13034	107	579	2300
94-95	13185	108	584	2329
95-96	13600	108	587	2349
96-97	14987	108	614	2349
97-98	15106	109	623	2369
98-99	15206	111	631	2514
99-00	15326	115	642	2735

Source: Govt. of Kerala, Economic Review, 2001, State Planning Board.

Sustainability of medicinal plants is important because of the dependence of the Scheduled Tribe (ST) population of Kerala on medicinal plants. The ST population in Kerala according to 1991 census is 3,20,067, that is one percent of total population. Many of the tribal people now find alternative income sources and use modern medicines. Around 22 per cent of the tribes, who live inside the forests, depend solely on medicinal plants and other non-wood forest products [NWFPs] for their sustenance. They use tribal medicines based on wild herbs for their primary health care.

In the present chapter, an overview of the medicinal plant economy of Kerala is attempted. First, the industrial demand for a sample of medicinal plants and the sources of their supply are studied. The linkages existing in the sector as well as the factors affecting the sustainability of the medicinal plants are identified.

Methodology

One hundred and nineteen Minor Forest Products are listed by the Forest Department as marketable and 104 out of them are medicinal plants. A sample of 20 medicinal plants was selected for the present study.

Table no.2.2 Plants selected for the study

Sl.no.	Name	Botanical name	Plant-type	Parts used
1	Atalotakam/ vasak	<i>Adhathoda zylanica</i>	Shrub	Whole plant, mainly roots
2	Kattupadavalam/ wild snake gourd	<i>Trichosanthes cucumeriana</i>	Climber	Roots/ whole plant
3	Kurunthotti	<i>Sida cordifolia</i>	Under shrubs	Roots/ whole plant
4	Puthari chunda/ Creat	<i>Solanum voilaceu ortega</i>	Under shrubs	Roots/ fruits/ seeds
5	Moovila/ tictrhoil	<i>Pseudarthria viscida</i>	Ground herbs	Roots/ whole plant
6	Orila	<i>Urarialago podioides</i>	Under shrubs	Whole plants/ roots
7	Karinkurinji/ common yellow	<i>Nilgirianthus ciliatus</i>	Shrubs	Roots/ whole plants
8	Cherula	<i>Aerva lanata (Linn) juss</i>	shrubs	Roots
9	Vayampu/ Sweet flat root	<i>Acorus calamus Linn</i>	Small plant	Roots/ rhizomes
10	Kumizhu/ white teak	<i>Gmeliaa urborea Linn</i>	Medium sized to large tree	Roots/ bark/ fruits/ flowers
11	Palaka payyani/ indian trumpet	<i>Oroxylum indicum</i>	Small to medium sized tree	Roots/ bark
12	Pathiri/ trumpet flower	<i>Sterospermum colais</i>	Large deciduous tree	Roots/ fruits/ flowers
13	Koduveli/ lead wort	<i>Plumbago zylanica</i>	Small plant	Rhizomes/ roots
14	Shathavari/ asparagus	<i>Asparagus racemosus</i>	Shrubby climber	Rhizomes/ roots
15	Kacholam	<i>Kaempferia glanga Linn</i>	Herbs	Rhizomes
16	Chittamruthu/ heart leaved moon seed	<i>Tinospora cordifolia</i>	Shrubby climber	Whole plant
17	Kadukka / chebulic myrobalan	<i>Terminalia chebula</i>	Medium sized to large tree	Fruits/ bark
18	Thanni	<i>Terminalia bellirica</i>	Medium sized tree	fruits
19	Nelli/ amla	<i>Phylanthus emblica</i>	Small tree	fruits
20	Thippali	<i>Piper longum</i>	Shrubby climbers	Fruits/ roots

Source: Nair, 1996

(See table no. 2.2) (It may be noted that the Malayalam names of the plants alone will be used in the thesis hereafter.) For selecting this sample, 10 leading AMMUs were asked to rank 50 medicinal plants that are commercially and medicinally most important. Based on their ranking, 20 most important plants were identified. The selected species include shrubs, climbers, small trees, and large trees. The roots, bark, rhizomes, fruits, leaves or whole plant is used for manufacturing medicines. A profile of these plants is given in Appendix-I. To analyse the demand for these medicinal plants, the Ayurvedic medicine manufacturing industry alone is taken. Although other systems like Homeopathy and other sectors like cosmetics use herbs, they are excluded from the present study for two reasons: 1) Ayurveda uses the largest percentage of the total quantity of medicinal plants utilised. 2) Inclusion of other sectors would make the study too extensive. Moreover, demand for only the recent five years are considered because the focus of the present study is on the sustainable means for producing the medicinal plants. Observations on the level of demand just set a background for the analysis.

In 2000, there were 750 registered and operating AMMUs and private estimates show that there are more than 250 unregistered units

also. Only the registered units were considered for the present study. A 10 per cent stratified sample was taken, with stratification into small scale, medium scale and large scale units. All the sample points falling in the medium and large category were selected; they were 10 in number. The remaining 65 units were selected randomly from different districts of Kerala. The sample profile is given in table no. 2.3.

Table no. 2.3 Profile of the selected AMMUS

Turnover of firms	No. of firms	Direct employment	Indirect employment	No.of branch offices	No.of agencies
Upto 1 cr.	66	740	80	-	12
Between 1 cr.&25 cr.	8	1420	3300	42	1240
Above 25 crs.	1	4700	820	14	809
Total	75	68600	4200	58	2061

Source: Survey Data

While the total turn over of the industry during 2000 was Rs. 150 crores, the total turn over of the sample was Rs. 136 crores. Detailed primary data on the demand and supply of 20 selected plants were collected from the sample units through the interview method using a schedule and the data were extrapolated for the population.

Demand for medicinal plant raw materials

Demand for medicinal plant raw materials arises in two sectors: the industry and household sectors. Industries using medicinal plants are Indian System of Medicine and Homeopathy (ISM&H), herbal cosmetics and toiletries, and some dying and tanning industry. Household demand arises when some people prepare “kashayams” and “rasayanams” as per the prescription by the ‘vaidyans’. As mentioned earlier only the Ayurvedic Medicine Manufacturing units were selected for the present study.

The total turn over of the selected 75 units in 2000 was Rs. 136 crores, which is 90.7 per cent of the total turn over. So the sample demand is taken as 90.7 per cent of the population demand, and it is extrapolated to obtain the total demand for the year 1999-2000. Table no.2.4 shows the level of demand for medicinal plants for five years (95-96 to 99-2000), by the sample. The growth rates of the demand for medicinal plants for the last five years are also given. It is clear from the data that the demand for all the 20 medicinal plants is growing. The AMMUs’ claim is that at present the supply is just enough to meet the demand. However, the fact is that many of the manufacturing units rely on adulteration to some extent.

Table no.2.4 Demand for medicinal plants

Sl no	Items	consumption of medicinal plants by the sample					population demand for the year 99-00
		AMMUs during					
		95-96	96-97	97-98	98-99	99-200	
1	<i>Atalotakam</i>	74285	79954	89258	99254	109925	121196.3
			8%	12%	11%	11%	
2	<i>kattupadavalam</i>	42364	44321	47896	51885	56490	62282.25
			5%	8%	8%	9%	
3	<i>kurunthotty</i>	258735	279940	300000	320381	343396	378606.4
			8%	7%	7%	7%	
4	<i>orila</i>	79020	81559	84394	88254	92500	101984.6
			3%	3%	5%	5%	
5	<i>moovila</i>	80025	83459	85821	89008	93550	103142.2
			4%	3%	4%	5%	
6	<i>karinkurinji</i>	118962	127594	138952	150542	160355	176797.1
			7%	9%	8%	7%	
7	<i>putharichunda</i>	78692	82961	85631	88931	92010	101444.3
			5%	3%	4%	3%	
8	<i>Pathiri</i>	83652	86009	89952	93258	96300	106174.2
			3%	5%	4%	3%	
9	<i>Kumizhu</i>	61235	62930	66032	68591	71600	78941.57
			3%	5%	4%	4%	
10	<i>Cherula</i>	63851	65993	68210	70025	72970	80452.04
			3%	3%	3%	4%	
11	<i>Vayampu</i>	38947	41191	43000	45161	48300	53252.48
			6%	4%	5%	7%	
12	<i>Shathavari</i>	124937	129900	140827	152513	166215	183258
			4%	8%	8%	9%	
13	<i>Koduveli</i>	69821	72936	75006	78834	82090	90507.17
			4%	3%	5%	4%	
14	<i>Chittamruthu</i>	184035	196143	207935	223865	240750	265435.5
			7%	6%	8%	8%	
15	<i>Thippali</i>	88952	90334	92057	94628	97480	107475.2
			2%	2%	3%	3%	
16 (a)	<i>Nellikka (D)</i>	138329	142321	145987	148621	152160	167761.9
			3%	3%	2%	2%	
16 (b)	<i>Nellikka (F)</i>	121597	123598	126894	130048	134000	147739.8
			2%	3%	2%	3%	
17	<i>Kadukka</i>	153856	160932	168971	178000	189850	209316.4
			5%	5%	5%	7%	
18	<i>Palakapayyani</i>	75200	78090	80630	83221	87000	95920.62
			4%	3%	3%	5%	
19	<i>Kacholam</i>	40124	41005	42992	45980	47960	52877.62
			2%	5%	7%	4%	
20	<i>Thannikka</i>	62749	65987	70732	76256	82500	90959.21
			5%	7%	8%	8%	

* The growth rate over the previous year is also given

Source: Survey data

Supply of medicinal plant raw materials

Most of the medicinal plants available in Kerala are produced naturally and cultivation takes place only to a very small extent. Natural production takes place in forests, wastelands or homesteads. The total area of Kerala state is 38,843 sq.km. and the forest cover of the state is 10,323 sq.km. (Government of India, 1999). Around 540 different medicinal plants occur in these forests (KFRI, 1981).

An assessment by Basha S. Chand (Nair, 1996) in 1990 has shown that 26 per cent of the medicinal plants of the state are found in the ever green forests, 44 per cent in the moist deciduous forests, 17 per cent in the dry deciduous forests and 5 per cent in the semi ever green forests. While older teak plantations harbour several medicinal and other NWFP yielding plants, plantations of eucalyptus are rather poor in NWFP content. It is observed that 6 per cent of medicinal plants in Kerala originate in non-forest area. However, all the plants and parts of the plants are not made available to the industry. The firms have to seek alternative sources to meet their requirement. The present study is concerned with the sources from which the industry gets supply of medicinal plant-raw materials.

The identified suppliers of medicinal plants to the AMMUs are the Girijan

Service Co-operative Societies and the Federation, private dealers

Table 2.5 Source-wise Supply of Medicinal Plants

Sl no	Items	Total quantity consumed	quantity cultivated by AMMUs *	quantity supplied by GSCS& Federation *	quantity supplied by private dealers in Kerala *	quantity supplied by dealers outside Kerala *	directly delivered by collectors/ cultivators *
1	<i>Atalotakam</i>	109925	12500 11%		91750 83%		5675 5%
2	<i>kattupadavalam</i>	56490	1500 3%	9659 17%	37566 67%	4500 7.9%	3265 5.8%
3	<i>kurunthotty</i>	343396		6052 1.7%	303744 88%		10000 3%
4	<i>orila</i>	92500		28208 30%	59742 65%		550 1%
5	<i>moovila</i>	93550		28750 31%	61325 66%		475 1%
6	<i>karinkurinji</i>	160355	4500 3%	55000 34%	100705 63%		150 0.1%
7	<i>putharichunda</i>	92010	1300 1%	1819 2%	88491 96%		400 0.4%
8	<i>Pathiri</i>	96300	1700 2%		94300 98%		300 0.3%
9	<i>Kumizhu</i>	71600	3000 4%	25035 34.9%	43465 61%		100 0.1%
10	<i>Cherula</i>	72970		660 1%	64310 88%	8000 11%	
11	<i>Vayampu</i>	48300	750 2%		42980 89%	4000 8%	570 1%
12	<i>Shathavari</i>	166215	8500 5%	573 0.3%	146992 88%	10000 6%	150 0.1%
13	<i>Koduveli</i>	82090	2400 3%		71010 87%	8680 11%	
14	<i>Chittamruthu</i>	240750	1500 1%		196210 81%	42600 18%	440 0.2%
15	<i>Thippali</i>	97480			39480 41%	58000 59%	
16 (a)	<i>Nellikka (D)</i>	152160		22 0.01%	65565 43%	86573 57%	
16 (b)	<i>Nellikka (F)</i>	134000		8746 7%	26504 20%	98750 74%	
17	<i>Kadukka</i>	187850		3973 2%	67754 36%	116123 62%	
18	<i>Palakapayyani</i>	87000	750 1%		83400 96%	2850 3%	
19	<i>Kacholam</i>	47960		2 0.004%	39958 83%		8000 17%
20	<i>Thannikka</i>	82500			49500 60%	33000 40%	

* Each quantity as percentage of the total is also given.

Source: Survey data

in Kerala and private dealers outside Kerala. Apart from that, two units cultivate some plants required by them. Some units buy directly from the collectors or cultivators. Among these sources, the private dealers in Kerala often buy from dealers outside Kerala and sell to the AMMUs in Kerala. Since the private dealers were unwilling to provide information it was difficult to find out exactly how much comes from other states. Data on supply of medicinal plants for only one year were obtained because the Ayurvedic Medicine manufacturers do not keep records on how much they gather from each source. However, data for a year could be indicative, and serves the purpose of setting a background for analysis.

Of the total quantity of the 20 medicinal plants procured by the AMMUs, 79.8 per cent was supplied by the private dealers. The GSCSs and the Federation together supplied only 12.5 per cent. [See table no.2.5] This is because the GSCSs are interested only in a few items and they even sell out the procured materials to the private dealers. Although the right to collect the wild plants is with the GSCSs, the private dealers play the key role. The share of dealers from other states is 1.3 per cent. The AMMUs cultivate 2 per cent. Cultivators or collectors themselves deliver the remaining 4.4 per cent to the manufacturers. A detailed review of the collection and marketing of medicinal plants is given in chapter-3.

Linkages existing in the medicinal plant sector

The existence of forward business linkage in the medicinal plant sector is marked by the growing number of private traders involved in the transaction of raw medicinal plants. They perform the important function of mobilising resources. While the GSCSs and the federation are able to supply only those items collected by the tribal people, the private traders supply any item required by the manufacturing units. These items vary from wild medicinal plants, non-wild medicinal plants, pulses, sugar, honey and many other inputs that are not available within Kerala. The AMMUs just have to give a list of required items on a contract basis to the dealers. They supply the materials in required quantities, no matter where they come from. In the process they get a very good share of the market value of the materials.

Firms can buy at a lesser rate if they accept the materials delivered directly by the collectors; still they prefer to buy from the dealers for the convenience of buying all the items together. Besides that, ready payment is not necessary if purchased from the dealers. Businessmen usually buy goods on credit and the gatherers cannot wait for payment. So they have to sell their produce to the traders at a lower rate. In the case of cultivated plants, the middlemen collect the materials from the farms and the farmers

do not have to worry about transportation. All these factors make the private dealers very important players in the field.

There are some positive aspects to this kind of linkage. The AMMUs or the middlemen employ people, mostly females, in collecting medicinal plants from non-forest areas such as wastelands, homesteads, etc. The landowners who are not aware of the medicinal value of the plants consider them as weeds and do not charge the collectors for it. In this way, casual employment is generated.

Forward business linkage exists in the case of finished medicines also. The Ayurvedic medicines are sold through agencies and the number of agencies is growing. The growth of the Ayurvedic medicine industry has generated a lot of indirect employment through the growing number of agencies of the companies. At present, the industry has more than 2000 agencies. Only big companies have agencies, small companies send sales representatives to various areas. The method is to attract the attention in crowded places especially in rural areas through interesting sales speeches on the efficacy of certain traditional medicines. The approach is giving good results and more small units are trying the method. Even some big units are trying the method for popularising the planting materials developed by them.

Still another kind of linkage existing in the sector is the manufacturing units making use of the services of the traditional healers. The tribal vaidyans help the manufacturers in ascertaining whether the plants are the right ones and in determining their quality levels. This is true only in the case of small units; most of the medium and large units have experts employed in their organisation to ascertain the quality of the materials purchased by them. However, very few manufacturing units are conscious about quality so as to harvest the right plants at the right time.

Export of traditional medicines by some big units can also be considered as forward business linkage. Kottackal Arya Vaidya Sala even has branches in other states and has agencies in Malaysia and Singapore.

The Problem of Sustainability

The problem of sustainability starts with a demand-supply gap. The manufacturers claim that there is no gap at present, but it has become very difficult to get the raw materials delivered at the expected time. However, they agree that the problem of supply shortage is bound to arise in the future.

The fact is that many of the plants used by the industry have become very rare in India and even after over-harvesting the forest resources, it is not possible to meet the current level of demand. Evidently, the industry is

relying on adulteration, since cultivation of these plants is taking place only to a small extent. Thus there is a concealed demand-supply gap. Such practice affects the efficacy of the medicines and in the long run it will affect the popularity of traditional medicines. Thus the sustainability of the plants becomes crucial for the sustainability of the industry. Sustainability of medicinal plants is important for the survival of the tribes also, since they have no other resources to rely on.

Factors affecting sustainability

a) Deforestation

The forest cover of Kerala, based on satellite data of 1996 is 26.56 per cent of the total geographic area of the state (Government of India, 1999). The Forest Survey of India shows that the forest area has been decreasing over the years. The rate at which the forests are being destroyed is the prime factor affecting the sustainability of medicinal plants. The decreasing forest cover of the state implies the depletion of the reservoirs of medicinal plants. What is leftover is being over-exploited, causing the extinction of many plants.

b) Unsustainable collection practices

The increasing commercial importance of medicinal plants and the economic weakness of the gatherers lead to unsustainable harvest

practices. Further, many collectors are unskilled in proper harvesting techniques. Plants such as *Kurunthotti* (*Sida cordifolia*), *Muvila* (*Pseudarthria viscida*), *Orila* (*Urarialago podioides*), etc. flowers in September/ October/ November and fruits mature in October/ November/ December. In order to ensure regeneration, they should be plucked only after seed fall. Moreover, the active ingredients of the plant will be ready only by that time. In actual practice, they are removed immediately after the monsoon; that is in August or September, for then the soil is wet and it is easier to pluck the plant without damaging the roots. Similarly, while harvesting the roots of trees such as *Palakapayyani* (*Oroxylum indicum*), *Pathiri* (*Stereospermum colais*) and *Kumizhu* (*Gmeliaa urborea* Linn) only the roots grown towards the north should be removed. But in practice, the entire root is collected and this causes the death of the tree. Similarly, while collecting the bark of the trees, only one side of the tree should be peeled off and the other side should be peeled only after the peeled portion is covered with new bark. Moreover, it is important to collect the required part of the plant when it has reached the optimum point of growth, in order to ensure potency. For leaves it is just before flowering, for flowers it is just before full bloom, for roots and rhizomes it

is when aerial parts are beginning to wither and die, bark should be gathered in spring (Bunny,1982).

Most of the collectors are not aware of such things and the rest are not far sighted enough to care for future availability. The prime reason for such negligence is the poor economic status of the collectors. Their share in the value of medicinal plants is small, especially since no value addition takes place at the collectors' level. This issue will be discussed in details in the chapters three and four.

c) Non- implementation of regulations

The right to collect NWFPs from Kerala's forests is conferred on the tribe in the state. Still non-tribes collect these materials illegally from the forests. The authorities are not keen to check illegal collection of plants from the forests. The Minor Forest Committee set up by the Government allots ranges to MFP Societies and the maximum amount of each product that can be collected from the ranges. Nobody cares to ensure that the actual collection does not exceed the stipulated maximum.

d) Presence of unhealthy linkages

Procuring more medicinal plant products of natural origin is the strongest and the most dangerous kind of backward linkage existing in the sector. The business linkages between the medicine manufacturers and the

private dealers are of serious concern since they adopt every sarcastic method for maximising the supply of medicinal plants. They often bribe the collectors to over-exploit the forest resources. Even non-tribal people are employed by the middlemen to exploit forest resources.

e) Absence of domestication

The growing demand for medicinal plants can be met only through domesticating commercially important medicinal plants. Domestication is a process that involves three stages. They are managing the wild plants, active cultivation of medicinal plants and human-induced change in the genetics of a plant. As far as the first stage is concerned, the medicinal plants in Kerala have been brought under some form of management. But under the present system of management, no significant effort is being made to conserve the medicinal plants. Regarding the second stage, initiatives in cultivation is visible to some extent at present. However, the marketing channels for the cultivated plants have not been developed properly. The third stage can be developed only after the process of cultivation becomes active. Therefore, in the context of Kerala, the second stage is very crucial. The issues regarding cultivation will be dealt with in the fifth chapter.

Conclusion

Given the growing demand for medicinal plants and the depletion of natural resources, the sustainability of medicinal plants is under serious threat. The existence of business linkages and absence of linkages to cultivation and local value addition are the factors leading to over-exploitation of forest resources. More equitable distribution of the benefits of commercialisation of medicinal plants, controlling illegal exploitation of wild plants and domestication of the medicinal plants are the solutions to the problem. Various economic factors influencing gathering of plants from the forests and domestication are analysed in the coming chapters.

CHAPTER - 3

Analysis of Transaction Channels in Wild Medicinal Plants

Analysis of Transaction Channels in Wild Medicinal Plants

The sources of commercially utilised medicinal plants are forests, wastelands, homestead gardens and agricultural farms. The first two are natural sources and majority of the plants utilised by the AMMUs come from forests. Since medicinal plants are not properly domesticated through active cultivation, the natural resources are being over-exploited. The poor economic status and ignorance of the collectors are accentuating the problem. Therefore, equitable distribution of the benefits accruing from the commercialisation of these plants is crucial for the sustainability of the natural sources. In order to see how the benefits are shared at present, the transaction chain in wild medicinal plants is analysed and price spread is estimated for the selected medicinal plants.

Methodology

Details about the harvesting of medicinal plants of natural origin were collected from a sample of tribal collectors in Kerala. For selecting this sample the four regions into which the Federation has divided the state was used as the base. They are Thiruvananthapuram, Adimali, Thrissur and Kalpetta. There are 10 Girijan Service Co-operative Societies (GSCSs) in Thiruvananthapuram, 8 GSCSs in Adimali and 9 GSCSs each in Thrissur and Kalpetta regions which procure Non-Wood

Forest Products (NWFPs). Out of these 36 GSCSs, 10 were selected on the basis of their contribution to total quantity of medicinal plants collected. They are 3 GSCSs each from Kalpetta region and Thrissur region and 2 GSCSs each from Adimaly region and Thiruvananthapuram region. The 10 societies surveyed are Sulthanbatheri, Thavinjal, Thirunelli, Palapilli, Malampuzha, Kurumba, Njaraneeli, Achencoil, Vazhathope and Adimali. Data on the items collected by these societies, the procurement price, the selling price, and the agency to which the collected materials were sold were collected. For selecting a sample out of the members of the societies, a pilot survey in these regions was conducted. It revealed that most of the tribal people were engaged in wage labour and collect non-wood forest products only during the monsoon. The sample was taken in such a way that majority of the selected persons' prime occupation was collection of NWFPs. The strength of the sample is 375, which is approximately 5 per cent of the population.[See table no. 3.1.] Ninety-two per cent of the people belonging to the sample engage themselves only in the Forest Department's work, other than the collection of NWFPs. It is available for three four months every year. The remaining 8 per cent collect NWFPs only when no alternative work is available. Data were collected by interviewing the sample points, with a

schedule as a guide. Focus group discussions with the tribal *vaidyans* and the *mooppans* of each settlement, which they belong to, were also conducted.

The private dealers of medicinal plants were also approached for collecting information, but most of them were not willing to co-operate. So the information obtained from the gatherers and the manufacturing units about the private dealers were used for the study.

In order to see how the benefits from the commercialisation of medicinal plants are shared among the collectors, societies and the middlemen, the sales price at each level was compared. For this, four major marketing channels were used. In some cases, the NWFPs pass through more than one private dealer. But they are grouped as a single point in the present study as for most of the medicinal plants selected for the present study only one private dealer exists in the marketing channels.

The price spread for 17 medicinal plants belonging to the selected sample was calculated for the year 2000-01. It is taken as the difference between retail value of the medicinal plants and the price realised by the collectors. The remaining 3 plants were not collected from the forests during the period. How each actor in four marketing channels shared the market value of the medicinal plants was also estimated.

Table no. 3.1

Sample of tribal gatherers of medicinal plants

Region	MFP society	Tribes	Number of members	Strength of the sample
Thiruvananthapuram	Njaraneeli	Kani Malai pandaram	654	36
Thiruvananthapuram	Achencoil	Malai pandaram	155	8
Adimali	Vazhathope	Mannan Urali Mala arayan	618	30
Adimali	Kuttampuzha	Muthuvan Mannan Ulladan Mala arayan Malamkudi	1324	65
Thrissur	Kurumba	Kurumbar	556	27
Thrissur	Palappilly	Malayar Kadar	693	34
Thrissur	Malampuzha	Paniyar Muthuvar Irular	700	35
Kalpetta	Thirunelli	Chola naykar Kattu naykar Kurumar	784	39
Kalpetta	Sulthan batheri	Kattu naykar Paniyar Uralikal Kurumar	1338	66
Kalpetta	Vilangad	Kurichiar Paniyar Kattunaykar	697	35
TOTAL			7519	375

Source: Survey Data

Harvesting

Harvesting is the removal of a crop/plant or products of financially or physically matured trees or plants for human use. Medicinal plants can be harvested either from natural sources or cultivated sources. As mentioned in the previous chapter, a major share of medicinal plants used today is from natural sources. They are collected from natural forests, plantation forests, wastelands, and homesteads. Today either the tribal people or the casual labourers sent by the dealers or the manufacturers collect the plants from forests or other natural sources. Often the economic weakness of the gatherers leads to unsustainable harvest practices. Further, many collectors are unskilled in proper harvesting techniques.

Collection of medicinal plants and other non-wood forest products form an integral part of the economy of the forest dwellers. Earlier, the Forest Department allotted ranges to contractors for extracting non-wood forest products on the basis of quotations. The contractors employed labourers for collecting the materials from the forests. This system affected the tribal economy. Right now, the monopoly right to collect medicinal plants and other non wood forest products from the forests of

Kerala is conferred on the Scheduled Tribes (STs) of Kerala . The collected materials are to be marketed through the GSCSs. The forest department allots forest ranges to each society and fixes the maximum quantity of each NWFP that can be collected from a range. The societies in turn give permit-cards or identity cards to the members. Little or no processing takes place at the collectors' level, which means there is no value addition at the local level. Due to this, the share of local returns in the market value of the medicinal plants is very low.

The major items regularly collected by them are honey, lac, *shikakai*, *paththiri poovu*, *orila*, *muvila*, *karinkurinji*, *nellikka*, *kurunthotti* and *maramanjil*. The societies are not interested in other products. The basic problem faced by the tribal collectors is the low collection charges paid to them and the lack of interest on the part of the societies to buy the products other than the above mentioned ones. Therefore they need to work very hard to collect materials worth a reasonable income.

The forest department has identified 119 products as commercially important, among them only a few easily marketable items are accepted by the societies. This has resulted in two problems:

*The younger generation of the tribal communities is becoming increasingly alien to the items not collected by them regularly and this is

resulting in an erosion of their knowledge base.

*A large quantity of NWFPs are illegally collected by non-tribals and sold to the private traders. This often results in competition and over-exploitation. (Muraleedharan, et.al, 1997)

Private dealers pay better charges, but if the members of the society are found to be selling outside, action such as canceling permit for collection will be taken against them. Still some of them sell to the private dealers secretly.

Transactions of medicinal plants

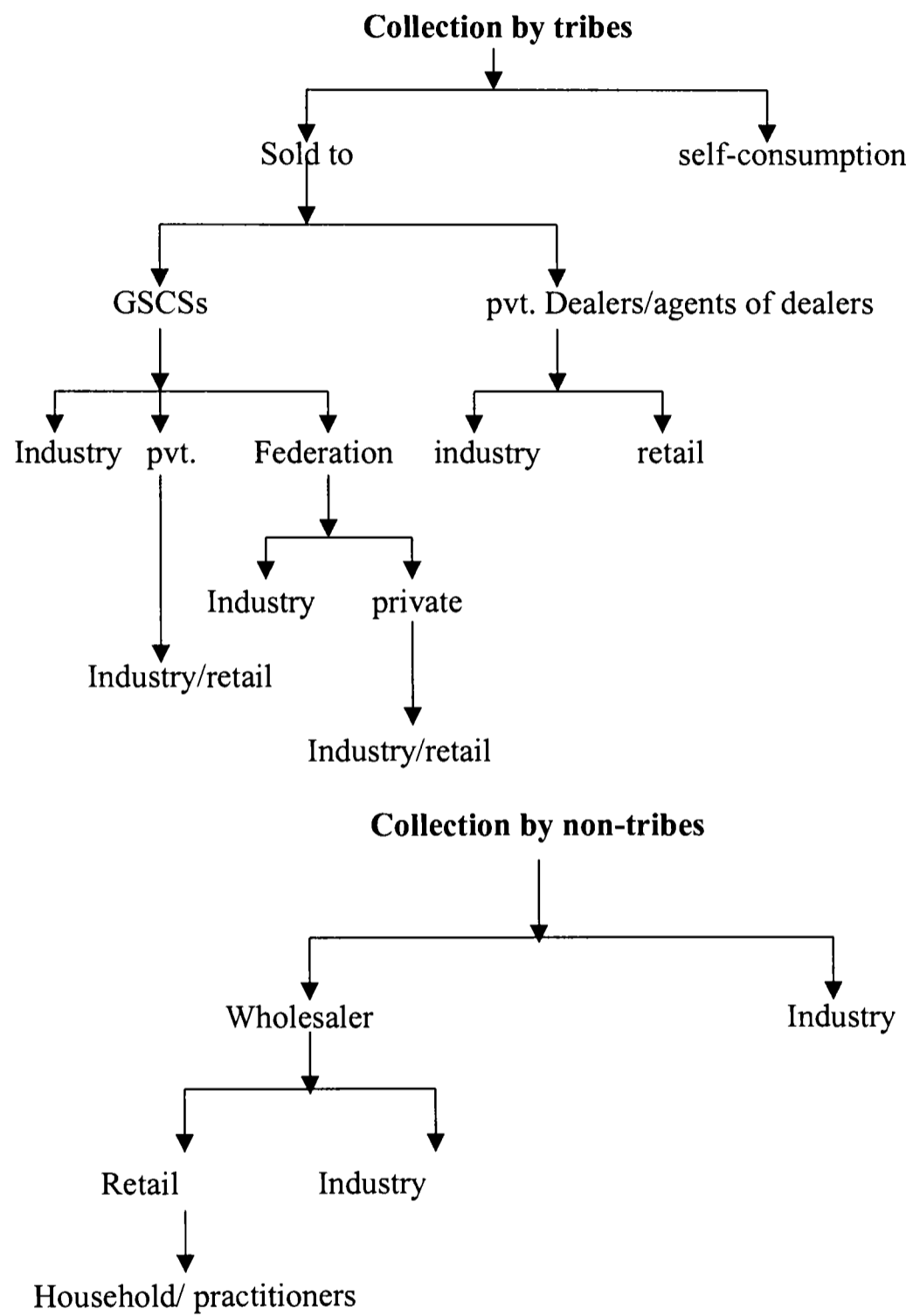
There is a legal set up to channelise the transactions in medicinal plants. The Girijan Service Co-operative Societies and their apex body the Kerala State Federation of Scheduled Castes/ Scheduled Tribes Development Co-operative Societies [hereafter called the federation.] are authorised to market these products. The Minor Forest Committee set up by the Government meets annually and fixes the minimum collection charges and selling rate from time to time and allots ranges to each society. It is obligatory to give away 80 per cent of the market value or price as collection charges. The societies' share is 15 per cent and the federation's share is 5 per cent. Members of the MFP Committee are

1. The Chief Conservator of Forests (Protection) as Chairman,

2. the Registrar of Co-operative Societies,
3. the Director of the Department for Tribal welfare,
4. the Managing Director of Kerala State Scheduled Caste and Scheduled Tribe Development Co-operative Federation Ltd,
5. the Managing Director of Kerala Pharmaceutical Corporation,
6. the Government's Health Secretary,
7. the Director of Kerala Forest Research Institute, Peechi, Thrissur
8. the Principal of Government Ayurveda College, Thiruvananthapuram,
9. the Director of the Department of Indian System of Medicines,
- 10.the Chief Conservator of Forests (World Bank Project) and
- 11.the Chief Conservator of Forests(Eco Development and Tribal Welfare).

Still illegal players dominate the field because out of the 119 items sanctioned by the FD, less than 20 are procured by the GSCSs, that too at prices much lower than what the private dealers pay. The number of items collected by the 10 GSCS is given in table no. 3.2. Societies in regions other than Thrissur are not interested in collecting medicinal plants for the reason that the market for medicinal plants and the activities based on them are concentrated in Thrissur. So they prefer lac, honey, honey wax,

Flow of Medicinal Plants



shikakai, etc. which have ready markets. Most societies accept only a few items such as lac, honey, *paththiripoovu*, *shikakai*, *nelli*, *maramanjai*, *orila*, *muvila*, etc. Although the purpose of the societies is to buy what the members collect, in practice, the societies ask the members to collect a few specific materials and do not buy anything other than those items. Some of the members then sell the other materials to private dealers. Apart from the lower prices paid by the GSCS, the collectors sometimes have to wait until the bill gets passed before receiving their due. Therefore when the gatherers are in some urgent need of money, they are unable to meet the requirement by selling to the societies.

It is obligatory for the societies to pay bonus to the members during Onam season. This should be done by keeping a certain per cent of the collection charges with the society and giving away during *Onam* with the due interest. This endeavour is not properly done by many of the societies. The societies in wynad districts do not pay bonus to the members. Even where bonus is actually paid, the members are not sure whether they are being paid the correct amount because they do not keep accounts. Therefore they do not find the system of bonus very attractive. One advantage of selling to the GSCSs is that they have collection centres in most of the tribal hamlets while in selling to the private dealers, they have

to transport the goods to the nearest town. However the advantage in transportation is outweighed by the difference in collection charges.

Table no. 3.2 Number of items collected by the GSCSs

Sl.no	Name of GSCS	Number of items collected	Number of medicinal plants collected
1	Malmpuzha	18	11
2	Palappilly	26	15
3	Kurumba	17	10
4	Vilangad	9	4
5	S. Batteri	13	9
6	Thirunelli	13	8
7	Kuttampuzha	15	6
8	Vazhathope	15	10
9	Achencoil	14	6
10	Njaraneeli	16	9

Source : Survey Data

A comparison of the collection charges paid by the societies and the private dealers is given in table no. 3.3. On the average, the price paid by the societies is only 77 per cent of that paid by the middlemen. Besides

the higher payment, the dealers attract the collectors with advance payment and personal contacts. They sometimes gift arrack and tobacco

Table 3.3

Comparison of collection charges paid by GSCSs and private dealers.

No.	Items	Collection charges paid per kg. by		Price paid by GSCS as %ge of that by pvt. dealers
		GSCS	pvt.dealers	
1	<i>Kurunthotti</i>	5.8	8	73%
2	<i>Putharichunda</i>	7	9.5	63%
3	<i>Orila</i>	7.3	9	81%
4	<i>Moovila</i>	7	8	88%
5	<i>Karinkurinji</i>	4	5.5	73%
6	<i>Shathavari [F]</i>	3.6	5.5	65%
7	<i>Kattupadavalam</i>	32	50	64%
8	<i>Nellikka [D]</i>	10	15	67%
9	<i>Kacholam [F]</i>	62	70	89%
10	<i>Chittamruthu</i>	2	2.5	80%
11	<i>vayampu</i>	12	15	80%
12	<i>Paththiri veru</i>	5.5	11	92%
13	<i>Thippali veru</i>	7	10	70%
14	<i>Kadukka</i>	8	11	73%
15	<i>Kumizhu veru</i>	4	4	100%
16	<i>Thannika</i>	3	5	75%
17	<i>Cherula</i>	5	6	83%

Source : Survey data

to the tribal people. In advance payment, the tribes are sometimes cheated because they do not keep accounts. Price paid by middlemen for medicinal plants is lower in Wynad than in other regions, because the societies do not buy medicinal plants regularly and most of the medicinal plants collected from this region are sold to private dealers. The objective of the societies is to eliminate middlemen from the medicinal plant-marketing field. But in actual practice, most of the materials collected by the societies are sold to the middlemen. If the societies had tie-up with the industry, they could get better margin and the earnings of the collectors would be enhanced. Most of the societies sell materials through auctions and the industry is not interested in going through the formalities.

The existence of societies has however, resulted in the private dealers paying better prices. Still, the tribes are at a disadvantageous position since it is obligatory for them to sell materials to the societies. In areas where the societies are not active, the private dealers pay much lower prices. Thus it is the competition between the societies and the private dealers that is keeping the prices of medicinal plants and other Non-Wood Forest Products at the current level.

Pricing Mechanism

There is no clear-cut pricing mechanism for the medicinal plants in Kerala. The minimum prices fixed by the MFP Committee are not related to the market. The rates at which actual transactions take place are influenced by many factors. At the first level of transaction, the buyer fixes the rate, no matter if the collector sells to the society or to the private dealers. The people who spend days and nights in forests for collecting the materials are merely price-takers, because of their poor social and economic status. Still the competition between the societies and the private traders results in the latter paying better rates to induce the tribes to go out of the official channel.

The dealers on the other hand, sell these materials at the rates declared by them. Some sort of sellers' market exists at this level of transaction. Since there exist a large number of buyers competing with each other, the seller has a say in the market. However, the societies often do not get attractive prices because of their poor delivery system and after purchase services. As mentioned earlier, the societies sell materials through auction and the manufacturers do not bother to go through the formalities.

Although the market for Ayurvedic medicines as a whole is growing, the production of each single medicine is guided by supply side factors. Many a time the prices of medicinal plants are influenced by the price of their complementary raw materials. For example, when the price of coconut oil is low, the manufacturers produce medicines based on them in bulk quantities. For that they require the medicinal plants used in those medicines in bulk quantities, and if any of them is short of supply at the moment, the price of that particular item shoots up. The agents of the manufacturers go in search of the materials and buy it from available sources at whatever price quoted by the supplier. Even in such situations, since the manufacturers have no direct linkages with the tribal collectors, the benefits are not accrued to the collectors. On the other hand the middlemen have contacts and can mobilise resources to cater to the needs of each manufacturer. While competent industrialists can cover the costs incurred in production by selling the medicines, the collectors are left at the most disadvantageous position.

Price Spread

Price spread for the plants was estimated for analysing the returns. Price spread may be defined as the difference between price paid by the consumer and the price received by the producer for an equivalent

quantity of products (Achary & Agarwal, 1987). Although most of the marketed plants are sold to the manufacturing units and only a small portion realise retail price; the retail price is taken as the market value of the medicinal plants. The purchase prices of manufacturing units are different for each channel. Taking retail price as the final value facilitates comparison of the share of each player in the marketing channels. There are different channels of transaction in NWFPs as identified by authors such as Thomas (1996) Muraleedharan (1997) and Anjana Shankar (1994) For the purpose of the present analysis of returns to the actors in the medicinal plants sector; the following channels have been used.

Marketing Channels in Medicinal plants

1. Collectors → Society → Federation → Industry

2. Collectors → Society → Industry

3. Collectors → Society/federation → private dealers → industry/Consumer

4. Collectors → Private dealers → Industry/Consumers

Price spread for each of the medicinal plants falling in the present sample was calculated. Price Spread for the first three channels on the average is 70 per cent, while for the fourth channel it is 60 per cent. [See tables no. 3.4 to 3.7] Price spread reflects the costs of transportation, the costs of marketing inputs such as materials used for processing and packaging and so on. In the case of medicinal plants in Kerala, costly processing or packaging does not take place at the intermediate levels. The cost of transporting is the only marketing cost incurred. Still, the intermediaries enjoy high margin. Clearly there are market imperfections that must be corrected in order to ensure the development of the medicinal plant sector.

Around 80 per cent of the medicinal plants delivered to the pharmaceutical companies come either through the 3rd or the 4th channel of transaction. Among the collectors selling directly to the private dealers (those in the 4th channel) majority are non-tribes. Clearly the private dealers play a vital role in marketing the medicinal plants. They have networks and information to mobilise resources. The AMMUs just have to give the list of raw materials required by them and the dealers deliver the goods at their doorsteps, no matter where their origin is.

Table no. 3.4 Price spread for channel-1

Sl. No	Products	collection charges (A)	sales price of gscs (B)	Sales price of federation (C)	retail price (D)	price spread (D-A)/D*100
1	<i>Kattupadavalam</i>	30	40	80	120	75%
2	<i>Kurunthotti</i>	5.5	7	12	20	72%
3	<i>Orila</i>	6	10.2	17	22	73%
4	<i>Muvila</i>	7	10	17	25	72%
5	<i>Karinkurinhi</i>	4	9	12	20	80%
6	<i>Putharichunda</i>	6.5	10	12	25	74%
7	<i>Shatavari</i>	3	5	8	15	80%
8	<i>Kacholam</i>	60	70	80	140	57%
9	<i>Chittamrithu</i>	2	3	5	6	67%
10	<i>Cherula</i>	5	6.5	10	15	67%
11	<i>Nellikka</i>	10	18	28	65	85%
12	<i>Kadukka</i>	8	11	18	30	73%
13	<i>Thannikka</i>	3	5	8	11	73%
14	<i>pathiri veru</i>	5	8	11	12.5	60%
15	<i>kumizhu veru</i>	4	6	9	10	60%
16	<i>Vayamp</i>	12	16	20	35	66%
17	<i>thippali veru</i>	7	12	18	20	65%

Source: Survey data

Table no. 3.5 Price spread for channel-II

Sl. No.	Products	Collection charges (A)	sales price of GSCS (B)	retail price (C)	price spread (C-A)/C*100
1	<i>kattupadavalam</i>	34	65	120	72%
2	<i>kurunthotti</i>	6	12	20	70%
3	<i>orila</i>	8	15	22	64%
4	<i>muvila</i>	7.5	14	25	70%
5	<i>karinkurinhi</i>	4.5	12	20	77%
6	<i>putharichunda</i>	6	12	25	76%
7	<i>shatavari</i>	4	8	15	73%
8	<i>kacholam</i>	65	85	140	54%
9	<i>chittamrithu</i>	2	4	6	67%
10	<i>cherula</i>	5	9	15	67%
11	<i>nellikka</i>	10	20	65	85%
12	<i>kadukka</i>	8	16	30	73%
13	<i>thannikka</i>	3	6	11	73%
14	<i>pathiri veru</i>	5.5	10	12.5	56%
15	<i>kumizhu veru</i>	4	6	10	60%
16	<i>vayamp</i>	13	24	35	63%
17	<i>thippali veru</i>	8	15	20	60%

Source: Survey data

Table no. 3.6 Price spread for channel-III

sl. No.	products	Collection charges (A)	sales price of GSCS (B)	sales price of private dealers (C)	retail price (D)	price spread (D-A)/D*100
1	<i>kattupadavalam</i>	32	55	116	120	73%
2	<i>kurunthotti</i>	6	10	18	20	70%
3	<i>orila</i>	8	11	20	22	64%
4	<i>muvila</i>	7	11	23	25	72%
5	<i>karinkurinhi</i>	4	8	15	20	80%
6	<i>putharichunda</i>	6	10	22	25	76%
7	<i>shatavari</i>	4	6	10	15	73%
8	<i>kacholam</i>	62	75	130	140	56%
9	<i>chittamrithu</i>	2	3	6	6	67%
10	<i>cherula</i>	5	8	12	15	67%
11	<i>nellikka</i>	10	14	35	65	85%
12	<i>kadukka</i>	8	12	25	30	73%
13	<i>thannikka</i>	3	5	9	11	73%
14	<i>pathiri veru</i>	5.5	7	11	12.5	56%
15	<i>kumizhu veru</i>	4	6	8	10	60%
16	<i>vayamp</i>	12	16	30	35	66%
17	<i>thippali veru</i>	7	11	20	20	65%

Source: Survey data

Table no.3.7 Price spread for channel-IV

Sl. No.	products	Collection charges (A)	sales price of private dealers (B)	retail price (C)	price spread (C-A)/C*100
1	<i>kattupadavalam</i>	50	116	120	58%
2	<i>kurunthotti</i>	8	18	20	60%
3	<i>orila</i>	9	20	22	59%
4	<i>muvila</i>	8	23	25	68%
5	<i>karinkurinhi</i>	5.5	15	20	72%
6	<i>putharichunda</i>	9.5	22	25	62%
7	<i>shatavari</i>	5.5	10	15	63%
8	<i>kacholam</i>	70	130	140	50%
9	<i>chittamrithu</i>	2.5	6	6	58%
10	<i>cherula</i>	6	12	15	60%
11	<i>nellikka</i>	15	35	65	77%
12	<i>kadukka</i>	11	25	30	63%
13	<i>thannikka</i>	4	9	11	64%
14	<i>pathiri veru</i>	6	11	13	54%
15	<i>kumizhu veru</i>	4	8	10	60%
16	<i>vayamp</i>	15	30	35	57%
17	<i>thippali veru</i>	10	20	20	50%

Source: Survey data

Returns at Different Stages in Transaction of Medicinal plants

A comparison of the share of each actor in the market value of the product will throw light on the effectiveness of the present distribution system in protecting the interests of the society as a whole. Such an analysis for the four channels of distribution in medicinal plants is attempted here.

Table no. 3.8 depicts the returns at each stage in channel-1. On the average, the share of collectors is 30 per cent of the retail price; the largest share is taken by the wholesale buyer, viz, 33 per cent. In most cases, the wholesale buyer is the medicine manufacturer. GSCSs get 15 per cent and the federation gets 22 per cent. The federation still makes losses since it does not always succeed in selling the materials during the year in which it purchases the materials. Since it does not have proper storage facilities, wastage takes place.

In the second channel [table no. 3.9], the share of the collectors is higher at 32 per cent while GSCSs get 27 per cent and the industry gets 41 per cent. It is clear that the societies can earn better returns through direct contact with the industry.

The third channel [table no.3.10] also keeps the share of collectors the same as first channel. The largest share is accrued to the dealers who get 35 per cent. GSCSs get 15 per cent and the industry gets 17 per cent.

In the fourth channel [table no 3.11], the collectors get a better share of 39 per cent. The private dealers get a share of 42 per cent while the industry get a share of 19 per cent.

In the first two channels, the share of the industry is higher than the others. Such higher gain by the industry is not leading to a lower price of the medicines manufactured because only a small part of the total quantity bought come through these channels. Even if this happens, it is difficult to say whether keeping industry's purchase price for medicinal plants down could result in any welfare gain by the society. This is for the reason that many other costly inputs are used for preparing medicines. What do make a difference to the welfare of the society are better collection charges.

The 4th channel has the collection charges higher than the rest. That means selling to the middlemen leaves the tribal collectors better off. This does not undermine the importance of the GSCSs, it points out that it is the presence of the societies that is keeping the collection charges at the present level. Despite the low collection charges paid by the societies, a major share of the NWFPs marketed goes through the societies.

Share of each marketing agent in the market value of medicinal plants: channel-1

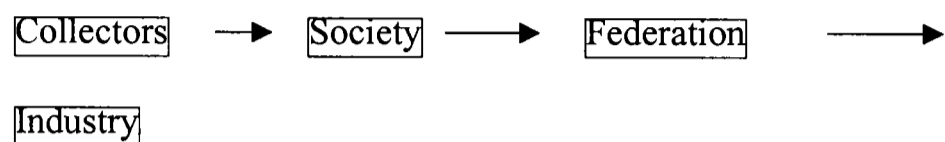


Table no. 3.8

Sl. No.	products	share of collectors	share of gscs	share of federation	share of industry
1	<i>kattupadavalam</i>	25%	8%	33%	34%
2	<i>kurunthotti</i>	28%	8%	25%	39%
3	<i>orila</i>	27%	19%	31%	22%
4	<i>muvila</i>	28%	12%	28%	32%
5	<i>karinkurinhi</i>	20%	25%	15%	40%
6	<i>putharichunda</i>	26%	14%	8%	42%
7	<i>shatavari</i>	20%	13%	20%	47%
8	<i>kacholam</i>	43%	7%	7%	43%
9	<i>chittamrithu</i>	33%	17%	33%	27%
10	<i>cherula</i>	33%	10%	23%	34%
11	<i>nellikka</i>	15%	12%	15%	58%
12	<i>kadukka</i>	27%	10%	23%	40%
13	<i>thannikka</i>	27%	18%	27%	28%
14	<i>pathiri veru</i>	40%	24%	24%	12%
15	<i>kumizhu veru</i>	40%	20%	30%	10%
16	<i>vayamp</i>	34%	11%	11%	44%
17	<i>thippali veru</i>	35%	25%	30%	10%

Source: survey data

Share of each marketing agent in the market value of medicinal plants:

channel-2

Collectors → Society → Industry

Table no. 3.9

Sl. No.	products	share of collectors	share of GSCS	share of industry
1	<i>kattupadavalam</i>	28%	26%	46%
2	<i>kurunthotti</i>	30%	30%	40%
3	<i>orila</i>	36%	32%	32%
4	<i>muvila</i>	30%	26%	44%
5	<i>karinkurinhi</i>	23%	38%	39%
6	<i>putharichunda</i>	24%	24%	52%
7	<i>shatavari</i>	27%	27%	46%
8	<i>kacholam</i>	46%	14%	40%
9	<i>chittamrithu</i>	33%	33%	34%
10	<i>cherula</i>	33%	27%	40%
11	<i>nellikka</i>	15%	15%	70%
12	<i>kadukka</i>	27%	27%	46%
13	<i>thannikka</i>	27%	27%	46%
14	<i>pathiri veru</i>	44%	36%	20%
15	<i>kumizhu veru</i>	40%	20%	40%
16	<i>vayamp</i>	37%	31%	32%
17	<i>thippali veru</i>	40%	35%	25%

Source: Survey data

Share of each marketing agent in the market value of medicinal plants:
channel-3

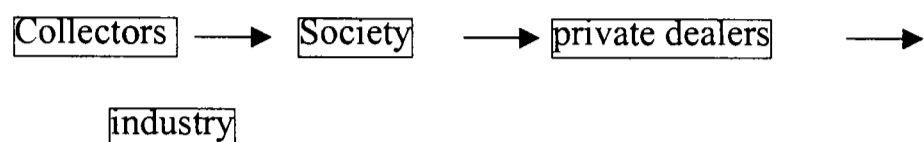


Table no.3.10

Sl. No.	Products	share of collectors	share of gscs	share of dealers	share of industry
1	<i>kattupadavalam</i>	27%	19%	46%	4%
2	<i>kurunthotti</i>	30%	20%	30%	20%
3	<i>orila</i>	36%	14%	41%	9%
4	<i>muvila</i>	28%	16%	36%	20%
5	<i>karinkurinhi</i>	20%	20%	35%	25%
6	<i>putharichunda</i>	24%	16%	44%	26%
7	<i>shatavari</i>	27%	13%	27%	33%
8	<i>kacholam</i>	44%	9%	36%	11%
9	<i>chittamrithu</i>	33%	17%	50%	0%
10	<i>cherula</i>	33%	20%	27%	20%
11	<i>nellikka</i>	15%	6%	32%	47%
12	<i>kadukka</i>	27%	13%	40%	20%
13	<i>thannikka</i>	27%	18%	36%	19%
14	<i>pathiri veru</i>	44%	12%	32%	12%
15	<i>kumizhu veru</i>	40%	20%	20%	20%
16	<i>vayamp</i>	34%	11%	40%	15%
17	<i>thippali veru</i>	35%	20%	25%	20%

Source: Survey data.

Share of each marketing agent in the market value of medicinal plants:
channel-4

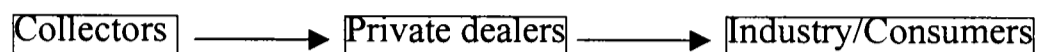


Table no. 3.11

Sl. No.	Products	share of collectors	share of private dealers	share of industry
1	<i>Kattupadavalam</i>	42%	50%	8%
2	<i>Kurunthotti</i>	40%	40%	20%
3	<i>orila</i>	41%	50%	9%
4	<i>muvila</i>	32%	48%	20%
5	<i>karinkurinhi</i>	28%	48%	26%
6	<i>putharichunda</i>	38%	46%	16%
7	<i>shatavari</i>	37%	30%	33%
8	<i>kacholam</i>	50%	39%	11%
9	<i>chittamrithu</i>	42%	58%	0%
10	<i>cherula</i>	40%	40%	20%
11	<i>nellikka</i>	23%	31%	46%
12	<i>kadukka</i>	37%	43%	20%
13	<i>thannikka</i>	36%	45%	19%
14	<i>pathiri veru</i>	46%	38%	16%
15	<i>kumizhu veru</i>	40%	40%	20%
16	<i>vayamp</i>	43%	43%	14%
17	<i>thippali veru</i>	50%	30%	20%

Source: Survey data.

This is because, action such as cutting the license or membership to the societies will be taken against them if caught selling to the dealers. They sold to the private dealers only those items, which are not accepted by the societies. Other items are sold to private dealers secretly when the collectors face some urgent need of money.

Although the GSCSs could get a share of 15 to 27 per cent it is not always able to realise the potential because of inefficient marketing, bureaucratic bottlenecks, lack of storage facility, and so on. The societies sometimes are not able to sell the entire quantity of products procured by them in the same year. This sometimes causes wastage due to the lack of storage facility.

Selling directly to the industry is beneficial to the societies. A regular tie up with the industries could lead to better movement of the goods and by doing this the societies could provide better service to its members. But this is not happening because of bureaucratic problems. The employees get fixed salaries and they have no incentive to improve the efficiency of the system.

Conclusion

Majority of medicinal plants utilised by the pharmaceutical companies in Kerala come from wild resources. The legal right to collect

these materials from the wild is only for the tribal people of Kerala. Still there are some illegal players operating in the field. The organisations authorised for marketing the products, viz, the GSCSs, are inefficient and most of the transactions take place through private channels. The competition from the GSCSs has, however, resulted in the private traders paying better collection charges. Even with the higher charges paid by the private dealers, the collectors are at disadvantageous position since it is obligatory for them to sell to the societies. This is leading to over-exploitation of the natural resources. Means for controlling the depletion of the natural resources are discussed in chapter- 4.

Reference

Achary, S.S. & Agarwal,N.L.(1987), Agricultural Marketing in India, Oxford &IBH Publishing Co.

Muraleedharan, P.K, Seethalakshmi, N & Shashidharan, 1997 “Biodiversity in Tropical Moist Forests: A Study of Sustainable Use of NWFPs in the Western Ghats, Kerala, KFRI Research Report no.133.

Thomas, Philip 1996 “Dynamics of Co-operative Marketing in Tribal Economies- A Study of Non Timber Forest Produce Marketing in Kerala”, Thesis Submitted to the Department of Applied Economics, Cochin University of Science and Technology.

CHAPTER - 4

Local Returns and exploitation of Forest Resources - A Qualitative Exploration

Local Returns and Exploitation of Forest Resources

– A Qualitative Exploration

Forests are reservoirs of valuable natural resources, which provide raw materials for industry as well as planting materials for agriculture. As far as medicinal plants are concerned, many species are not domesticated and the wild resources are facing extinction. Conservation of forest resources is obviously the need of the hour. Over-consumption of natural resources is caused by demand side as well as supply side factors. On the demand side, there is increasing popularity of natural products. Public boycotts of goods that are produced by over-using scarce natural resources are identified as effective methods for reducing over-consumption (Brown & Cameroon, 2000). In the case of medicinal plants it is not prudent to manipulate the demand side factors because commercialisation of medicinal plants could boost the rural economy and the medicines based on them are very promising. Any measure for reducing the demand for medicinal plants would have negative impact on development. Therefore reducing the supply of naturally grown medicinal plants and increasing the supply of cultivated plants is the solution. However, this should be done in a way that the sustenance of the tribes dependent on these resources is not affected. In this chapter, it is inquired

whether enhancing the returns to the tribes would make them reduce the exploitation of wild plants to more sustainable levels.

Socio-economic aspects of harvesting wild medicinal plants

Ninety-two per cent of the people interviewed for the study are engaged primarily in collection NWFPs. They have forest department's wage labour for three to four months every year. The medicinal plants that are collected most frequently are *pathiri*, *kurunthotti*, *orila*, *muvila*, *maramanjil* etc. which are easily available during their season and these plants can be collected in large quantities. Apart from that they collect frequently the products such as *kunthirikum* (Lac), shikakai, honey etc. But *shatavari*, *kattupadavalam*, *koduveli* etc. are rare and cannot be collected in saleable quantities in one visit to the forests. Further, the societies do not encourage the collection of other plants. However, in times of difficulties like illness or contingencies like marriage of a family member, they try hard and gather as many marketable plants as they can and sell them to the private dealers. Thus monetary returns from medicinal plants are very crucial in emergencies.

Some of the gatherers carry rice, tapioca or pulses with them during visits to the forests, cook food in the forests and stay there until they collect materials worth a target amount of money. Some stay in the

forests for 2-3 days in a week, eating forest food such as fruits and rhizomes. Some of them go alone, some visit the forest as a group of two or three men and in some cases the members of a family except children below 8 years go to forests. Visiting forests is a part of their life and it is neither possible nor fair to make them withdraw from the forests.

Sixty-four per cent of the people falling in the sample have own house and the remaining 34 per cent live in their parents' house. On the average, each of the houses is built in 5 cents of land. In addition to that, 55 per cent of them have land allotted to them for agricultural purposes, by the forest department. The average area of agricultural land allotted to them is 8 cents. But only 20 per cent are engaged in agriculture. Thirty-five per cent have livestock such as goat and poultry. [See box no.4.1.] Others feel that the wild elephants will destroy the crops and the tigers and foxes will eat up the livestock. Anyway, the earnings from agriculture and livestock are not very significant in the households. The major share of their income is from Non-Wood Forest Products. On the average, the annual income from NWFPs accrued to a person who regularly collects these materials for the period of the study is roughly Rs. 15750/-. The average income from the Forest Department's labour is Rs. 6840/-.

R
330.123.7 : 633.88 (548.3)
ANIN

Box no. 4.1

1. Number of people interviewed	: 375
Male	: 329
Female	: 46
2. Literacy rate	: 77%
3. Housing :	1room: 27% 2rooms: 32% more: 5%
	staying with parents: 36%:
4. Average land holding around the houses	: 5 cents
5. Percentage having land allotted for agriculture	: 55
6. Average area of agricultural land allotted to them	: 8 cents
7. percentage occupied in agriculture	: 20
8. Percentage owning livestock	: 35
9. Average yearly earnings from NWFP collection	
per head*	: Rs.15750/-
10. Average yearly earnings from labour per head*	: Rs.6840/-
11. Average yearly earnings from	
agriculture/livestock	: not available
12. Average yearly expenditure	: Rs. 22425/-

Source: Survey Data

*for persons whose prime occupation is NWFP collection

G18647



As described in chapter three, the collectors get only a small portion of the market value of the medicinal plants. In a bid to maximise earnings, they rely on unsustainable collection practices such as cutting the branches of trees to collect the fruits, collecting the entire roots or bark at a time and so on.

Importance of medicinal plants in the healthcare of the *adivasis*

Eighty-four per cent of the respondents use raw medicinal plants collected by them for treating minor illnesses such as fever, cough, indigestion, body pain etc. Some commonly used remedies are:

for fever - an extract of *orila* (*Urarialago podioides*)

or *panikoorka* (*Anisochilus carnosus*)

for cough – *atalotakam* (*Adhathoda zylanica*)

for indigestion – *vayambu* (*Acorus calamus* Linn)

or *anachukku* (*Solanum stramonifolium*)

for pain in joints – *karinkurinji* (*Nilgirianthus ciliatus*)

for head ache – *munja* (*Premna herbacea* Roxb)

for mouth ulcer – *karinochi* (*Vitex nigundo*) or *arya veppu* and so on.

Thus these plants are very crucial in the primary healthcare of the *adivasis*. In cases of moderately serious diseases, where they have to approach any medical practitioners, then 73 per cent approach the health

centres established by the Government, where modern medicines are prescribed. The dependence on modern medicines is partly because of they are provided in the health centre and partly because of the fast healing. Fifteen percent rely on Ayurvedic medicines and only 8 per cent approach the tribal vaidyans. In cases of more serious diseases, 94 percent rely on modern medicines. [See Table no. 4.1] As a result the useful know-how of the tribes which could keep the cost of healthcare low, is being eroded.

Table no.4.1

**Importance of medicinal plants in the health care
of the *adivasis***

Type of illness	Healthcare method*				
	Raw medicinal Plants	Tribal medicine	Ayurveda	Allopathy	Total
Minor	314 (84)	61 (16)			375
Moderate	15 (4)	29 (8)	57 (15)	274 (73)	375
Serious		7 (2)	14 (4)	354 (94)	375

Source: Survey data

* Percentages of raw total in parentheses.

Since the collection of NWFPs contributes to the major share of the tribal collectors' income and they depend on medicinal plants for primary healthcare, reducing the extraction of medicinal plants from the forests is bound to affect the subsistence of the adivasis. At the same time, if the resources are exploited at the current rate, they will be left with no resources at all in the future. The following section discusses whether higher collection charges could induce them to reduce harvesting.

Collection charges and Harvesting Intensity

By the traditional work-leisure principle if the income effect of a wage hike is greater than the substitution effect, then persons offer less of their labour, as wages increase. Treating collection charges as wages, we want to explore the relation between wages and harvesting intensity. For quantitative analysis, data on the quantity sold at both lower and higher wages is required. Two rates at which the tribes sell the materials are available, viz., the official rate and the rate at which the private dealers buy. However, it is obligatory for the tribes to sell the materials to the societies, therefore the quantities sold to these two buyers are not guided by the collection charges. Hence empirical estimation of the impact of wage hike is not possible. In the present study only qualitative data were used for the purpose. [See table no. 4.2]

Survey data show that 74 per cent of the respondents visited forests keeping a target in mind. Some of them returned after collecting materials worth a target amount of money and some returned after collecting a target quantity. They visited the forest again after all the income earned was spent off. They felt that collection of medicinal plants is a tedious and risky job. Evidently more income per the quantity of collected materials would reduce the frequency of visits to the forests and reduce harvesting intensity.

Table no. 4.2

Motive for visiting forests

Prime motive for visiting the forests	Number of respondents	percentage
Target return:		
Quantity	53	14
Money	224	60
Fondness to forests	68	18
Others *	30	8
Total	375	100

Source: Survey data

* those who visit the forests only when no alternative work is available

Eighteen percent of the respondents go to the forest with their family; in each visit, they stay in the forest for some days and collect as much materials as they can. They enjoy being in the forests and a hike in collection charges may not reduce the frequency of their visits to the forests. However, it is possible that at least some of them may prefer more leisure. For the remaining 8 percent, collection of NWFPs is not the primary occupation. They collect the plants only during the monsoon, when no alternative work is available. Better collection charges are not likely to induce them to increase the visits to the forests, since they prefer wage labour to collection of NWFPs. But it is likely that at least some of them harvest more intensively in each visit.

Moreover, when the collectors are in urgent need of more money 66 per cent of them sell the collected materials to the private dealers secretly instead of relying on harvesting more. Twelve per cent of the respondents harvested more and 22 per cent borrowed money. Apart from that, all the respondents complain that since they visit the forest, whenever there was a theft of timber from the forest, the officials first question them for information about the thieves. Majority of the respondents harvested the forest resources just enough to meet their day to day requirements because harvesting from the forests is a tiresome job

and they often get wounded by thorns or even by wild animals. Thus generally, better collection charges are bound to result in more controlled harvesting.

Means for increasing collection charges

As explained in the previous chapter, the reason for low collection charges is market imperfections. The returns to the collectors could be raised by a tie-up between the societies and the industry. Some of the societies do sell materials directly to the industry at times. This should be done regularly through some form of agreements. Since the supply is from natural sources, fulfilling the quantity agreed upon may not be always realised. Still initiatives in that direction could be taken.

Another option is for the industry to create an environment in which the companies can buy the goods directly from the collectors. This could eliminate official as well as unauthorised middlemen from the scene. But this requires infrastructure such as collection centres, transportation facilities, and so on. Infrastructure could be developed through self-help groups of the adivasis or the manufacturing units. The industry does have an association and it may be suggested that the Ayurvedic Medicine Manufacturers' Association to take up the role of

middlemen. The association, at present, is interested only in their traditional role of lobbying.

Local returns through cultivation and processing of medicinal plants

Along with the efforts to provide better collection charges to the collectors, alternative sources of income should also be developed. The tribal people could be encouraged to grow medicinal plants in the land provided to them by the government for cultivation. Only 36 per cent of the tribal people who have agricultural land raise any crop. Among them 8 persons grow medicinal plants. The rest of the land is lying idle and could be engaged in the cultivation of medicinal plants to generate income. The constraint of marketing faced by the farmers will not be there in the case of tribes, since they have established channels of transaction. Apart from that, they will be free to sell the cultivated plants wherever they want. The societies should encourage this by providing planting materials at subsidised rate. Cultivation by the tribes could strengthen the tie-up between the societies and the industry. The quantity required by the industry would be supplied by them through collective action, even when the natural supply falls short of the requirement. In this case also the initiatives should be taken by the manufacturing units. The planting materials from the nurseries of the manufactures could be distributed to

the adivasis for cultivation and at the time of harvesting, the product could be bought back by the units. Two units have already taken initiative in this direction. Nagarjuna Herbal Concentrates Limited and Vaidyarathnam Ayurveda Oushadhasala have contacted some of the interested tribes through the krishibhavans in Thrissur and formed agreement. The problem is that the agricultural land allotted to the adivasis that is lying idle is mostly in Wynad district and the medicine manufacturers have not approached the adivasis in that region.

Apart from that, the manufacturers can benefit from such contacts with the adivasis since they can market the traditional know-how of the adivasis. The Tropical Botanical Garden and Research Institute has developed a drug called 'Jeevani' based on the knowledge of the Kani tribes of Agastyarkudam, Thiruvananthapuram. The marketing right was patented to the Coimbatore Arya Vaidya Pharmacy. The kanikars are to receive royalty of the know-how and 50 per cent of the commercial returns. The pharmacy has reached on an agreement with the kanikars to buy the *arogya pacha*, the plant used for the drug, cultivated by the kanikars. (Kurup, 2000)

Value addition through primary processing by the collectors also could lead to better local returns. The harvested plants and plant-products

require primary processing such as cleaning, drying, powdering or peeling off bark and in some cases, making extracts out of them. Such activities can be carried out using simple techniques without any capital investment. Currently, processing taking place at the collectors'/cultivators' level is limited to cleaning and drying and in some cases peeling of the barks of rhizomes that too by very few collectors. The survey data shows that only 3 per cent of the collectors who sell directly to the manufacturing units carry out processing other than drying.

Although backward linkage to processing is weak at present, there is scope for a greater potential linkage. It is palpable from the contract into which the Kottackal Arya Vaidya Sala has entered with some of their suppliers. They have some local collectors who traditionally supply some fresh plants, leaves and rhizomes. The primary processing of the large quantity of materials acquired by them is difficult to carry out in their premises. Now the suppliers process the items on a contract basis. These include drying some rhizomes after peeling of the bark and preparing extracts from some other items. The quality of the collected materials and the processing standards are under constant scrutiny by the experts from the Vaidya Sala. Such primary processing requires very little capital,

equipment and technology and if encouraged has a great potential for employment generation.

Conclusion

Providing better collection charges and promotion of cultivation and processing of medicinal plants by the *adivasis* can check exploitation of Forest resources. For this, encouragement from the industry is required. They do realise that in future supply of raw materials may fall short of demand, but most of them want government intervention as a solution. They press the govt. to raise a medicinal plant garden. However it is not the government's duty to provide raw materials to industry. The AMMUs should realise that they should rely on self-help and encourage the farmers who are willing to cultivate medicinal plants through entering into strong contracts with them. Parallel to such an initiative, the societies should become more creative and imaginative in their marketing activities. Through better marketing, which is in tune to the present day's liberalised environment, the societies can earn more income and repatriate better collection charges to its members.

Moreover, the *adivasis* should be made aware of the importance of conserving the natural resources. They should also be given proper training on sustainable collection techniques.

All such initiatives could lead to reduced exploitation of forest resources by the tribes. But the forests could still be exploited by illegal collectors. It is the business of the authorities to implement the regulations strictly and eradicate illegal collection of medicinal plants from the forests. The measures that required from the authority's side will be discussed in chapter-6.

Reference:

Brown, Paul M. & Cameron, Linda D. 2000, "What can be Done to Reduce Overconsumption?", *Ecological Economics*, 32(2000) 27-41

Kurup, A.M. 2000, "Indigeneous Knowledge and Intellectual Property rights of Tribals: A Case Syudy" *Yojana*, Vol.44, No. 4.

CHAPTER - 5

Economic Considerations in Domestication of Medicinal Plants

ECONOMIC CONSIDERATIONS IN DOMESTICATION OF MEDICINAL PLANTS

In the broadest sense, domestication of medicinal plants is a process of increasing human inter-action with the medicinal plants. The first stage is the collection of wild medicinal plants from the forests for consumption and for income generation. The second stage is active cultivation of the plants. In the third stage, breeding and manipulation of the genetic traits of the plants take place. The collection of wild medicinal plants has already been dealt with in the previous chapters. Of these stages the second stage is very crucial at present for the sustainability of medicinal plants in Kerala. The economic aspects of cultivation of medicinal plants are discussed in this chapter.

Given the growing global demand for medicinal plants and the decreasing natural supply of them, cultivation of medicinal plants is bound to be an economic activity. Cultivation is closely related to conservation of the wild stock of these plants. However, of the 400 plant species used for production of medicines by Indian industry, less than 20 are currently under cultivation in the country (Government of India, 1997). In Kerala too, despite the growth of the Ayurvedic medicine sector, widespread cultivation of the species used by the

manufacturing units is not taking place. The purpose of the present chapter is to inquire the reasons for the lack of interest on the part of farmers and planters to grow medicinal plants on a commercial basis. The farmers make decisions on which crop to cultivate based primarily on profitability and saleability of the crops. So the focus of this chapter is on the profitability of cultivation of medicinal plants and on the issues in marketing the produce. Based on the analysis, an attempt is made to suggest measures to encourage cultivation of medicinal plants.

Cultivation of medicinal plants has a number of advantages: It can ensure a consistent, predictable and stable supply of raw materials required by the industry. Plants with desirable genetic traits can be developed. It facilitates income generation. It contributes to the protection of diminishing natural supply of the medicinal plant resources. Medicinal plants are easy to handle and transport. So they can be produced in small plots or in remote areas where other options are minimal. All these contribute to the sustainability of the sector as a whole. Apart from that promotion of their production can control migration to cities to some extent, by enhancing rural income.

Some of Ayurvedic medicine units took initiative during the period 1995-96 to promote the cultivation of medicinal plants and they promised to buy some important plants from the farmers. The krishi

bhavans provided planting materials with 90 per cent subsidy under the location specific scheme. A number of farmers were interested and initiated cultivation. However, at the time of harvesting the plants some units were not willing to buy the plants because the complementary raw materials were either not available or very costly. Some other units wanted the materials at prices lower than those agreed upon earlier. Moreover, the businessmen usually buy materials on credit and the farmers could not afford to wait for payment. These factors made the cultivation of medicinal plants risky and some farmers stopped growing medicinal plants. The plants cultivated were *atalotakam, kattupadavalam, koduveli, iruveli, neelamari, karinkurinji, vayambu, brahmi, kacholam, shamghupushpam, shatavari, chittaratha, cherula, thippali, and chittamrutu*. Out of them, only 9 fall in our sample. Different aspects of the cultivation of these plants are analysed to suggest measures to facilitate backward linkage to cultivation.

Methodology

The number of farmers involved in growing medicinal plants is observed to be very small. Among the 20 plants selected for the present study, only 9 are cultivated in Kerala on a commercial basis. Even these plants, are cultivated on a small scale. *Kacholam* is found to be cultivated on a medium scale. Cultivation of medicinal plants is found

mostly in Thrissur district, but *kacoram* is cultivated in other districts also. Thrissur district is selected as the sample area and 10 panchayaths from thrissur were taken. The medicinal plants cultivators of the area were identified using the information from Ayurvedic medicine manufactures as well as from the krishibhavans. The researcher could identify 46 persons growing at least 2 medicinal plants belonging to the present sample during the period of data collection and 10 others who abandoned it two years back. There are many others who cultivate kachoram but they are not considered for the survey since kachoram is used not only for medicinal purposes. The selected farmers belong to the following panchayats: varantharappilly, manaloor, ollur, vetilapara, vellangallur, punnayurkulam, mullassery, madathara, vadanappilly, and kodakara. All the 46 farmers were interviewed to collect primary data on costs, returns, issues related to marketing the produce, etc. The period of data collection was September to December 2001. Based on the data obtained from the 46 persons who raised medicinal plants during the period of data-collection, the average costs and returns from cultivation in one cent of land for each plant is computed. Profitability for a point of time 2000-2001 was calculated using the data obtained from the 46 farmers.

Two ayurvedic medicine-manufacturing companies are also engaged in the cultivation of medicinal plants, but their issues are different from those of farmers because they do not face the problem of marketing the medicinal plants. For this reason, they are excluded from the analysis.

Among the sample of medicinal plants the tree species are excluded from the study due to non-availability of data on yield. People just keep these tree species in their farm or garden and just sell the bark or fruits whenever someone demands it and do not keep records on how much they spent or how much they earned.

The plants that are being cultivated with the number of farmers in the sample growing them in brackets are: *atalotakam*(21), *kattupadavalam*(7), *koduveli*(3), *shatavari*(27), *kacholam*(36), *karinkurinji*(5), *chittamrithu*(8), *cherula*(3), and *thippali*(12). These plants have different gestation periods and some plants in their second or third year of age do not have any costs incurred for the period in which data were collected. Data for each farm were collected regardless of the age of the crops and figures were averaged to get a general picture.

Table-5.1 The sample of small-scale cultivators-A profile

Type of land Occupation →	Owned land	Premises Of residence	Leased land	Forest land	Total
Alternative Source of income ↓					
Agriculture	14	4	8	6	32
Business	3	4	-	-	7
Others	-	-	-	-	-
None	-	7	-	-	7
Total	17	15	8	6	46

Source: Survey Data.

The Model

Profitability is used as the tool for analysing the prospects of medicinal plants-cultivation. There are different measures for returns such as gross output per acre, farm business income per acre, net profit per acre, etc. For the present study net farm business income is used since the farmers in the sample selected for the study find it most crucial in deciding which crop to cultivate. The following definition (Khusru, 1964) for farm business income is apt for the present piece of research:

$$\text{Net farm business income (Y)} = \text{Gross output (O)} - \text{paid out cost (C}_p\text{)}$$

Here, paid-out costs rather than total costs are used because the other component of total cost, viz., the imputed costs is not a decisive factor. These imputed costs or retained costs include family labour, owned land, etc. Net farm business income as per cent of total paid-out cost is used as the measure of profitability.

For studying the availability of land, the information about the land utilised by the cultivators is used. Issues in marketing medicinal plants were analysed qualitatively, using the information on the experiences of the farmers. Only small-scale cultivation was considered for the present study because medium and large scale operation is being carried out only by the medicine manufacturers, for whom profitability does not matter.

Factors affecting the farmers' decision

Five factors influenced the medicinal plant cultivators while deciding which plant to grow in their farms. They are initial investment required, profitability, saleability, availability of land and the farmer's interest in the crop. An understanding of these factors is required for suggesting means for promoting domestication of medicinal plants. These factors are discussed in details in the following sections.

The Costs of Cultivation of Medicinal plants in Small-Scale Operation

For calculating costs of cultivation, only paid out costs are considered because the farmers want to minimise only the monetary payments made. They are willing to invest as much household labour and owned land in order to maximise returns. The components of the investment required for cultivating medicinal plants are discussed below.

A) Rental cost of land

The cost on land is considered for each farmer based on the type of his/her land occupation. One type is owned land, majority of the sample farmers fall in this category, and it includes cultivation in the premises of their houses and cultivation in the agricultural field. Since no rental cost is involved in cultivation in this case, cost on land is not considered. Another type is land occupation under lease. In such cases, cost is taken as the lease rent. Still another type is occupation of forestland for cultivation. In this case also, cost is not taken.

B) Labour costs

Labour is required for preparing the land for cultivation (that is, removing weeds and taking bunds in some cases) and for watering and applying fertilisers. Labour, for the majority of sample points is owned

labour and in most cases the cultivator and the members of his/her family spend their leisure time on medicinal plant-garden. Cost of such labour is not considered since no monetary payment is involved. In the case of hired labour, the total amount of wages paid to labourers during the period from planting to harvest is taken as labour cost. Some plants need to be planted only once. They reoccur themselves in the next season and in the subsequent years, cost of planting materials is nil.

C) Cost of planting materials

Some of the farmers collect planting materials locally and develop them in their own nursery and plant them in the field. Such practice is followed only in the case of very small scale of operation. Some others buy materials from the Medicine manufacturing units that have nurseries, or from Kerala Agricultural University or from the department of Agriculture. In the first case, the cost is calculated based on the total money spent on collecting and processing the planting materials. In the second case, the average rate at which these institutions sell the planting materials is taken as the cost on planting materials. Weighted average of these two types of costs was taken to obtain the cost of planting materials per each cent of land.

D) Cost on fertilisers

For medicinal plants, only bio-fertilisers such as cow dung, born meal or ash are used. Chemical fertilisers are harmful because they could change the composition of the plants. Apart from that, some plants die if chemicals are applied. The costs incurred by the cultivators in the sample on fertilisers are averaged to obtain the cost for each plant.

Profitability of Small-scale Cultivation of Medicinal Plants

The most important factor guiding the farmers is the profitability of cultivation. Profitability is net returns as percentage of paid out costs. Returns are calculated by multiplying average yield from cultivating in one cent of land by the average price received by the farmers for the period. Farm income for the period 2000-01 was calculated regardless of the age of the crop, assuming that the average value will give a general picture. Net income is obtained by deducting paid-out costs from returns. Profitability is computed assuming that the entire produce is sold out and the problems related to selling are dealt with separately. See table no. 5.2. More details about the components of costs and the yield for each medicinal plant is given in Appendix-II.

Table no 5.2 Profitability of cultivation of medicinal plants.

	Name of the plant/No. of farmers growing the plant	Land occupation	Type of cultivation	Costs (C)	Net income (Y)	Profitability (Y/C)*100
A	<i>Atalotakam</i> (13)	Own/forest land	Mono-cropping	1277	213	16.7
	-do- (8)	Leased land	-do-	1393.5	226.5	16.5
B	<i>Kattu Padavalam</i> (4)	Own/forest land	-do-	1585	305	19.2
	-do- (1)	Leased land	-do-	1655	375	22.7
C	<i>Koduveli</i> (2)	Leased land	Inter-cropping	335	215	64.2
D	<i>Shatavari</i> (20)	Own land	-do-	335	97	28.9
	-do- (7)	Leased land	-do-	395	89	22.5
E	<i>Kacholam</i> (30)	Own/forest land	-do-	634	536	84.5
F	<i>Karinkurinji</i> (3)	Own/forest land	Mono cropping	580	190	32.7
G	<i>Cherula</i> (2)	Own land	Mono cropping	80	24	30
H	<i>Thippali</i> (12)	Own land	Inter-cropping	890	85	9.5
I	<i>Chittamrutu</i> (2)	Own land	Mono-cropping	1275	245	19.2
	-do- (6)	Leased land	Inter-cropping	500	130	26

Source: Survey Data

Discussion

It is clear from table no. 5.2 that the cultivation of medicinal plants is profitable. The average net return from growing medicinal plants in one cent is positive for all the plants. Some plants like *thippali* show negative returns in the first year because of low yield. In the subsequent years, costs are lower and yield is higher. As a result net returns become positive. Generally cultivation of medicinal plants by micro farms is very cost-effective, provided the farmers are able to sell the produce. The costs are very low in tiny holdings because in those cases hired labour is not used. The members of the family do watering the plants, clearing weeds and applying fertilisers themselves in their leisure time. Since area under cultivation is very small, the plants get enough care even if planted closely. Insecticide cannot be applied on these plants because they are to form part of medicines and because some of these plants die if insecticides are applied. Though it involves some amount of cost reduction, there is threat from insects as a risk factor. Some farmers apply insecticides in the soil where the plants are cultivated. There are times when they fail to find market for their produce. Issues in marketing are dealt with elsewhere in this chapter.

Atalotakam: Found only in monocropping system, *atalotakam* is cultivated by 46 per cent of the sample farmers. The marketing of this plant is easier compared to other plants because it is not very common in the forests. Still at times the cultivators face difficulties in the form of crop failure and low rates offered by the dealers, when the supply is abundant.

Kattupadavalam: Only 15 per cent of the sample cultivators grow this plant, for if the plant is not cut and sold at the right time, it perishes. Most of the time, the cultivators are not able to find buyers at the time when their plants are ready for sale. Moreover, it is very difficult to raise the plant because it should be provided with '*pandal*'. Although the plant has become very rare in our forests, supply from the natural sources of other states at low rates makes marketing difficult for the cultivators.

Koduveli: this plant is cultivated by only 6 percent of the 36 cultivators surveyed for the study. The risk of damage to the plant is very high as the plant is prone to mal formation or fungal growth on the roots. It is not found in home gardens or in mono cropping systems.

Shatavari: *shatavari* is found as an ornamental plant in the premises of many houses. The plant is easy to grow and it stays for two to three years. The rhizomes can be harvested after one year but the yield

increases if it is maintained for two or three years. Still the cultivators face the problem of competition from other states. The plant is cultivated by 59 per cent of the sample farmers.

Kacholam: It can be cultivated as an under crop in rubber or coconut plantations. The risk factors involved are low compared to the other medicinal plants. Since the rhizomes are used in perfumes and cosmetics, in addition to medicines, they can be marketed easily. Therefore there is widespread cultivation of the plant. 78 per cent of the cultivators surveyed for the present study, grow the plant and cultivation is mostly in inter cropping systems.

Karinkurinji: This plant also has the problem of marketing because of the low prices offered by the dealers. Sometimes the farmers fail to sell the plants at all, because of the bulk supply from natural sources in and outside Kerala. 10 per cent of the surveyed farmers cultivate *karinkurinji*.

Cherula: This plant can be cultivated very easily. Once planted, it regenerates itself in the subsequent years and no cost of cultivation is involved. Still, the plant is not very popular among the cultivators because of its low yield. Only 6 per cent of the sample cultivators grow this plant.

Chittamrithu: The plant faces serious competition from natural sources of other states. 17 per cent of the surveyed farmers cultivated the plant and many of them have abandoned its cultivation due to the difficulty in selling the plant and the low prices.

Thippali: Attracted by the high prices of the fruits of the plant, many cultivators initiated the cultivation of *thippali*. The plant is widely cultivated in many parts of north India and its supply is abundant. Now, most of the people who started cultivation of the plant have abandoned it, because the labour charge incurred in harvesting the fruits is very high and they found it difficult to sell the product at good price. 26 percent farmers in the sample have *thippali* in their farms.

As far as medicinal plants are concerned, small scale of operation has an advantage. This is because, in small-scale cultivation, labour cost is low because the members of the family use their leisure time on these plants. Also, the crops can be planted very closely, leading to better yield per unit of land. In large-scale cultivation, the cost of watering and caring the plants is very high and if planted very closely, caring the plants becomes more difficult. Whereas in small-scale operation family labour is sufficient in watering, weeding and applying fertilisers, in large-scale operation one has to employ labourers. Since the investment is lower, the risk of incurring loss is

lower in small-scale cultivation. Moreover, putting a large area of land for cultivation of medicinal plants is risky compared to other crops. This is because medicinal plants are vulnerable to insects, prone to malformation and easily get decayed. Safe guards such as insecticides or chemicals cannot be applied on them. Since the marketing channels for cultivated medicinal plants are not properly developed, promotion of large-scale cultivation seems far from practical.

While individuals are not involved in large-scale cultivation of medicinal plants, the AMMUs cultivate on a large-scale basis, because they have ready markets in their own manufacturing units, and they do not face any risk of loss. Through cultivating, they can have reliable source of raw materials and lower input costs. Apart from that the manufacturing units can use their own waste materials as bio-fertilisers, leading to considerable reduction in cost of cultivation.

Availability of Land

Availability of land is a crucial issue in promoting the cultivation of any crop. It is not advisable to replace the crops in farms with medicinal plants because of low yield and low price. Therefore, a comparison of the returns from other plants and medicinal plants is not attempted in the present study. One option is utilising the wasteland for producing medicinal plants. According to estimates, the percentage of

wasteland in Kerala to total geographical area is only 3.73 and total non-forest wasteland in Kerala is 10.53 lacs hectares (Eswaran, 2001). In order to see whether it is possible to convert these areas into medicinal plant gardens, investigations on the suitability of soil and on the ownership of the land are required. The present study concentrates only on the land utilised by the contemporary medicinal plant growers.

Among the farmers surveyed for the present study, 33 per cent use the premises of their houses, 37 per cent use a small portion of their agricultural land, 13 per cent use a portion of the forest area occupied by them and 17 per cent use leased land for cultivation of medicinal plants.

Cultivation of medicinal plants in the home gardens and in micro holdings where land cannot be put into alternative commercial use is highly profitable. Women in the household can spend their leisure time in the medicinal plants and earn some additional income to the family without costing much. Growing these plants along the boundaries of agricultural farms is found to be very and cost-effective because applying fertilisers do not require additional money or energy and because commercially usable land is not employed.

Putting a part of the agricultural field is found in remote areas. In forest areas also, comparatively large area of land is put aside for

medicinal plants. This is for the reason that medicinal plants are easier to handle and transport. Only the farmers who have regular tie up or contracts with the manufacturing units carry out cultivation of medicinal plants in leased land.

The data supports the viability only small-scale cultivation of medicinal plants. However, it is suggested that large-scale cultivation can be operated in rubber, teak or coconut plantations as an additional source of income. It is particularly viable in the early years of plantation when return from the main crop is nil. Inter cropping of medicinal plants in plantations is supported by agriculturists also, since 50 per cent shade is apt for the growth of these plants.

Although availability of land for agricultural purpose is a crucial issue in Kerala, for medicinal plants it is somewhat reduced because micro farms, home gardens and remote areas can be put into their cultivation. What is more decisive is the marketing of the plants.

Issues in marketing

The most serious constraint faced by the medicinal plant growers is the problem of marketing the produce. The issue is especially crucial because the medicinal plants dry away unless harvested at the right time and processing at the farmers' level is not taking place. They have to compete with the natural supply of

medicinal plants, which involve only the cost of collecting. Wild materials from other states are available at comparatively lower prices and the dealers prefer such materials. Manufacturing companies, in turn prefer buying from the dealers since they deliver goods in bulk quantities, often for credit. The dealers approach the cultivators only when they fail to get enough quantity to meet the demand of the manufacturers. When such shortage arise for a particular plant, the farmers who have the plant in their garden get very good price. Similarly when the price of some important complementary raw material falls suddenly, medicines based on them are produced in large quantities and the medicinal plants used in these products are procured at high prices. If the natural supply of the plants is out of season at that moment, the cultivators gain. Some of the manufacturers even rely on adulteration when there is shortage. All these factors make the saleability of cultivated medicinal plants highly unstable and the returns from the plants very unpredictable.

The manufacturers could actually buy at lower rates if purchased directly from the cultivators. Among the manufacturing units surveyed for the present study, only 12 per cent buy materials directly from the cultivators/gatherers. Of this 12 per cent many buy directly from the cultivators only occasionally. Still there are

companies, which have, sub-contracting with cultivators. In such cases, the risk of cultivators is reduced. Even after entering into contracts, sometimes companies refuses to buy the medicinal plants when they are ready for harvesting if the price of some important complimentary raw material rises suddenly. At times, the farmers are able to negotiate and fetch better prices than that agreed in the contract. Some farmers sell the plants to retail sellers and two farmers in the sample have own retail shop for selling raw medicines. Some farmers, who have other crops as well, sell medicinal plants to the dealers who buy other products. Still others keep the plants in their premises for windfall gains. See table no. 5.3

Table no 5.3 Selling outlets of cultivated medicinal plants

Sl. no.	Marketing channel	No. of farmers falling in each channel	Proportion of total quantity in each channel
1	wholesaler	20 (55.5%)	51%
2	retailer	5 (14%)	7 %
3	Industry	11 (30.5%)	42%

Source: Survey data

The problem of marketing can be tackled through the farmers forming self-help groups that could do marketing collectively and through entering into contracts with the pharmaceutical companies.

Unless the farmers supply the plants in bulk quantities, enabling such contracts would be difficult. Therefore, it is necessary that more people cultivate these plants. Currently some farmers cultivate these plants despite the unstable markets, because they have interest in traditional remedies. Therefore a programme to educate the farmers on the effectiveness of the traditional medicines and their commercial importance seems beneficial.

Farmers' interest in medicinal plants

The owners of micro farms cultivate medicinal plants because alternative economic utility of land is negligible. The people who put aside a part of their agricultural land for medicinal plants and those who grow medicinal plants along the boundary of land do it because of their affinity to medicinal plants and the reliance on traditional medicines. Therefore more people could be persuaded to cultivate medicinal plants through widespread campaign.

Conclusion

The cultivation of medicinal plants is found to be profitable, but large area of land cannot be devoted to it because of the uncertainty factor. However, it is viable to raise the plants in plantations and in areas where alternative commercial use of land is not possible. Some of them can be grown as ornamental plants with monetary returns. The

biggest constraint to the potential benefits from cultivation is marketing the produce. Among the three selling outlets, industry is crucial. Sub contracting with the industrial units is highly beneficial, despite the fact that some units fail to fulfil the contract frequently. It is observed that the farmers who have tie-ups with the industrial units carry out cultivation more intensively and even in leased land. There are practical difficulties for the units to enter into such agreements because the farmers are able to offer only small quantities of materials. Some large units like the Kottackal Arya Vaidyasala have contracts with a few farmers who together provide the required quantity. Other units should follow the example. The farmers on their part should form self-help groups, which could collectively market the small quantities cultivated by them.

Female participation is particularly suggested for their leisure time and the wasteland in the premises of the houses could be engaged in income generating activities. There are incidences of rural women around us organising themselves and engage in income generating activities like the story from the village of Bankura in West Bengal (Singh, 2000). A women *samity* in the Bankura village obtained degraded land on lease from the villagers in 1980 and developed it into thick tree plantation with tassar silk worms reared in them. Learning

from the story more *samities* were formed and now there are 1500 women from 36 villages in the *samities* which have agricultural and allied activities in leased land. In Kerala degraded land is not available, still women can join together to market the plants cultivated in the premise of their houses. The *ayalkoottams* formed during the process of people's planning could take initiative. Krishibhavans should continue to provide planting materials and methodologies for cultivation.

The *adivasis* can also grow medicinal plants in the land provided to them for agricultural purposes. As mentioned in chapter 4 only 36 per cent of the tribes who have agricultural land allotted to them utilise the land. Rests of them feel that elephants will eat up the crops. Such people could be induced to raise medicinal plant gardens by giving planting materials free of cost. They can also collect the materials from forests. The societies should be willing to buy their crops along with the materials collected from the forests.

Apart from the sustainability aspect, domestication of medicinal plants, if popularised, has the advantages of enhancing rural income, empowerment of women, saving a heritage of human knowledge, contributing to conservation of bio-diversity and improving the output from plantations.

References

Government of India, 1997, Report of the Committee on Medicinal plants submitted to GOI in May, 1997. Source: <http://mohfw.nic.in/ismh/mcmain.htm>

Khusru, A.M. 1964, "Returns to Scale in Indian Agriculture" ; Indian Journal of Agricultural Economics, Vol. XIX Nos. 3&4, July-December.

Source: **Eswaran, V.B.** 2001, <http://www.india-seminar.com/2001/499.htm>

Singh, Nalini, 2000, "The Bankura Story", Wastelands News, Vol.15. No.3.

CHAPTER - 6

Sustainability of Medicinal Plants through Adaptive Management

Sustainability of Medicinal Plants through Adaptive Management

Equitable sharing of the benefits of commercialisation of medicinal plants is necessary for the sustainability of medicinal plants. This can be brought about only through fostering linkages in the sector. Linkages between the GSCs, which market the plants and the medicine manufacturers, and between the cultivators of medicinal plants and the manufacturers should be fostered. At present there are manufacturers who have tie-up with cultivators and societies. Still, they have to develop into strong sub-contracting in order to facilitate sustainability. To bring about such an environment, an adaptive management system should be evolved.

Adaptive management as a resource management technique was introduced in the 1970s. Now it is accepted globally as the best technique for managing natural resources. Adaptive management tries to incorporate the views and knowledge of all interested parties and accepts the fact that management must proceed even if all the required information are not available (Johnson, 1999). Developed by ecologists to accommodate uncertainty and complexity in ecosystem management, it is now linked with social science perspectives. The working definition for the British Columbia Forest Service Adaptive Management initiative is “adaptive management is a systematic process for continually improving

management policies and practices by learning from the outcomes of the operational programmes” (government of British Columbia, 2000).

The key characteristics of adaptive management are: acknowledgement of uncertainty about what policy is best for the issue; planning and implementing an initial policy; monitoring of key response indicators; incorporation of the results into future decisions. 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). Typically, adaptive management begins with a conference in which all the interested parties discuss the problem, sharing the information available to each of them. Then models are developed to analyse the data and set up goals. Then a management plan that will pursue the goals as well as generate new information to reduce the data gap is evolved. The plan is then implemented along with a monitoring plan and new data are analysed to revise the management plan. Although adaptive management may be very expensive to initiate, in the long run it is paid off if it leads to effective management (Johnson, 1999). In order to discuss the prospects of adaptive management system for medicinal plants, it is necessary to see what the current system is. A review follows.

The present system of managing medicinal plants in India

There are no policies or regulations exclusively for the conservation or management of medicinal plants. Their conservation is covered under the Indian Forest Act, the Forest Conservation Act, 1980, and the Wild Life Protection Act (1972), which are enforced by the Forest Departments(FDs) and the Indian government's Directorate of Wild Life Preservation. In forest policies, NWFPs get mentioned, but without clear objectives and strategies. If medicinal plants are to realise their potential for contributing to rural poverty alleviation and foreign exchange earnings, there should be well-articulated policies for promoting development of the plants. Equally important is the need for implementing the policy and enforcing rules and regulations. In India, there is no central or state level agency with a clear mandate for the conservation of medicinal plants.

Foundation for Revitalisation of Local Health Traditions (FRLHT), a Non Government Organisation has made considerable efforts in conserving the wild medicinal plants in the four South Indian States. It had established a network of 8 medicinal plant conservation areas in Kerala during 97-2000. Harvest of specified plants from these areas was regulated strictly. These areas were in Peechi (Thrissur), Athirappally

(Chalakkudi), Kulamavu (Idukki), Iravikulam (Munnar), Agastayar (Thiruvananthapuram), Thriveni (Ranni), Silent valley (Palakkad) and Thirunelly (Wynad). The foundation identified some species that are facing extinction in these areas. The identified plants were protected by fencing them and controlling the extraction from the plants for the specified period. After the period, the plants were left to nature. Further the local tribes were given training in the right level and method of harvesting.

The National Council for Plant Genetic Resources and the Central Institute for Medicinal and Aromatic Plants (CIMAP) are actively involved in R&D on medicinal plants. However these institutions have little collaboration with the stakeholders in the sector.

Five Year Plans and medicinal plants

In every FYP an allocation is made for the Indian System of medicine and Homeopathy, mainly for the purpose of Research and Development in the field. The conservation of medicinal plants did not get attention until the 8th plan. In the 8th plan, it was declared that the cultivation and conservation of medicinal plants would be supported in the State and joint sector farms. In 1995 a department for ISM&H was set up. Apart from supporting R&D in the field and quality control, the

department has initiated a scheme for development and cultivation medicinal plants by providing central assistance. Some states like Himachal Pradesh has set up herbal gardens and linked them to production units of drugs. In Kerala any such effort is not visible.

The 9th plan envisaged the development of medicinal plants with the co-ordination of Departments of Bio-technology, Indian System of Medicine and Homeopathy (ISM&H), and Horticulture, various research institutions and gene banks. At the village level, cultivation was to be developed through a collaboration of the Agriculture Department and Department of Rural Development. The central assistance to cultivation of medicinal plants has not been utilised properly in Kerala until now.

Initiatives in Kerala

In Kerala, under the location specific schemes of the Krishibhavans, an initiative was made to promote the cultivation of medicinal plants at the village level. Under the scheme, planting materials were distributed to interested farmers at subsidised rate. However the scheme failed because the farmers faced problems in marketing the output.

The Forest Department (FD) established medicinal plant gardens on a broad-basis in Begur, Oonchavayal and Neduthani in Wynad. The first

one was World Bank's project and the remaining two were under National Rural Employment Programme (NREP). These gardens with 46 species were maintained during the period 1984-1993. The cost of production was high in these gardens because 10 to 13 hectare of land was brought under cultivation without proper management practice. In the absence of linkage to the market the gardens turned out to be unprofitable. Now the gardens are there only for name and commercial activities were abandoned in 1993. The only benefit from the gardens was that a number of *adivasis* could employ their labour in them. See box no. 6.1 With the World Bank's initiative a plan for the conservation and development of medicinal plants is being implemented. It involves promotion of cultivation of medicinal plants. Under the scheme, a small garden of medicinal plants is being established and maintained in every Range Office of the Forest Department. It is not carried out as a commercial activity, only specimens of rare species are kept in the gardens.

Currently, the right for the collection of medicinal plants and other NWFPs is conferred on the tribal population and marketing is done by tribal co-operatives in some states and corporations like Forest Development Corporation, Tribal Development Corporation etc. in some states.

Box no. 6.1

Details of medicinal plant gardens raised in Social Forestry Division, Wynad

a) COSTS

I Begur (area of garden: 10Ha.)

Year of plantation	planting cost	maintenance cost	no of plants
1984-85	Rs. 57,416	Rs. 3,61,596	50,000

II. Oonachavayal (area of garden: 13Ha.)

Year of plantation	planting cost	maintenance cost	no of plants
1984-85	Rs. 1,37,935	Rs. 3,72,909	65,000

III. Neduthani (area of garden: 10Ha.)

Year of plantation	planting cost	maintenance cost	no of plants
1985-86	Rs. 1,29,805	Rs.1,85,510	50,000

YIELD

Total yield upto 1987-88 was Rs. 7717.25. yearwise and gardenwise details until 1987-88 are not available.

Year	yield from		
	Begur	Onchavayal	Neduthani
1988-89	69	1512	38
1989-90	4113	-	-
1990-91	385	-	1840
1991-92	-	-	15912
1992-93	3093	788	2100

Source: Office of the Assistant Conservator of Forests, Social Forestry, Wynad

In Kerala, the right for marketing medicinal plants and other NWFPs is with the Girijan Service Co-operative societies and their Apex body, The Kerala State SC/ST Development co-operatives Federation. Different studies have proved that these institutions have failed to meet their goals. The poor status of the tribes and the inefficiency of the societies have resulted in over-exploitation of the forest resources. In the absence of strict implementation of regulation, non-tribes also collect medicinal plants illegally from the forests. Hence there is need for an institutional restructuring.

Prospects for adaptive management

The first step in adaptive management is to bring all the stakeholders in the sector together to share the information available to each of them and to present their requirements. Organising such a meeting requires much time and energy. The Forest Department, NGOs like FRLHT, and R&D institutions like TGBRI or CIMAP could take initiative to provide a platform for such a meeting. Then a comprehensive management plan should be developed and implemented, which should then be scrutinized from time to time so that the plan can be revised to take care of the shortcomings.

Required Institutional Restructuring

The management problem for medicinal plants involves three major aspects. They are: providing fair returns to the gatherers and cultivators, providing regular supply of raw materials to the industry and keeping the costs of production of traditional medicines low so that more people can afford them. Suggestions put forward in the present study are:

The first step towards sustainability of medicinal plants is raising local returns. This could be achieved through better collection charges to the tribes. In the current official system of marketing, the returns from these plants are not shared in a socially desired way. The ideal solution is to form self-help groups by the tribes. The group should have no salaried employees, so that the group is driven by self-interest. More transparency could be expected in self-management. At the same time the group should have the ability to check over-harvesting. However, given the low educational levels of the tribes, in the absence of societies, they become vulnerable to exploitation. The private dealers pay higher rates only to compete with the societies. So the solution is to improve the efficacy of the societies.

Through a direct linkage with the industry, the societies can earn more income and repatriate better collection charges to its members. The

societies should complement such efforts by encouraging the members to cultivate medicinal plants. The planting materials developed by various research institutions could be channelised to the tribes through the societies. Apart from such efforts, the collectors should be given training in sustainable collection techniques so that the resources do not become extinct.

Still, the intensity of extraction will not be reduced to sustainable levels, unless the collection by illegal players is checked. Since the FD is organised to manage large forest areas and are best suited to act as a monitoring sector, it could make sure that no illegal collection or over-harvesting of medicinal plants takes place. Despite the realisation world wide that non-wood forest resources are socially and ecologically more important than wood resources, forest management in India is wood oriented. Through a mere reorientation of its goals, the Forest Department can contribute much to the conservation of medicinal plants. It should also continue cultivation of medicinal plants, learning from the experiences in earlier attempts. Cultivation should be carried out in wastelands, tiger reserves and in plantation forests. This could provide alternative income opportunities to the tribes and the output could be marketed through the societies.

Any reduction in the supply of medicinal plants from the forests should be substituted by cultivation of medicinal plants. An awareness programme in the rural areas is required to bring more people to cultivation, targeting especially housewives. People's planning could take up the issue. The constraint in marketing could be tackled through forming self-help groups, and through sub contracting agreements with the manufacturing units. Self-help groups would help the cultivators in gaining economies of scale and efficiency in marketing through collective action. Subcontracting would reduce the uncertainty factor in the commercial cultivation of medicinal plants.

The local returns could be increased by value addition through primary processing. There could be considerable value addition to medicinal plants through simple techniques such as drying, cleaning, crushing, powdering, peeling off bark and so on. This should be encouraged by the industry. Some of the manufacturers do have sub-contractors who carry out primary processing for them.

Apart from all these efforts, the major task is wide spread promotional activities for conserving medicinal plants. Initiative should be taken by the Ayurvedic medicine manufacturers' association to encourage people to raise medicinal plant garden in their premises. The

units carry out such activities individually, but collective action is not taking place. The cultivation methodologies developed by the R&D institutions should be popularised by the associations. For encouraging the commercial cultivation in the state, the industry should ensure the potential farmers that they are the ready buyers of the plants. The sustainability of medicinal plants could be ensured to a large extent through fostering backward linkages to cultivation and to primary processing. This could be promoted only by the initiative of the manufacturers of traditional medicines. Thus the industry should find solution to the raw material problem instead of urging the government to provide raw materials for them.

To conclude, the sustainability of medicinal plants and overall development of the sector can be ensured only through co-ordination and networking among the various stakeholders. For this, the policymakers should carry out awareness programme. At the same time, the stakeholders of the sector should realize that the government's role is one of facilitator rather than provider.

Reference

Government of British Columbia, 2000,

Source: www.for.gov.bc.ca/hfp/amhome/amdefs.htm

Johnson, Barry.L. 1999. “Role of Adaptive Management as an Operational Approach for Resource Management Agencies” *Conservation Ecology* 3(2): 8. [online]

URL:<http://www.consecol.org/vol3/iss2/art8>

CHAPTER - 7

Conclusion

CONCLUSION

There is worldwide consensus on the fact that medicinal plants are important not only in the local health support systems but in rural income and foreign exchange earnings. Still the existing studies on the economic aspects of the medicinal plants in Kerala are limited to the issues in marketing the plants collected from natural sources. The present study has attempted to address the issue of sustainability of medicinal plants.

While plant-based medicines are growing in popularity, the sustainability of medicinal plants is under serious threat. Sustainability of medicinal plants is important for the survival of forest dwellers, the forest eco-system, conserving a heritage of human knowledge and overall development through linkages. Since controlled harvesting of natural resources and domestication of medicinal plants are very crucial for their sustainability, the focus issues in the present study were local returns from wild medicinal plants, the profitability of cultivation, the availability of land for cultivation as well as the marketing of medicinal plants. The major highlights of the work are summarised in the following paragraphs.

Demand for medicinal plants by the Ayurvedic Medicine Manufacturing units has been growing for the period from 1995-2000. A major share of the benefit from the growing demand goes to the private

dealers, especially since the societies authorised to market the wild medicinal plants are not interested in many of the plants listed by the government as marketable. Out of the medicinal plant raw materials bought by the manufacturing units, around 80 per cent are delivered by the private dealers in the state and the Federation supplies only 12.5 per cent. The share of cultivated sources is less than 5 per cent.

More equitable sharing of the benefits from commercial utilisation of the medicinal plants was found essential for the sustainability of the plants. The traditional Work-leisure principle was applied to see whether the harvesting of the natural medicinal plants could be reduced to more sustainable levels by giving increased collection charges to the gatherers. The result was that a hike in collection charges could reduce the harvesting intensity.

In order to find out how the benefits are shared by the actors in the sector, an analysis of the transaction chain of medicinal plants was undertaken. Price spread for 4 marketing channels of medicinal plants was estimated. The *adivasis* received 30 per cent of the market value of the while selling to the societies and 39 per cent while selling to the private dealers. The societies received 27 per cent in selling to the industry/retailer and 15 per cent in selling to the private dealers. The private dealers got 35 per cent

when buying from the societies and 42 per cent when buying from directly from the collectors. When the societies sell the materials to the private dealers, the largest share goes to the dealers. If the societies sold directly to the industry they could fetch higher profits and repatriate better returns to the *adivasis*. In the present situation the societies have to offer goods at much lower prices than the dealers do because the dealers also offer raw materials other than medicinal plants and many other services.

A qualitative analysis of the present and potential linkages in the medicinal plant sector revealed that business linkages were prominent and linkages to cultivation and processing are weak. By the theory of linkages, overall development in the sector could take place through upsurge in production of medicinal plants. There is potential for developing the linkages to cultivation and primary processing through sub-contracting with the manufacturing units and through other marketing arrangements. Through fostering such linkages, sustainable development of the medicinal plant sector could be made possible.

Cultivation is very crucial for the sustainability of the sector and therefore it was studied in details. Trissur district was taken as the sample area and 9 out of the 20 selected plants were found to be under commercial cultivation during the period of the study. Cultivation takes place mostly in

micro farms, homesteads, along the boundary of farms, forest areas, and leased land and in coconut or rubber plantations. Only small scale of operation was being carried out. Profitability in cultivation of these plants ranged from 9.5 per cent to 84.5 per cent. The initial investment required for carrying out cultivation in micro farms and homesteads is very low. Therefore this could be seen as a mean for rural poverty alleviation.

Availability of land is not a constraint since medicinal plants can be raised effectively in micro farms, homesteads where alternative commercial utilisation of land is not possible and in plantations as under crops. As handling and transporting the plants are easy, they can be cultivated in remote areas as well.

Agricultural land is not being devoted to the cultivation of medicinal plants on a large-scale because of the uncertainty factor. The biggest constraint faced by the farmers is marketing the produce. The manufacturers are willing to buy only from the bulk suppliers. Dealers prefer to buy from the gatherers or from the sources in other states against whom they have higher bargaining power. Some farmers tackle this problem successfully through sub-contracting agreements with the manufacturers.

The institutions responsible for managing the medicinal plants in Kerala are the Forest Departments, Kerala State Federation of SC/ST

Development co-operative Societies, and the minor Forest Products societies. The activities of the FDs are timber oriented and they do nothing to control the over-exploitation of non-timber resources and to check the illegal collection of medicinal plants by non-tribes. The Federation is run by salaried officials who have no motivation to improve efficiency. The societies were formed to eliminate middlemen, but the middlemen remain to be dominant forces. The institutions like Tropical Botanical Garden and Research Institute, Kerala Forest Research Institute and Kerala Agriculture University conduct studies on various aspects of medicinal plants, but these institutions have no direct linkages to any of the economic actors in the sector. Some Ayurvedic Medicine Manufacturers have R&D wing and they develop medicinal plants in nurseries and sell planting materials to interested farmers. However, these materials are not subject to proper quality control. Proposals for developing medicinal plants in the 8th and 9th Five Year Plans included central assistance to cultivation of medicinal plants. At the village level, cultivation was to be developed through a collaboration of the Agriculture Department and Department of Rural Development. Under the location specific scheme of Kerala's krishi bhavans, planting materials were distributed to interested farmers at subsidised rate. However the scheme failed because the farmers faced problems in marketing the out put.

A system of adaptive management requires the co-ordination of all these institutions. The performance of each of them should be assessed from time to time and new goals should be set up, learning from the past experience. Such a co-ordination of all the stakeholders in the sector could create an environment that fosters linkages between the industry and the collectors or cultivators of medicinal plants.

Through a direct tie-up with the industry, the societies can earn more income and repatriate better collection charges to its members. The societies should complement such efforts by encouraging the members to cultivate medicinal plants. They could distribute planting materials to the members and provide training in sustainable collection techniques.

The Forest Department should make sure that no illegal collection or over-harvesting of medicinal plants takes place. It should also continue cultivation of medicinal plants, learning from the experiences in earlier attempts. Cultivation should be carried out in wastelands, tiger reserves and in plantation forests. This could provide alternative income opportunities to the tribes and the output could be marketed through the societies.

An awareness programme in the rural areas is required to bring more people to cultivation, targeting especially housewives. Their leisure time and

homesteads could be utilised effectively in generating income through growing medicinal plants. People's planning could take initiative at the village level for promoting cultivation. The constraint in marketing could be tackled through forming self-help groups, and through sub contracting agreements with the manufacturing units.

The local returns could be increased by value addition through primary processing. This should be encouraged by the industry-some of the manufacturers do have sub-contractors who carry out primary processing for them. For encouraging the commercial cultivation in the state, the industry should ensure the potential farmers that they are the ready buyers of the plants. Thus the industry should find solution to the raw material problem instead of urging the government to provide raw materials for them.

In short, the various players in the sector could find solution to their specific problems through co-operation and networking among them. They should rely on self-help rather than urging the government to take care of their needs. As far as the government is concerned, the Forest Dept. through checking over-exploitation of wild plants and the Agriculture Dept. through encouraging cultivation could contribute to the sustainable development of the medicinal plant sector.

BIBLIOGRAPHY

Achary, S.S. & Agarwal,N.L.(1987), Agricultural Marketing in India, Oxford &IBH Publishing Co.

Arnold, J.E.M., 1995,"Economic Factors in Farmer Adoption of Forest Product Activities", in Domestication and commercialization of Non-timber forest products in agroforestry systems, NWFPs- 9, FAO, Rome.

Banerjee, Sujoy, Ramanathan,B, Sudin, K & Sharma, Archana, 1997, Wasteland News, Vol. XII, No. 3

Bbenkele, B.C. 1998, "Enhancing Economic Development by Fostering Business Linkages between the Pharmaceutical Companies and the Traditional Medicines Sector", Source: www.eagerproject.com/southafrica.shtml#_1_2

Brady, G.L. & Geets, P.C.F. 1994, "Sustainable Development: The challenge of Implementation". Journal of Sustainable Development Economics, 189-97.

Brown, Paul M. & Cameron, Linda D. 2000, "What can be Done to Reduce Overconsumption?", Ecological Economics, 32(2000) 27-41

Bunny, Sarrah. (ed) "The Illustrated Encyclopaedia of Herbs", Chancellor Press

Chipeta, M.E.1995, "Making Non-Wood Forest Products Programmes Succeed: Lessons from Small-Scale Forest-Based Enterprises", In Report of the expert consultation on non-wood forest products, Indonesia, Jan.1995. NWFPs 3. FAO, Rome.

Chandrashekharan, C, 1996 "NTFPs-Potentials and Challenges", in M. P. Shiva & R.B.Mathur, eds, "Management of Minor Forest Products for Sustainability" Oxford & Ibh Publishing Co. Pvt. Ltd, New Delhi.

Chandrasekharan, C. 2000a, The Keynote Address delivered at the national Seminar on Sustainable Management of Non-Timber Forest Products, conducted by Kerala Forest Department, 25-26, May, 2000.

Chandrasekharan, C. 2000b, "An Overview of the Situation and Potentials of Non-Wood Forest Products in Asia", Paper presented in the National seminar on Sustainable Management of NWFPs of Western and Eastern Ghats, conducted by Kerala Forest Department, 25-26, May.2000.

DeSilva, Tuley 1995, "Industrial Utilisation of Medicinal Plants in Developing Countries" in Non-Wood Forest Products- 11(FAO), "Medicinal Plants for Forest conservation and Health Care".

Eswaran, V.B. 2001, <http://www.india-seminar.com/2001/499.htm>

Federation of Ayurvedic Medicine Manufacturers of India. (FAMMI),2001

Foundation for Revitalisation of Local Health Traditions (FRLHT), 1999, "The Key Role of Forestry Sector in Conserving India's Medicinal Plants".

Government of British Colombia, Source:

www.for.gov.bc.ca/hfp/amhome/amdefs.htm

Government of India, 1997, Report of the Committee on Medicinal plants submitted to GOI in May, 1997. Source: <http://mohfw.nic.in/ismh/mcmain.htm>

Govt.of India.,1999, "The State of Forest Report", Forest Survey of India, New Delhi.

Hirschman, A.O. (1958),"The Strategy of Economic Development", New Haven, Yale University Press.

Hoareaw, Lucy& DaSilva, Edgen J. 1999, "Medicinal Plants, A

Re- emerging Health Aid" www.ejb.org/content/vol.2/issue2/full/2/bip/index.html

- Issar, Ranjit** 1994, Source: NWFPs 7, 1995, “NWFPs for Rural income and Sustainable Forestry” pg. 88 FAO, 1995, Rome
- Johnson, Barry L** 1999, “Role of Adaptive Management as an Operational Approach for Resource Management Agencies”; www.consecol.org/vol3/iss2/art8
- Karki, Madhav**; 2000, “Development of Biopartnerships for sustainable Management of Medicinal and Aromatic Plants in South Asia”, Paper presented in the 21st Congress of the International Union of Forestry Research Organizations(IUFRO); Source: <http://iufro.boku.ac.at/iufro/iufro.net/d5/wu51102/pub2-5.11.htm>
- Khusru, A.M.** 1964, “Returns to Scale in Indian Agriculture” ; Indian Journal of Agricultural Economics, Vol. XIX Nos. 3&4, July-December.
- KFRI**, 1981 “Medicinal Plants of Kerala Forest”, Kerala Forest Research Institute (KFRI) Information Bulletin 4.
- Kurup, A.M.** 2000, “Indigeneous Knowledge and Intellectual Property rights of Tribals: A Case Syudy” Yojana, Vol.44, No. 4.
- Kuipers, Soppie Emma.** 1995, “Trade in Medicinal Plants”, in NWFPs-11, “Medicinal plants for Forest conservation and health care” FAO, Rome.
- Lambert, John; Shrivastava, Jithendra and Viemeyer, Noel.** 1997, “Medicinal Plants, Rescuing a Global Heritage”, World Bank Technical Paper No. 355.
- Malayala Manorama**, daily, 26/7/2000
- McConnel, Campbell R. & Brue, Stanly L.,**1986; “Contemporary Labour Economics” McGraw-Hill Book Co. ,Singapore.

- Muraleedharan, P. K., Seethalakshmi, N. & Shashidharan, K.K.** 1997 “Biodiversity in Tropical Moist Forests: A Study of Sustainable Use of NWFPs in the Western Ghats, Kerala, KFRI. Research Report-133, Kerala Forest Research Institute, Pecchi.
- Nair, K.K.N.**1996, “A Manual of Non-Wood Forest Produce Plants in Kerala State”. KFRI Research Report-115
- Nair, K.K.S.**,1990, “Status and Potential of Non-Timber Products in the Sustainable Development of Tropical Forests”, In Proceedings of the international seminar on tropical forest management held in Kamakura, Japan, 1990
- Nickel, William & Sennhauser, Ethel** “Medicinal Plants: Local Heritage with Global Importance”; www.worldbank.org/html/extdr/offrep/sas/ruralbrf/medplant.htm
- Peters, Charles M.**1996, “The Ecology And Management of Non-Timber Forest Resources”, World Bank Technical Paper no. 322
- Saigal, Sushil; Agarwal, Chettan & Campbell, Jeffrey Y.** 1997, “Food, Fodder, Fuel...NTFPs can sustain Joint Forest Management”. Wasteland News, Vol.13 No. 1
- Singh, Nalini**, 2000, “The Bankura Story”, Wastelands News, Vol.15. No.3.
- Singh, R V.** 1996, “Participatory Forest Management for Conservation and Sustainable Utilisation of Plant diversity in India”. In “Management of MFP for sustainability” edited by M.P. Shiva & R.B. Mathur
- Suxena, N.C.** “Non-Timber Forest Product- Policy Issues”, In “Management of MFP for sustainability” edited by M.P. Shiva & R.B. Mathur
- Thomas, Philip.** 1989 “Collection and Marketing of NTFPs by the Kerala Girijans”, Paper published by Centre for MFPs, Dehradun

Thomas, Philip 1996 “Dynamics of Co-operative Marketing in Tribal Economies- A Study of Non Timber Forest Produce Marketing in Kerala”, Thesis Submitted to the Department of Applied Economics, Cochin University of Science and Technology.

Wiersum, K. F. 1995, “Domestication of valuable Tree Species in Agroforestry Systems: Evolutionary Stages from gathering to Breeding”, in Non-Wood Forest Products-9(FAO): “Domestication and Commercialisation of NTFPs in Agroforestry Systems”.

APPENDIX-I
PROFILE OF MEDICINAL PLANTS SELECTED FOR THE STUDY

Malayalam/ English Name	Botanical name	Plant- type	Parts of the plant used	Season	Places of occurrence	Uses
<i>Atalotakam/ Vasak</i>	<i>Adhathoda zylanica</i>	Shrubs	Whole plant, mainly roots	Flowers feb.-june Fruits mature in june-aug	Throughout the state in the wild and homestead	For treating bronchitis, asthma, cough, diarrhoea, dysentery, etc. Oil content in the leaves used as insecticide and weedicide
<i>Kattupadavalam/ Wild snake gourd</i>	<i>Trichosanthes cucumeriana</i>	Climber	Roots/whol e plant	Flowers aug.-dec. Fruits mature in feb.-march	Due to over- exploitation, the species has become rare. Found in the mid to the high lands of north and central Kerala.	All parts of the plant are medicinal, used against intestinal worms. A decoction of stem and leaves is given for bilious disorders and skin diseases
<i>Kurunthotti</i>	<i>Sida cordifolia</i>	Under shrubs	Roots/whol e plant	Flowers aug.-dec. Fruits mature in nov.-jan	Common in forests, roadsides, homesteads, wastelands, etc., throughout the state	Used for tuberculosis, rheumatism, etc. A decoction of roots in milk is given for arthritis. A decoction of roots facilitates child birth. Stems are used for skin problems.
<i>Puthari chunda/ The Creat</i>	<i>Solanum voilaceu Ortega</i>	Under shrubs	Roots/fruits /seeds	Flowers sep.-may, fruits mature in oct.-nov.	Common on shades in moist deciduous and semi-evergreen forests throughout the state.	One of the "dasamoola", seeds are preservatives, oil from seeds is used for tooth ache.

Malayalam/ English Name	Botanical name	Plant- type	Parts of the plant used	Season	Places of occurrence	Uses
<i>Moovila/ Tictrefoil</i>	<i>Pseudarthria viscida</i>	Ground herbs	Roots/whole plant	Flowers in oct.-nov. fruits mature in dec.- april	In mid to high lands throughout the state.	One among the "dasamoola", roots are used in treating rheumatism, fever, diarrhoea, astma, heart diseases, worms and piles.
<i>Orila</i>	<i>Urrialago podtoides</i>	Under shrubs	Whole plant/roots	Flowers in nov.-jan. Fruits mature in march - april.	Common in disturbed deciduous forests, forest fringes,etc.	One among the "dasamoola", an alcoholic extract from the plant is used in the treatment of intermittent fever and chest inflammation
<i>Karinkurinji/ Common yellow nail dye plant</i>	<i>Nilgiranthus ciliatus</i>	Shrubs	Roots/whole plant	Flowers in dec.-feb Fruits mature in march-april	Found throughout the state in hilly uplands and highlands	All parts of the plant are used against jaundice, dropsy, rheumatism, urino-genital ailments, etc. Leaves are applied externally in gout, lumbago, pain in joints, etc.
<i>Cherula</i>	<i>Aerva lanata (Linn) Juss</i>	Shrubs /trees of small size	Roots	Flowers in june- aug. Fruits mature in sep.-oct.	Found in the shades of evergreen forests in central Kerala.	Fruits are edible, seeds yield oil that is poorly fluorescent Plant is used to treat lithiasis. Roots are used against stranquery.
<i>Vayampul/ Sweet flat root</i>	<i>Acorus calamus, Linn</i>	Small plants	Roots/rhizom es	Flowers in may-june, fruits mature in july-aug.	Very rarely distributed in the marshy areas of Idukky cultivated in Palakkad, Calicut and thiruvananthapuram	Plant is emetic, carminative, anti-spasmodic, used for kidney and liver complaints. Oil extracted from rhizomes is anti-bacterial.

Malayalam/ English Name	Botanical name	Plant-type	Parts of the plant	Season	Places of occurrence	Uses
<i>Kacholam</i>	<i>Kaempferia galanga Linn</i>	Herbs	Rhizomes	Stems are produced by the onset of monsoon, rhizomes can be harvested within one year	Common as an under growth in ever green, semi evergreen & moist deciduous forests in valleys of hills and near stream banks, throughout the state. Often cultivated in Kerala.	Rhizome juice is administered against gonorrhoeal discharges and for blood purification. Used in manufacturing liquors, and essence, perfumes and cosmetics
<i>Chittamrith/ Heart leaved moon seed</i>	<i>Tinospora cordifolia</i>	Shrubby climbers	Whole plant	Flowers in feb.-may Fruits mature in may-july	Found mostly in deciduous forests, also in forest outskirts and open areas in mid and hilly up lands	Stems are the most important parts, used in treating dyspepsia, urinary infections, etc. A dried and powdered root in combination with honey/ghee is curative of jaundice and rheumatism. Roots are tonic for elephants
<i>Kadukkal/ Chebulic myrobalan</i>	<i>Terminalia chebula</i>	medium sized to large tree	Fruits/bark	Flowers in mar-april, fruits mature in nov.-jan.	Found in southern dry mixed deciduous forests, High elevations like Munnar, Thekkady, Thiruvananthapuram.	Bark is diuretic and cardiogenic, it regulates the function of liver. Fruits are one among the "thribhala". It maintains youthful vigour and promotes retentive power. It is used in local application to chronic ulcers and as a gargle in stomatitis.
<i>Thanni</i>	<i>Terminalia bellirica</i>	Medium sized tree	Fruits	Flowers in feb.-april fruits mature in nov.-dec.	Throughout the state confined to the hilly uplands and highlands	One among the "thribhala", pulp of fruits is used against dropsy, piles, diarrhoea, leprosy. Mixed with honey, the fruit pulp is medicinal for ophthalmia. Used in the tanning industry, non-edible oil from seeds is used in soaps.

Malayalam/ English Name	Botanical name	Plant-type	Parts of the plant	Season	Places of occurrence	Uses
<i>Shathavari</i> / Asparagus	<i>Asparagus racemosus</i>	Shrubby climber	Rhizomes/ roots	Flowers in aug.- nov. fruits mature in jan.- mar.	Common along hedges in scrub jungles and waste places, as under growth in plantations, etc. in the moist dry deciduous forest tracts of Kerala. Also found in home gardens.	Roots and rhizomes are used for treatment of biliousness, throat complaint, tuberculosis, leprosy, diseases of blood, kidney and liver, gleans and gonorrhoea.
<i>Nelli</i> / Amla	<i>Phyllanthus emblica</i>	Small to medium sized tree	Fruits	Flowers in jan.- mar. fruits mature in nov.- dec.	Found mostly in the mid to highlands throughout the state. Also grown/cultivated in homesteads and waste places.	Fruits are used for treating burning sensation, vomiting, urinary discharges, diabetes, leprosy, constipation, inflammation, and piles. Fruits are among the "thribhala".
<i>Thippali</i>	<i>Piper longum</i>	Under shrubs	fruits	Flowers in apr.- may, fruits mature in nov.- dec.	Earlier a common plant throughout the state, now rare in Kerala's forests. Widely cultivated in N.India.	All parts are medicinal, used for treating asthma, bronchitis, etc. It is a stimulant and carminative tonic. Fruits are used as spice