Chapter 4

Supply Chain Analysis of Medicinal Plants Market in Kerala and Ayurvedic Industry

Since the time immemorial people have gathered plant and animal parts for their needs from forest. Forest was his first mother providing all that he needed which included edible nuts, fruits, mushrooms, herbs, spices, fodder fibers for construction of shelter, and materials for clothing. Even today a considerable portion of the people in developing countries derives a part of their subsistence income from forest products (Iqbal, 1993; Walter, 2001). The first known written record of curative plants was of Sumerian’s during 2200 B.C. In the 5th century B.C, the Greek doctor Hippocrates listed out some 400 herbs for common usage. Dioscorides, in the first century A.D, wrote an herbal directory by using 600 plants which ultimately became the base for many later works.

Herbs have been used for uncounted time for various purposes like healing the sick and infirm. Most of the people still continue to use herbs to benefit their bodies and believed that herbs helped to keep the body in tune with nature. Man has also been aware of the effects of herbs on the body, mind and emotion, for instance flowers were utilized to attract love, food and protection. Fragrant plants were worn to heal the body and give a sense of well being. The most costly flowers are offered to gods and goddesses and the use of aromatic incense is recorded from the earliest of times. Medicinal plants which are considered to be the most popular non timber forest product, includes goods of biological origin also. There are many scientific studies being undertaken different parts of the world to discover the use of medicinal plants in western medicine.
Medicinal plants play a central role in safeguarding and enriching the lives of people. Human competence of using natural products for health and curing of diseases has been in practice since his origin and medicinal plants are the mostly used item (Susan and Marla, 2003). Traditional system of medicine uses a wide spectrum of natural resources as a part of their pharmacopeias. Medicinal and Aromatic Plants1 (hereafter MAPs) play a considerable role in meeting the demand for traditional medicine market both nationally and internationally. The proper number of medicinal and aromatic plants used in the formulations is not correctly known. The WHO has estimated that since 1971 around 21,000 plant species are used in medicinal formulations (Penso, 1998). However in China alone 4941 out of the 26,092 native spices are used as ingredients in Chinese medicines. If the total number of flowering plant species coming around 42,200, is added to this list of 21,000 then the total number of plants used in medicinal formulations will exceed 50,000.

The Ministry of Environment and Forestry, Government of India has identified 9500 species of medicinal plants that are used by the pharmaceutical industry of this nearly 2300 are used by traditional medicines and at least 150 medicines are used on a large scale (EXIM Bank, 1997). The numbers of plant species used for medical purposes in different countries are given in the table 4.1 below.

It can be seen from the table that India posses a rich tradition of indigenous knowledge of the use of medicinal plants. Twenty percent of our plant species have medicinal value. China follows India with 19 percent. Ayurveda identifies three groups of natural products derived from animal plant and mineral kingdom as a source of drugs and diets. Among these the sources from plants
supersede other two. The use of turmeric to cure wounds is very popular in the Indian epics.

Table 4.1

<table>
<thead>
<tr>
<th>Country</th>
<th>Plant species</th>
<th>Medicinal Plant Species</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>26092</td>
<td>4941</td>
<td>18.9</td>
</tr>
<tr>
<td>India</td>
<td>15000</td>
<td>3000</td>
<td>20</td>
</tr>
<tr>
<td>Indonesia</td>
<td>22,500</td>
<td>1000</td>
<td>4.4</td>
</tr>
<tr>
<td>Malaysia</td>
<td>15,500</td>
<td>1200</td>
<td>7.7</td>
</tr>
<tr>
<td>Nepal</td>
<td>6973</td>
<td>700</td>
<td>10.0</td>
</tr>
<tr>
<td>Pakistan</td>
<td>4950</td>
<td>300</td>
<td>6.06</td>
</tr>
<tr>
<td>Philippines</td>
<td>8931</td>
<td>850</td>
<td>9.5</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>3314</td>
<td>550</td>
<td>16.6</td>
</tr>
<tr>
<td>Thailand</td>
<td>11625</td>
<td>1800</td>
<td>15.5</td>
</tr>
<tr>
<td>USA</td>
<td>21641</td>
<td>2654</td>
<td>12.26</td>
</tr>
<tr>
<td>Vietnam</td>
<td>10,500</td>
<td>1800</td>
<td>17.1</td>
</tr>
</tbody>
</table>

Source: FAO, 2004

Plant base is widely used in drug processing, development and application (Kamboj, 2000). Amongst the Ayurvedic drugs manufactured today, 57.4 percent of them are only herbal, 28.7 percent are herbo-minero-metallic and the rest of the 13.9 percent are minero-metallic preparations. This helps to understand that the plant base is crucial for formulating the Ayurvedic medicines. At the same time it is this plant base that creates better demand for the medicines. The table 4.2 reveals this aspect.
<table>
<thead>
<tr>
<th>Preparation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbal Content</td>
<td>57.4</td>
</tr>
<tr>
<td>Herbo-Minero-Metallic</td>
<td>28.7</td>
</tr>
<tr>
<td>Minero-Metallic</td>
<td>13.9</td>
</tr>
</tbody>
</table>

Source: FRLHT, 1997

4.1 Materia Medica of Ayurveda

The literature in Ayurveda is rich with regard to its materia medica. Ayurveda contains a wide and crystal clear account of the various plant formulations and their correct composition. The *Aushadi Sukhta* in *Rig Veda* (Section 10, Chapter 97 verses, 1-23) is the oldest document available on medicinal plants in India. This document mentions about morphological character of the plants, their therapeutic classification, habitat and the curative properties. These hymns convey that the use of plants was based on observation of their effects on other species.

Another document referred as the *Doctrine of Signature* teaches to compare parts of plants with parts of human body. Ayurveda has a unique way of understanding plants starting from the earliest Ayurvedic text of *Charaka Samhita* (1500 B.C- 400 A.D). It describes about 600 plants and their medicinal uses. These Samhitas deal with their nomenclature, descriptions for identifying the plant, the time to pluck the plant, its biological characteristics and actions, habitat, regional specifications and the types of poisonous plants. *Charaka Samhita* also teaches about the way to collect, classify, combine and process these plants for producing 341 drugs. Other Samhitas like the *Susrutha Samhita*, *(395 drugs)* *Astanga Samhita*,


AstangaHridaya (all written before the Seventh century) also deal with this knowledge. A few other Samhitas such as Bala Samhita and Kasyapa Samhita are not available in the complete form today (Unnikrishnan, 2002).

The depth of the materia medica of Ayurveda can be understood from the table given in the appendix. It shows the glory of Ayurvedic pharmacological literature. It is to be remained that all systems of medicines irrespective of their approach and principle use plants in their drug formulation (Tewari, 1999). The difference lies in the content of the plant base. Allopathy Ayurveda, Unani, Homeo and the tribal medicine’s usage of medicinal plants is well acknowledged. The amount of plants and plant base used in their formulation can be understood from the figure given below.

**Fig 4.1**

**Medicinal Plant Species Used in Various HealthCare Systems**

Ayurvedic medicines contain the food items such as jaggery, spices, oils sugar, milk, ghee, animal products, honey, fresh and dry fruits (Harilal, 2004). But around 80-85 percent of the total raw materials used is plant based or some way
or other related to plants. The roots, tubers, bulbs, leaves, fruits, flowers and barks of wild vegetation, depending on their active principle contents, are used for the preparation of medicines for different ailments (Ray et al., 2003). Indian rich biological diversity supported the system of medicine from time immemorial. The diverse agro-climatic conditions, variation in regional topography, occurrence of variety of floral and faunal types, different human practices have not only contributed to the richness of Indian biological diversity, but also have maintained the same to a great extent.

Tribal people in India, mostly forest dwellers, played very significant role in the identification, conservation and collection of medicinal plants from the very ancient times. A number of drugs were introduced from other parts of the world through trade and commercial relations. It is estimated that only 16.5 percent of the drugs require whole medicinal plant where as others needs one or more than one medicinal plant part (FRLHT, 1997). The raw drugs consist of roots, rhizomes, leaves, flowers, fruits, seed oil, gums and resins bark and wood or whole plants. The various percentage of usage of plant parts in Ayurveda is given in the table 4.3.

Roughly one third of the medicinal plants used are trees and this corrects the belief that medicinal plants used are mostly herbs. Hence conservation of trees is more important than the conservation of plants. It also denotes that 16.5 percent of the Ayurvedic formulations use the whole plant. 10 percent of the medicines use the fruits and 2.8 percent of the drugs use the wood. Thus it has to be inferred that no part of the plant is left unused in Ayurveda. This substantiates the crucial linkage between the Ayurvedic industry and medicinal plant market.
Table 4.3
Percentage of Plant Part Used in Ayurvedic Formulations.

<table>
<thead>
<tr>
<th>Parts used</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roots</td>
<td>29.5</td>
</tr>
<tr>
<td>Rhizome</td>
<td>4.0</td>
</tr>
<tr>
<td>Leaves</td>
<td>5.8</td>
</tr>
<tr>
<td>Flowers</td>
<td>5.5</td>
</tr>
<tr>
<td>Fruits</td>
<td>10.3</td>
</tr>
<tr>
<td>Seed</td>
<td>6.6</td>
</tr>
<tr>
<td>Stem</td>
<td>5.5</td>
</tr>
<tr>
<td>Bark</td>
<td>13.5</td>
</tr>
<tr>
<td>Wood</td>
<td>2.8</td>
</tr>
<tr>
<td>Whole plant</td>
<td>16.5</td>
</tr>
</tbody>
</table>


It is to be added here that a single Ayurvedic medicine may contain numerous plant species. A list of commonly used Ayurvedic medicines and the number of plant species used in it are given in the table below. It is clear from this table that the average number of medicinal plants used in drug formulation varies from three to 68. The list of ingredients and the optimal composition of the plants are really laid down in the Samhitas which form the reference base for all drug formulations. These Samhitas however insist that there is no scope for any substitution of medicinal plants in the process of manufacturing. This makes the Ayurvedic drug manufacturing a rigid process.
### Table 4.4

**Selected Formulations and Number of Plant Species Used**

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Used for</th>
<th>Number of plant species used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chyawanaprash</td>
<td>Health supplement</td>
<td>40</td>
</tr>
<tr>
<td>Rasnadi choornam</td>
<td>For fever &amp; head ache</td>
<td>25</td>
</tr>
<tr>
<td>Dashamol arishtam</td>
<td>Gastro disorder</td>
<td>68</td>
</tr>
<tr>
<td>Dhawanantharam oil</td>
<td>Arthritis</td>
<td>44</td>
</tr>
<tr>
<td>Katuriadi pills</td>
<td>Gastro complaints</td>
<td>30</td>
</tr>
<tr>
<td>Agasthya rasayanam</td>
<td>Respiratory troubles</td>
<td>23</td>
</tr>
<tr>
<td>Brahmi kritham</td>
<td>Memory power</td>
<td>12</td>
</tr>
<tr>
<td>Elaneerkuzamphu</td>
<td>Ophthalmologic</td>
<td>7</td>
</tr>
<tr>
<td>Muktha arishtam</td>
<td>Pediatric indigestion</td>
<td>9</td>
</tr>
<tr>
<td>Thriphala choornam</td>
<td>Digestion, Vision</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: *SahasraYogam*, (Ed) 2000.

### 4.2 Significance of Medicinal Plants

The significance of medicinal plants in the development of a subsistence economy has to be well accepted. The production, post harvesting, marketing of medicinal plants have a good potential in the raising of the income of the rural people especially the tribal community. Various environmental factors also contribute towards the cultivation of medicinal plants.

#### 4.2.1 Socio-Environmental Factors.

Rural poor especially women and the tribal folk are the principal collectors of medicinal plants from the forest. It is a chief source of income for this group of the people. The demand for Ayurvedic medicines has increased, leading to a manifold increase in the demand for medicinal plants. Hence cultivation of
medicinal plants can raise the capabilities of the poor. Cultivation of medicinal plants is labour intensive and well suited to the labour and resource base of this people. Thus systematic production and processing of medicinal plants can offer promising income and employment opportunities to the rural poor which will improve their livelihood (Singh and Swanson, 2000). Many medicinal plants can grow in loose soil under rainfall and moisture conditions. This will help to regenerate nature. Many species are shade tolerant while others are climbers, trees, shrubs and herbs that can grow in different kinds of land and cropping systems.

4.2.2 Resurgence of Traditional Medicine.

The growing dissatisfaction of the people with western medicines due to its side effects and high price, has forced people to consider and renew their faith in traditional medicines especially Ayurveda. This trend is rapidly spreading over the years both in developed and developing countries. The demand for plant species used for health care needs are increasing at a rate of 8-15 percent per annum (Grunwald and Buttel, 1996). The WHO estimates support this view point. (WHO, 2002). This resurgence in traditional knowledge had led to increase in the large scale production of Ayurvedic medicines. This have further intensified the demand for medicinal plants. Easy and continuous supply of MAP’s is one of the chief factors that determine the growth of the industry (Harilal, 2004).

Thus the development of Ayurvedic industry requires the support of a well developed medicinal plant market. Apart from this even in many of the modern medicines the basic composition is derived from plant base and these have become very well acceptable due to less side effects, low prices and environment friendly attitude and lasting curative properties. This has also accounted to the growing increased use of medicinal plants.
4.2.3 Economics of Small Scale Cultivation.

Small scale cultivation requires very less inputs and hence can be made more viable. This can raise household income to a considerable level. The cultivation of medicinal plants does not require huge investments in terms of irrigation and incurs less cost. Hence it is suitable for small farmers. The increased demand for medicinal plants can bring more revenue to the small farmers. Given the growing demand for MAPs and the impending loss it creates to the biodiversity the Government of India has passed the Foreign Trade Development and Regulation Act of 1992. This law and related legislation now requires that all companies should declare the source of their raw material and prohibits the export of 29 different plants. This legislation can add dignity to medicinal plant cultivators.

In Kerala, many leading Ayurvedic medicine manufactures\(^2\) have launched a concept of home gardens to propagate medicinal plants cultivation. This tie up ensures the farmers that the manufacturers will buy back the product from the household cultivators. By assuring a sure market this system will help the society in two ways - one by raising the income of the household by utilising their idle land holdings and secondly this will help the manufacturing units to get medicinal plants, though in small quantities. A large scale propagation of this system can minimise the problems involved in the procurement of medicinal plants to a considerable level.

4.2.4 Explicit Advantages over Traditional Crops

As compared to traditional crops the cultivation of medicinal crops offers some explicit advantages. They are:

- Medicinal plant crops provide better returns to the cultivator than traditional crops.
• Have high demand within the country and outside the country and fetch back better prices in market
• In dry form they can be stored for a long time and can be sold when the prices are high
• Is largely drought tolerant and not easily gazed by animals
• Have low incidence of pest attack and diseases and less risk of price fluctuations
• Require less resources and hence the cost of cultivation is very low when compared with the traditional crops
• Can be raised as inter crop along with traditional crops even in degraded and marginal soils

Given these advantages the cultivation of medicinal plants are picking up in some areas. But the spread is not so large leading to deficiency in supply and thereby causing price hike and scarcity of medicinal plants. (Deshpande et al., 2006).

4.3 Demand and Supply of Medicinal Plants.

For the efficient functioning of a market a well coordination of market forces of demand and supply is essential. In the case of medicinal plant market the major source of demand and supply come from a few agents who play a significant role in the control and regulation of the market. The estimated area under medicinal plant cultivation in India comes around two lakh hectares. Nearly 75 percent of plant species used by the Ayurvedic drug manufacturers in India are gathered from regenerating forests and wild habitat. The Indian system of medicine uses around 1,100 medicinal plants that are regularly collected from forest and
around 60 species that are collected on demand (GOI, 2000). In this process, collectors are at the grassroots level because they are the inhabitants living near the forest. Depending upon the economic importance of different NWFPs, marketing channels are created and regulated. Accordingly, all the products are classified into three groups depending upon their degree of use, as indicated below:

- Products restricted to local use (saleable only in the village market);
- Products of moderate commercial importance (saleable in bigger markets at district and state level); and
- Products of high commercial importance traded within the country and abroad.

The raw drugs are traditionally grouped as Pettimarunnu (medicines in box) and Parimarunnu (plucked medicines) (Sasidharan et al., 2000). The former consists of items used in the dried form which include several raw drugs obtained from North India also. Parimarunnu are used as fresh and are locally available items. According to a study done by FAO there are two sources of supply of medicinal plants 1) material collected from the wild and 2) material cultivated (FAO, 2003).

Wild harvesting means collection of medicinal herbs from the forest. This can be bark, leaves, branches, roots, fruits, herbs and wood. It can be collected from many sources such as open land, unused agricultural lands, roadsides and forestlands. Much of the materials traded today still are wild and only a few are cultivated. Herbal raw materials are collected by daily labourers. In India the tribal population is given the sole right to collect medicinal plants from the forest. Wild harvested medicinal plants are cheaper as it does not require infrastructure and
investment. Many species used by the industry are required in small quantity and hence they are not economically viable to be cultivated. Again many plants need large area and hence they cannot be locally cultivated. Above all it is believed that wild herbs are more superior to cultivated herbs as the former grows in a natural habitat. Cultivated materials are more suitable for large commercial uses of pharmacies and industrial houses. The manufacturers need guaranteed products that are of a given quality. Only cultivated materials can ensure this. These quality considerations are becoming increasingly useful due to the restriction imposed by authorities. The regulations like Good Manufacturing Practice (GMP), Good Agricultural Practice (GAP), Good Agricultural and Collection Practices (GACP) etc. are followed in different countries. India, China, Argentina, Brazil, Hungary, Spain and Poland are the countries who have large cultivated source of medicinal plants (UNCTAD, 1982).

The cultivation of medicinal plants requires production of superior quality products at lowest possible cost. In most cases due to the high cost of land and the area of land needed, cultivation of medicinal plant is done under contract. Most of the large scale manufacturing units in Kerala have their own herbal gardens. AVS has the largest herbal garden in Kerala. Oushadi has a garden attached to its factory. Nagarjuna has a contractual garden system with local households. Normally they cultivate those plants that they use in large quantities or in the production of derivatives and isolations for which standardization is essential (FAO, 2003).

Cultivated material helps to mark reliable botanical identification; it helps to maintain quality standards and also facilitates controlled post harvest handling.
Given the continuous and steady demand for herbal products and depletion of wild habitat, the increase in large scale cultivation seems to be the only remedy for meeting the demand. But it is debated that the cultivated materials are treated as qualitatively inferior to the gathered specimen. For instance wild ginseng roots are considered to be 5-10 times more valuable than the roots produced by artificial propagation (Schippmann et al., 2002). Traditional medicine practitioners believe that the cultivated materials do not have the power of the material collected from the wild. Whatever be the debate between the wild and the cultivated it has to be accepted that the trade in medicinal plants are increasing.

After analysing the supply sources of medicinal plants it is essential to know from where the demand for these plants comes from. Medicinal plants are demanded sometimes as final commodities whereas in some other case as processed products. The demand is fast increasing as new products are derived from these products. The industrial demand for medicinal plants comes from the following sources as depicted in the figure given below.
The pharmaceutical companies are the main source of demand for medicinal plants in the world. They use the medicinal plants for isolation of single purified drugs, in advanced extract form and for the development of other semi-synthetic pharmacologically active substances. The second source of demand comes from Phyto - pharmaceuticals companies who use plant extracts and plants as such as raw materials (Sophie, 2003). Further health supplement manufacturing companies, traditional medicine manufactures and producers of alternative medicines (tribal medicines) use these medicinal plants. It is estimated that the world import of the vegetable material used in pharmacies by the different nations have increased phenomenally. India, Brazil and China are the largest exporters of the
medicinal plants where India’s contribution is less significant with ample scope for improvement. It is predicted that the medicinal and aromatic plants have a high market potential and the world demand for herbal products is increasing at seven percent per annum (Deshpande, 2002).

But one of the difficulties in assessing their importance both locally and globally is the lack of dependable information about their place of origin, their availability and distribution, how they are collected, when they are harvested, quantity involved and the related trade statistics. Although there are some solid efforts at national and regional level undertaken in the recent years, but much information are unreliable.

4.4 Medicinal Plants Trade in India

The nature of trade in medicinal plants in India is characterised by large scale irregularities, imperfections, and extreme complexities. There is no macro level information regarding the quantity of botanicals traded their price, number of traders and other parameters. There are many estimates which are less dependable. One such estimate put forward by (Srivastava et al., 1996) specifies that the medicinal plant market in India is of worth Rs10 billion a year. The ITCOT study in 1998 predicted that the trade in medicinal plants comes to Rs.25 billion.

The cardinal cause for this irregularity lies in the very nature of the market itself. The methodology of identification of the plant itself is unscientific. A plant known in a particular name is known by another name in other area or in other place. A species in a particular name is traded in different names. Further there are many species known by different names. In the case of medicinal plants they are traded in their dry form long after the harvest. In most cases it will not be possible to identify the plant. Hence the knowledge of the correct botanical name and
identifying the plant or its parts in the dry form are very essential for the participation of the players in the trade (Niraj et al., 2002). Owing to the above difficulties the data on medicinal plant trade is scanty in India. In spite of the deficiencies placed above, medicinal plants trade possesses certain inherent features which depict the true nature of the imperfections.

4.4.1 Structure of Medicinal Plants Trade across India

The purchase and sale of medicinal plants in India is networked through different markets spread across the nation. The study conducted by International Institute for Environmental Development (2002) classifies the markets into three, such as major medium and minor markets. A market with more than 25 traders and an individual turnover of Rs.5 billion or more is termed as a major market. A medium market will have 25 to 50 traders with a turnover ranging between Rs.2.5 billion to Rs. 5 billion. The rest of the market with small numbers of big traders with small turnover is termed as minor market. A minor market may consist of large number of traders dealing with a few species.
### Table 4.5
Zone and State–wise Classification of Medicinal Plants Market in India

<table>
<thead>
<tr>
<th>Zone</th>
<th>State</th>
<th>Major cities/ towns</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Northern</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delhi</td>
<td>Delhi</td>
<td></td>
</tr>
<tr>
<td>Jammu and Kashmir</td>
<td>Baramulla</td>
<td>Jammu</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>Patna, Raksal</td>
<td>Bilaspur</td>
</tr>
<tr>
<td>Bihar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>Dehradon, Lucknow, Kanpur, Tanakpur</td>
<td>Haridwar, Varanasi, Saharanpur, Barabanki, Muzaffernagar</td>
</tr>
<tr>
<td>Haryana</td>
<td></td>
<td>Amballa</td>
</tr>
<tr>
<td>Punjab</td>
<td>Amritsar</td>
<td>Hoshiarpur, Chandigarh</td>
</tr>
<tr>
<td><strong>Central</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>Raipur</td>
<td>Shivpuri, Dhamtari, Neemuch, Katni, Indore, Dewas</td>
</tr>
<tr>
<td>Rajasthan</td>
<td></td>
<td>Ajmer, Jaipur</td>
</tr>
<tr>
<td><strong>Southern</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>Hyderabad</td>
<td>Vishakapatnam, Kakinada</td>
</tr>
<tr>
<td>Karnataka</td>
<td></td>
<td>Bangluru, Mysore, Bijapur</td>
</tr>
<tr>
<td>Kerala</td>
<td></td>
<td>Thrissur, Palakkad, Badagaram, Kottur, Ernakulam</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>Chennai</td>
<td>Madurai, Virudhagan, Tuticorin, Dharmapuri, Pudukottai</td>
</tr>
<tr>
<td><strong>Eastern</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assam</td>
<td></td>
<td>Kokrajher, Barpeta Road, Dibrugarh, Guwahati</td>
</tr>
<tr>
<td>Orissa</td>
<td></td>
<td>Bhuvaneshwar</td>
</tr>
<tr>
<td>Meghalaya and other</td>
<td></td>
<td>Shillong</td>
</tr>
<tr>
<td>North eastern states</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Bengal</td>
<td>Kolkotta</td>
<td>Silliguri, Serampur</td>
</tr>
<tr>
<td><strong>Western</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gujarat</td>
<td>Sidhpur, Unjha, Ahmedabad</td>
<td>Palanpur, Mehasana</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>Mumbai, Nagpur</td>
<td>Ratnagiri, Vashi, Pune</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>6, 21, 38</td>
</tr>
</tbody>
</table>

The major markets for medicinal plants are located in big cities and there are certain markets which are specifically known for special medicinal plants. Major exports take place from Delhi, Mumbai, Chennai and Tuticorin. Indian medicinal plant market is characterised by large number of minor markets and a few major markets. None of these markets have an organised body for operating the business nor there exist any authority to regulate the business. Hence there is no statistics available on the actual volume of trade that is taking place. But the players involved in this trade are well coordinated and there exist an excellent networking of agents involved in the supply chain of medicinal plants. In an informal way, all of them are well linked. They have information regarding the price, parts of the plant traded plant that is most demanded and the market that can earn maximum returns.

4.5 Marketing Channels of Medicinal Plants

Tracing the major channels in the medicinal plant trade in India is a very difficult task for the reasons sited above. However it can be assessed that a systematic supply chain will consist of the following players. There is a long chain between the primary collectors and the end users and this makes the study more complex. And the supply chain varies from product to product and region to region. But in general a typical marketing channel will consist of six categories of actors involved in the marketing channel of medicinal plants from their collection from forest or farm to the final export or consumption as drugs or herbal preparations.

- Primary Collectors/ Cultivators
- Petty traders
- Private traders
- Agents
- Wholesalers
- Final consumers
4.5.1 Primary Collectors

The collectors are mostly tribal poor who live near to the forests. Collection of medicinal plants and other non-timber forest products provides income for the forest dwellers for their subsistence. Studies indicate that agricultural production from tribal land is inadequate to maintain a household at subsistence level. The forest dwellers hence, depend on collection of medicinal plants and other non-timber forest produce for their livelihood (Saxena, 1996). Realising the importance of collection of wild medicinal plants and other non-timber forest products (NTFPs) in the tribal economy, the Indian Forest Policy, 1988 provided for safeguarding the customary rights and interests of tribal people. The provision asks for protection, regeneration and optimum collection of minor forest produce along with institutional arrangements for the marketing of such products.

The collection of medicinal plant is a supplementary occupation of the tribals. They collect medicinal plants when they go to gather firewood and fodder (Datta, 2004). It is a labour intensive activity and is dominated by women and children. In a study conducted in the Great Himalayan National Park, Himachal Pradesh, 70-85 percent of the collectors constituted women and children (Tandon, 1996). It can be seen that women largely carryout the collection of leaves and fruits and flowers and men collect roots and other parts which are of high weight and plants that are seen only in interior forests. In some tribal outlets the collection of medicinal plants is the only source of income for the poor whereas in other pockets it is a supplementary source of income to the poor where collection is a part time activity. The remuneration paid to the primary collectors were extremely low, often a small fraction of the price paid by the final consumers. The payment depended
upon the daily wage rate, the kind of herb collected, and the availability of the herb and not related to the actual demand for the same. The rates paid had no correlation with the final price of the herb. In most cases the primary collectors got 10-58 percent of the final price (Niraj et al., 2002). Hence the rate of exploitation was high.

In Kerala before the advent of the colonial power the collection of NTFP were bartered by the tribals to the plainsmen. With the nationalization of the forests in 1974 the monopoly of collection was taken over by the Forest Department. Till the late 1950’s the forest department leased out portion of forests to the private agents for the collection of all NTFPs such as ivory, horns, honey bee’s wax which was collected by the forest (Anjana and Muraleedharan, 1998). Later forest ranges were leased to private collectors who employed tribals and non tribals for collection. They paid nominal amounts to these people and sold the collected NTFP’s in a higher margin. In order to prevent the exploitation the Government of Kerala granted the right of collection of NTFPs to the tribes in 1978. Tribal Service Cooperatives Societies (hereafter TCS) were formed to facilitate this which was replaced by the Kerala State SC/ST Federation (hereafter Federation) in 1982. The Federation is the apex of all TCS. Since then the monopoly right to procure and market all the NTFPs was given to the Federation. There are 82 tribal co-operative societies and 35 of them are (which covers 35 percent of the tribal population) engaged in the collection of NTFPs.

This arrangement helps the tribals to eliminate middlemen and fetch fair returns for the products collected. As per the Government of India (Ministry of Social Justice and Empowerment) rule the tribals should get at least 75 percent of the final sale value. The TCS is providing 80 percent of the final price to the tribals.
4.5.2 Private Traders

The second node in the supply chain is the traders who are in direct contact with the collectors. They buy the herbs from the collectors and often operate in more than two villages. They inform the primary collectors, the demand requirements for various herbs. In most cases we can see that primary collectors work for these traders. It is a male dominated activity. Different kinds of payment mechanism exist in this section. These local agents have a shop and sell medicines through these shops. Again they act as money suppliers to the collectors. During lean season when the agricultural returns are less they provide credit to these primary collectors who repay in cash or in kind (mostly by supplying medicinal plants) during the peak season. This interdependence brings the tribal collectors under the direct control of these agents by virtue of this credit system.

Another kind of operating procedure that seems to be popular in Kerala is praiseworthy. In most cases the local agents get advance order from the commission agents. These agents engage a set of collectors to procure orders and part of the payment is advanced to these collectors. This mechanism is better than the earlier process. Yet another practice seen in Kerala is that the primary collectors bring the medicinal plants to the local market (*chandasa*4) and sell them along with other agricultural products. The agents buy the herbs and procure them for the final sale to the next tier, the commission agents.

4.5.3 Commission Agents

The supply chain for medicinal plants becomes well organised in terms of its operation and highly informal in terms of documentation at this stage. The commission agents are the proverbial ‘big fish’ in the supply chain. Each and every transaction becomes more commercial from this stage onwards. They have an
excellent networking with players below and similar agents both within the state of
their operation and outside the state. They have a specialized business and in most
cases medicinal plants are just one of the many products traded by them. They
possess information regarding the prices prevailing in other markets and the
potential volume of demand for the herbs (known out of their past experience). The
prices of the herbs traded, the volume of their business, and the major supplier’s
quality of the products are all kept secretive and the difficulty in studying and
estimating the value addition begins here. Impenetrability creates barrier for further
analysis. Information is provided only to the agents in the chain. The local agent
supplies the herbs procured to the commission agents at a price fixed by them. The
agents in turn sell these herbs to other traders in major markets and charge a
commission. They receive full payment from the agents above.

The personal interview with these agents in Thrissur and Kozhikode
districts of Kerala revealed that these agents have large warehousing facilities which
help them to store the raw materials and broker these products when they have a
high market demand. It was understood that the dry parts that were stored, often
fetched more than 50 percent the prices when sold.

4.5.4 Wholesalers.

They are the group directly involved with the Ayurvedic medicine
manufacturers. They are well organised and use the modern methods of transaction
and respond to the tender requirements of the final consumers and supply according
to the terms and conditions agreed upon. The cost of transportation is borne by the
wholesaler himself and in some cases by the firms. In Kerala most of the firms have
specific sellers who have been supplying herbal raw materials for the past few
decades. AVS mostly depends upon conventional suppliers who are age old clients
of the firm. This relationship mutually benefits leading to uninterrupted supply of herbal raw materials. Apart from supplying herbs to the firms within the country these wholesalers are exporters who export the herbs along with other items.

4.5.5 Final Consumers

The final node in the supply chain of herbal raw materials is the end users of these herbal raw materials. They mostly are Ayurvedic medicine manufacturing firms, Ayurvedic practitioners (local health healers$^5$) and households who use these herbs for their household manufacturing at large. Though the volume of household purchase has declined considerably, small percentage of people still buy herbs for making hair oil and first aid medicines at home.

There is no record of number of people involved in each category of the supply chain. There is no necessity that the supply chain should follow the same route always. In some cases there may be direct sale by the private trader to the manufacturing firm or there may be multiple sales from one private trader to other in another market. In addition the trade may move in and out of the formal sector as well the legal boundaries at various stages of the transactions. What finally set the chain in motion are the advance orders set by the commission agents from the manufacturing firms. Once these orders are confirmed they pass this to the private traders who employ collectors to gather it.
Table 4.6

Probable Number of Players in the Medicinal Plant Trade in Kerala

<table>
<thead>
<tr>
<th>Players</th>
<th>Thrissur</th>
<th>Thiruvananthapuram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Collectors</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>Local Agents/Traders</td>
<td>More than 55</td>
<td>More than 36</td>
</tr>
<tr>
<td>Commission Agents</td>
<td>40-45</td>
<td>25-30</td>
</tr>
<tr>
<td>Wholesalers</td>
<td>25</td>
<td>Less than 15</td>
</tr>
<tr>
<td>Exporters</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Survey Data, 2009

From the discussion and interview with the people involved in the chain revealed certain information which might throw light on the dynamics of the players involved and the nature of imperfections involved in the trade. The information was gathered from the markets at Thrissur and Thiruvananthapuram districts and is depicted in table given above.

Information revealed from the players in the supply chain reveals that there is no direct relation or contact between the various players in the supply chain. Apart from some plants like Aloe vera for example all other plant part reaches the final consumer after passing several hands. In most case the producers did not have any information regarding the primary collectors and vice versa. In Kerala there are mainly four outlets for the primary collectors to sell there product viz., the oldest market at Badagara, in Kozhikode District; Kozhijanpara in Palakkad District (both in North Kerala) and Kottur in Thiruvananthapuram District (South Kerala). The Federation is fourth outlet.
The oldest market for medicinal plants in Kerala is at Badagara. The market operates on all Tuesdays from 11 pm to five in the morning. This unique timing has been continuing since time immemorial. Earlier this market was a part of the common commodity market but as the commodity trade became necessary on all days, the present place where the medicinal plant trade is conducted is confined to purchase and sale of medicinal plants and goats. The informal gatherers arrive the previous day with their products and they arrange them in their own way. The sellers are all known each other and there was no evidence of competition among them. The private traders and a few commission agents were also seen. A small number of individual producers also arrive to purchase the plant species. There were around 50 primary collectors mostly the tribal folk. They come from the Kozhijanpara, and Nilambur forest area.

The primary study revealed that the number of tribal sellers have declined over the years. Most of the tribals sell the medicinal plant at their own premises to the private traders. This may be due to the poor initiative of the primary gatherers and the difficulty in transporting the material. It was reported that the quantity of plants plucked from forest area is fast declining and hence transportation cost cannot be met from the revenue obtained. The market was primarily a buyer driven market and one could see sellers going after buyers to sell their product. The buyers selected the medicinal plants according to their choice and had supremacy in negotiating the price. Finally the products were sold at the price fixed by the buyer.

One striking fact to be noted was that all sellers irrespective of their location of collection sold the products at a common price. This means that transportation cost does not enter the price determination in anyway. It was a male
dominated market where female sellers numbered less than ten. The volume of goods bought for sale by them were less and most often they sold their products to the male counterparts. Another market where primary collectors sell there product is at Kozhijanpara in the Palakkad District. This market is bigger than the Badagara market. It functions on all days and hence the volume of business here is much bigger than the former market. The medicinal plants collected from the Tribal belt of Western Ghats are sold though the Kottur Market in South Kerala. The AMMU’s located in the southern region depend upon this market.

Besides the Federation and private traders, primary collectors directly auction their NWFPs. This practice is found at Kottur, situated in the Agastyavanam Biological Park Range. This is locally known as Kaani chaantha (Kaani market). The local tribals come together every Wednesday and Saturday to market their NWFPs. These items are auctioned off under the supervision of Forest Department officials. The auction procedure is highly informal, when compared to that of the Federation. This is a unique marketing system in Kerala where the tribals meet together in one place to market their commodities. The main drawback of this system is that the products are not weighed properly. Only a guesstimate is made by the auctioneer. No official sanction or recognition has been accorded to this form of marketing by the Forest Department even though it has been in existence for the last 15 years.

The primary collectors are unaware of the final consumer, the actual price of the plant part, the final price at which they are sold, the transformation that the plant part takes in terms of its value addition etc. In short the primary collectors are ignorant of the monetary wealth stored in the trade of the medicinal plants
gathered by them. Each level of the trade is characterised by a number of middlemen who maintain a very secretive note on the trade and they are only motivated by their individual profits. None of the agents involved are interested in the conservation and preservation of medicinal plants; they are not concerned about the issues in the medicinal plants sector. But all of them agreed that it is becoming difficult to get medicinal plants in the required quantity according to the demand and hence the prices of the plant parts are increasing at an alarming rate.

4.6 Dynamism in the supply chain of medicinal plant trade in Kerala

Tracing supply chain of medicinal plant trade is a tough task. Broadly there are two categories of supply chains in the medicinal plant trade – one followed for fresh plant parts and other for dried plant parts. Some plants are needed in fresh and thus there arise the need for direct contract between the primary collectors and the Ayurvedic firms. The involvement of too many players will hamper the freshness of the plant part as it is time consuming. Here the rate of exploitation is minimal as the number of intermediaries is few.

But even in some extreme cases the fresh plant parts are traded with the help of intermediaries. In the case of the second chain the number of agents involved is many. It is a buyer driven supply chain. The market decisions are determined by the number of intermediaries involved. Larger the number of middlemen greater the rate of exploitation by the upper level players. This buyer driven supply chain is middlemen oriented where the system of relationship is guided by opportunism.
In Kerala the traders who appear in the second place collect the plant at a cheap rate and sell it to the distributor at the district level at a high price. With the growth of the Ayurvedic manufacturing units the number of these traders at village level has increased. They adopt two methods to raise their profits, either by reducing the buying price from the primary collectors which is much easier as they have less bargaining power and other by increasing the selling price of the plant part. The latter is not an easy strategy as there are too many traders in the market. Here an increase in the price by one trader will only lead to loss of a potential consumer. So the traders opt the way of deteriorating the financial gains of the primary collectors to raise their capabilities.

The third actor in the chain in Kerala is the big businessmen who buy plant parts from the traders and sell it to the manufactures. They adopt some kind of value addition here. The business men or commission agents collect the plant in the
raw form and convert it into semi processed form. Various methods of semi processing that are possible are cleaning and grading, cutting mixing, deseeding etc. Cleaning and grading are simple processes. Cleaning involves washing the plant part mostly root part and removing the mud and other impurities from the plant. This provides tremendous opportunities for the businessmen to charge higher price. Grading involves separating different quality classes. The primary survey conducted among the commission agents at Thrissur district revealed the price of Safed musli (Chlorophytum borivillianum) varied between Rs.220 - Rs.1800 per kilogram. This indicated that there are large varieties of Safed musli available (3-4 inch long root which fetches highest price ; 3 inch long that gets intermediate price and broken fragments that get lowest prices) and the rate depends upon the grade of the plant part. Most of the commission agents have their own machines and factories to carry out these operations. Recently these commission agents have set up units for extracting the concentrate from plant base which is widely exported for manufacturing cosmetic formulations.

Another kind of chain operating in Kerala is institutional or government regulated one. Here the primary/tribal collectors are directly connected to the tribal cooperatives which come under the Kerala State SC/ST Federation. The four branches of the Federation, located in Trivandrum, Adimali, Thrissur and Wayanad districts, market the medicinal and other forest products of 82, TCS spread over different districts in the state. Every year, the Minor Forest Products Committee allocates forest areas to different tribal societies for the collection of NWFPs. To facilitate collection, societies establish collection depots inside the forests during the peak collection season. These depots are managed by commission/agents/depot managers who are mainly tribals. When adequate quantities have been collected
from the different depots, auction notices are sent by the Federation to all the parties who have registered interest in the auction.

Another marketing practice adopted by the Federation is direct negotiation. This is resorted to for sales of *Sida rhombifolia*, *Desmodium gangeticum*, *Pseudarthria viscida* and *Nilgirianthus ciliatus*. These plants are needed in the raw form and cannot be stored for long periods. Therefore, the Federation enters into an agreement with the parties interested in purchasing these items and supplies them at a mutually agreed price. Inadequate storage facilities and lack of funds during the peak collection season are the two major hurdles that impede the smooth functioning of the society and the Federation (Thomas, 1993). Many of the tiers that operate in the earlier nodes are not present here.

The Federation often faces stiff competition from the private traders in procuring and marketing medicinal plants in Kerala. The private traders compete with the Federation by offering higher prices to the collectors. This results in the flow of products to the private sector and weakens the position of the Federation as a marketing agent.

**4.7 Supply Chain Analysis**

It is clear from the above supply chain analysis that there are too many agents who play their part in the production of Ayurvedic products directly and indirectly. Starting from the primary collectors there are a number of agents involved in trading the medicinal plants the most important ingredient for making medicines. The price of the medicinal plants traded varies as it passes from one hand to another. It is widely accepted that the price of Ayurvedic medicines are
increasing at a manifold rates over the years. One of the major factors responsible for this price hike is the mounting raw material cost. Medicinal plants form the key ingredient in the preparation. The raw material costs constitute 40 to 45 percent of the total production cost of the firm (Survey Data, 2009). The increase in the price of medicinal plants has not affected the demand for medicines, which can be seen from the sales figures of the leading firms. Further the rigidity in the formulation of Ayurvedic drugs supports this. But this hike in the demand for medicinal plants which is derived from the demand for Ayurvedic medicines has not improved the status of the primary collectors. This complex situation leading to large scale exploitation is dealt in the succeeding section.

Table 4.7

<table>
<thead>
<tr>
<th>Medicinal Plant</th>
<th>Price at which the medicinal plants sold by</th>
<th>Share of the Primary Collector in final price (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Collector</td>
<td>Private Trader</td>
</tr>
<tr>
<td>Kadukka</td>
<td>4-5</td>
<td>8</td>
</tr>
<tr>
<td>Thanikka</td>
<td>3-4</td>
<td>8</td>
</tr>
<tr>
<td>Nellikka</td>
<td>8</td>
<td>28</td>
</tr>
<tr>
<td>Gulgulu</td>
<td>25</td>
<td>65</td>
</tr>
<tr>
<td>Thippali</td>
<td>52-55</td>
<td>152</td>
</tr>
<tr>
<td>Chittamruthu</td>
<td>10-15</td>
<td>18</td>
</tr>
<tr>
<td>Vizhalari Parippu</td>
<td>65</td>
<td>135</td>
</tr>
<tr>
<td>Thrikopakonna</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Elavarnam</td>
<td>40</td>
<td>65-70</td>
</tr>
<tr>
<td>Kattarvazha</td>
<td>6-10</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: Survey Data, 2009.
The table shows the price obtained by each of these players for different species traded. The difference between the reward paid to the primary collectors and the market rate of the product is considerable. For instance Kadukka sold at Rs. 4 - Rs. 5 by the gatherers is purchased by the final consumer at Rs. 22/- which means the gatherer gets only 18-23 percent share of the final price. Similar exploitation can be seen in the case of Thippali an ingredient widely used by most of the Ayurvedic firms and in making of several drugs. Thippali’s price triples when it reaches the private trader and doubles with the commission agents and finally sold to the final consumer for Rs 425/kg. To put more explicitly, price of Thippali increases nine times when it moves from the primary collector to the final consumer. The former gets only five percent of the share in the final price. The share of primary collector ranges between five to 36 percent of the price at which the plant is sold to the final consumer. The same is the case with all other species also. The condition is much more vulnerable during monsoon. When the supply is high during rainy season the middlemen succeeds in buying the species at a lower price and the primary collector has no other alternative other than to sell at the price fixed by the buyer themselves. Hence the existence of the middlemen, hamper the prospects of the primary collectors.

Unless and until these intermediaries are controlled or regulated the living conditions of the primary collectors cannot be improved. To add on, it is worthwhile to identify who emerges as the biggest trader in the trade. This can be known from the table given below. The intensity of price changes discussed above is further interpreted in the table to follow.
Table 4.8
Price Spread between various players in the trade of Medicinal Plants
(in Rs.)

<table>
<thead>
<tr>
<th>Medicinal Plants</th>
<th>P1 to P2</th>
<th>P2 to P3</th>
<th>P3 to P4</th>
<th>P1 to P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kadukka</td>
<td>3-4</td>
<td>6</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>2. Thanikka</td>
<td>4-5</td>
<td>2</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>3. Nellikka</td>
<td>20</td>
<td>22</td>
<td>30</td>
<td>72</td>
</tr>
<tr>
<td>4. Gulgulu</td>
<td>40</td>
<td>410</td>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>5. Thippalli</td>
<td>97-100</td>
<td>198</td>
<td>75</td>
<td>370-373</td>
</tr>
<tr>
<td>6. Chittamruthu</td>
<td>3-8</td>
<td>2</td>
<td>20-30</td>
<td>35</td>
</tr>
<tr>
<td>7. Vizhalariparippu</td>
<td>65</td>
<td>30</td>
<td>15</td>
<td>110</td>
</tr>
<tr>
<td>8. Thrikolpakonna</td>
<td>80</td>
<td>85</td>
<td>35</td>
<td>200</td>
</tr>
<tr>
<td>10. Elavarnam</td>
<td>25-30</td>
<td>35-40</td>
<td>25-35</td>
<td>95</td>
</tr>
</tbody>
</table>

Source: Survey Data, 2009.
Based on field survey at Badagara market.
P1 (player 1) primary collector, P2 (player 2) Private trader, P3 (player3) Commission agent P4 (player 4) final consumer.

The table given above attempts to identify the biggest gainer in this trade. All the players are connected according to their position in the chain. Although it is clear that the private trader exerts considerable power in raising the price of the product, the gain to them from the purchase from the primary collector is not considerable on the whole. But he is not a looser in this channel of trade. Secondly when we compare the trade between the private trader and the commission agent, we find that the private trader can extract considerable gain from the trade. In the case of five medicinal plants traded, private trader makes the maximum gain. The commission agent who introduces the value addition gains control in the trade of three medicinal plants. When we consider the intensity of price spread between the second and third player, it is clear that the private trader’s gain is more than the
gain of the commission agent. Finally the last column of the table shows the price spread between the primary collector and the final consumer. There is no comparison between the prices at these two stages.

The primary collector is the main looser in the trade taken individually and relatively. What can be concluded from this table is that there is no hard and fast pattern for the gain. Either the private trader or the commission agent gets the monetary gain of the trade. The study also highlights the fact that although the commission agent introduces value addition he is not capable enough to raise the price of the product. This may be due to the bargaining power of the manufacturers. The price spread between the primary collector and the final consumer is very significant and has very crucial impact on the general working of the medicinal plant market and Ayurvedic industry in the state.

It is a commonly held view among those associated with the medicinal plants sector that the marketing of medicinal plants is generally biased in favor of the so-called ‘middleman’ (which include petty traders, commission agents wholesale buyers etc.), resulting in low returns to the stewards and collectors of the resource. In many cases, prices paid by wholesalers are of a higher magnitude than the selling prices for collectors, even though no value addition to the plants occurs during the stages falling between the collector and the wholesaler. Studies that document these price differences, usually posit the view that the middleman exploits the lack of market information to obtain a cheap price. The market is imperfect in terms of price-setting because of the restricted flow of information. Given the imperfections and complexities of the market as described above, price behavior is difficult to assess. Prices tend to be volatile and may follow fluctuations between scarcity and over-supply, as well as seasonal variations (Kuipers, 2003). In addition,
as noted above, prices also vary enormously in different places, a phenomenon which though still not fully understood, seems to be primarily a result of the general lack of information dissemination and overall awareness of different buyers and sellers at different points in the chain.

When we analyse the trade undertaken by the Federation we find that the institutional arrangement created for the purpose of its operation is hierarchical and well channelised. The minor forest products collected by the TCS are marketed through the Federation. The Federation sells the product at a price not less than the price fixed by the Non Timber Forest Produce (NTFP) committee. This committee fixes three prices viz., collection price, procurement price and sale price. The collection price is the minimum price given to the tribes by the TCS. The procurement rate denotes the rate at which the collected products are procured by the Federation and finally the sale prices refers to the rate at which this is sold. The prices are so fixed that the tribals would get 80 percent of the sale value as collection charges, 15 percent as commission to TCS and 5 percent as overhead charges to the SC/ST Federation. (Thomas, 1996). In order to affix a certainty in the purchase of medicinal plants the TCS has made it mandatory that the Oushadi should purchase all their medicinal plant requirements from the Federation and the balance can be sold in the open market by inviting tender or conducting auctions (Thomas et al., 1993). A comparison of the prices of the medicinal plants sold through the Federation and that in the open market is highlighted in the upcoming section. This is essential for understanding the need to strengthen this supply chain.
Table 4.9
Comparison of the Raw Material Price of the Federation and Private Traders

(in Rs/Kg)

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Medicinal Plant (B)</th>
<th>Collection Charge (C)</th>
<th>Procurement Charge (D)</th>
<th>Selling Charge (E)</th>
<th>Price of Private Trader (F)</th>
<th>Price Spread (G)= F−E</th>
<th>Percentage difference (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kadukka</td>
<td>8</td>
<td>9.50</td>
<td>10</td>
<td>22</td>
<td>12</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>Thanikka</td>
<td>10.40</td>
<td>12.35</td>
<td>13</td>
<td>15</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>Nellikka</td>
<td>6</td>
<td>7.10</td>
<td>7.50</td>
<td>30</td>
<td>22.50</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>Thippali</td>
<td>116</td>
<td>137.75</td>
<td>145</td>
<td>425</td>
<td>280</td>
<td>66</td>
</tr>
<tr>
<td>5</td>
<td>Cardamom</td>
<td>160-280</td>
<td>190-333</td>
<td>200-350</td>
<td>700</td>
<td>350-500</td>
<td>50-71</td>
</tr>
<tr>
<td>6</td>
<td>Chittamrithu</td>
<td>4.50</td>
<td>5.35</td>
<td>5.65</td>
<td>40</td>
<td>34.40</td>
<td>86</td>
</tr>
<tr>
<td>7</td>
<td>Vizhalari</td>
<td>120</td>
<td>142.50</td>
<td>150</td>
<td>175</td>
<td>25</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: Compiled from the price list records of the Kerala SC/ST Federation, Thiruvanathapuram, 2007 & Survey Data, 2009.

Needless to say there is a glaring difference in the prices fixed by the Federation and that of the private trader. The price of the former is largely subsidised. The difference in price in absolute terms varies from Rs.2 to Rs.500 where as in relative terms it varies from 13 to 86 percent. In spite of this vast difference in the price, the Federation has failed to develop the system effectively. Most of the manufacturers do not buy plant parts from the co-operatives as they are not regular in supply and most of their supply decisions are caught in the bureaucratic redtapism. The inherent weaknesses in the system are quite many. For instance the AVS do not buy plant parts from the Federation as they are not consistent and prompt in their supply.
In spite of the efforts of the Federation and the Forest Department, nearly 60 to 70 percent of NWFPs are marketed by private traders. The traders, therefore, exert considerable control over collectors. The private traders provide the tribals with food, clothing, and financial assistance. This in turn forces the tribals to sell their products to repay the loans. Thus a vicious circle is very wisely constructed and maintained. Private traders offer higher prices than those offered by the societies, but the collectors are cheated by the traders because their products are weighed at less than their actual weight. In remote areas, where tribal societies do not function, the prices paid by the private traders are much lower. The products are then transported to wholesale dealers or exported to other states.

The AMMU’s prefer the private traders because they are ready to supply the raw material at the factory premises, which can reduce the cost of transportation to the barest minimum. In case of the Federation the manufacturers has to arrange transportation facilities at their own cost and collect herbs from the supply spots which are mostly near forest areas. The addition of transportation cost to the price of NTFP’s makes the entire deal uneconomical.

The institutional financial arrangement of the Federation is organised in such a way that they cannot offer credit to buyers. This becomes a hurdle for most of the manufacturing units especially small and medium sized units. The private traders provide minimum 60 days of credit which is a source of relief for the buyers. As in the case of any other governmental processing the procedures to be completed are many. Further it is being observed that the Federation is not able to provide advance information about their sales, date of sales, kind of products and their volume brought for sale, etc. This creates difficulties for the firms to arrange orders
and place their requirements. Private traders welcome advance orders and supply the required quantity on the date specified. This adds to their acceptability. Most important factor in this trade is the provision of required quantity at the needed time. Any dilution to this is a waste. In sufficient quantity at unwanted time will make trade unprofitable. Private traders know this fact very well. Finally most of the manufacturing units have age old suppliers with whom they have an undisputed bondage. The case of AVS is of this manner.

The handicaps sited above are easily correctable. The Federation has to be mastered with greater professionalism, which can make the channel more popular. The strengthening of the medicinal plants trade via the Federation is seemingly important because they are able to sell the product at a very less rate which account to the reduction of the raw material cost. To substantiate the significance of trade via the Federation, a comparison of the difference in the raw material cost of both channels is done in the table given below.

The glaring difference in the proportion of raw material cost in the total price is evident from the table. In some cases the raw material costs dips to half that of the cost with private traders. In the case of the medicine called Amruthadi Kashayam, a medicine widely prescribed for the treatment of fever in Ayurveda, the raw material cost comes to only four percent of the price, whereas if the manufacturer had purchased the raw material from the private trader the cost would run to 33 percent of the price.
Table 4.10

Raw Material Cost and Variations in Drug Prices

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of Medicine</th>
<th>Raw Material Cost</th>
<th>Other costs</th>
<th>Price of the medicine sold</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private trader (1)</td>
<td>Federation (2)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Gulgulu Panchabala choornam</td>
<td>4.40 (63)</td>
<td>2.60 (37)</td>
<td>3.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.80</td>
</tr>
<tr>
<td>2</td>
<td>Amruthadi Kashayam</td>
<td>13.80 (33)</td>
<td>1.60 (4)</td>
<td>30.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>44</td>
</tr>
<tr>
<td>3</td>
<td>Manibhadram Lehyam</td>
<td>12.40 (30)</td>
<td>7.40 (18)</td>
<td>30.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>43</td>
</tr>
</tbody>
</table>

Source: Survey Data, 2009. Figures in parentheses shows the percentage of raw material cost in the final price, computed from the survey results in the table 4.12 and 4.13

An attempt to calculate the probable price of the medicines under the two different channels of supply of raw materials is also done. Assuming all other costs to be same, one can witness a drastic fall in the price of medicines if the raw materials were purchased from the Federation. The price of Amruthadi Kashayam fell from Rs 44 to Rs 32. In the case of Gulgulu panchaba choornam the price fell to Rs 6. whereas in the case of Manibdara lehyam the reduction was up to Rs. 38. This fall in the price can benefit the consumers immensely. The only reason that creates hesitation among core Ayurvedic people is the cost of treatment which is largely attributed by the price of medicines which has to be consumed for a longer period of time (Sankar, 2002). The need for correcting the defects inherent in the system of trade of medicinal plants by the Federation has to be taken seriously and urgently. The ignorance of the industry related aspects of the officials in the Federation is
pointed out as the chief cause for this derailment. The Oushadi who is the main buyer, in this trade can emerge as a channel for negotiating the trade. The channel can be made more appealing if people related to industry are connected to the process and mechanism. Hence the supply chain of trade can be restructured in the following manner.

The starting point of the proposed supply chain model is the primary collector i.e., the tribal folk itself. The collected herbs are procured by the Federation and stored at the warehouses of the Oushadi. After buying herbs for its own use, Oushadi can sell the balance to other firms. The sale obviously involves many procedures which can be distributed among various organisations in the field. Inviting the sale tender is the starting point and that can be given to the Federation. After evaluating the tender the medicinal plants can be transported to the buyers by seeking the assistance of the Government. The government has come forward with a strategy for transporting fish from the harbor to the fish market for the fisherwomen through the organization called *MatsyaFed*. In this system the government provides vehicle and aid to fisherwomen to transport fish from the collection point to the place of sales. Similar procedure can be advised for this trade. The non provision of credit for the buyers was seen as a major default. This can be corrected if government can arrange credit to buyers through financial institutions and banks. To grade the product and check adulteration government can seek the assistance of the State Medicinal Plant Board. Finally the marketing may be done effectively by the Federation itself.
Figure 4.4
Proposed Supply Chain for the Trade of Medicinal Plants in Kerala

Primary Collectors

The Federation

Oushadi

Own Use

Other Firms

Inviting Tender Via Federation
Transportation Via Govt.
Credit Via KFC
Quality Control Via SMPB
Marketing Via Federation
Although the proposed chain involves too many players, it has to be noted that all the organisations connected to the chain, already exist. What is needed is to redefine their role and prospects. This is not going to be expensive. But care should be taken to avoid unnecessary delay and redtapism which can be overcome by efficient and dynamic leadership.

4.8 Value Share Analysis

An attempt is made in the succeeding section to compute the value share of each agent involved in the trade. In order to compute the value share four drugs are selected. Three conditions were set while selection of medicines. They should be classic drugs which are prepared as per the guidelines set in the *Sahasrayogam*. Second condition required that, they should be produced by most of the firms, which implies that the drugs are widely demanded. Finally it was also seen that number of medicinal plants used for the formulation of the medicines should not be less than three.
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of the Medicine</th>
<th>Quantity Packed</th>
<th>MRP in Kerala</th>
<th>Ingredients &amp; Composition</th>
<th>Share of the Players</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Primary Collector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kadukka 16.7 g</td>
<td>0.10 (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Thanikk 16.7 g</td>
<td>0.10 (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Nellikka 16.7 g</td>
<td>0.10 (8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Erattimadum 16.7 g</td>
<td>0.30(20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kanikonna 33.2 g</td>
<td>0.40(15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total share</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 gm</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gulgulupanchabala choornam</td>
<td>10 g</td>
<td>7</td>
<td>Gulgulu 5.3 g</td>
<td>0.10 (25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Thippali 1.1 g</td>
<td>0.10 (55)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Thripala thodu 3.2 g</td>
<td>0.10 (17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Elavarnam 0.3 g</td>
<td>0.0 (40)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cardomom 0.3 g</td>
<td>0.0 (600)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total share</strong></td>
<td><strong>0.3</strong></td>
</tr>
<tr>
<td>3</td>
<td>Amruthadi Kashayam</td>
<td>450 ml</td>
<td>42</td>
<td>Amruthu 112.5 g</td>
<td>1.70 (15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kadukka 75g</td>
<td>0.40 (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chukku 37.5 g</td>
<td>1.50 (40)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total share</strong></td>
<td><strong>3.6</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Manibhadram Lehyam</td>
<td>200 g</td>
<td>42</td>
<td>Vizhalari 11.1 g</td>
<td>0.70 (65)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Nellikka 11.1 g</td>
<td>0.10 (8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kadukka 11.1 g</td>
<td>0.10 (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Trikolpakonna 33.3 g</td>
<td>0.70 (20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jaggerry * 86.7 g</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ghee * 46.7 g</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total Share</strong></td>
<td><strong>1.6</strong></td>
</tr>
</tbody>
</table>

Source: Survey Data, 2009. Figures in brackets represent the price/kg of the medicinal plant. * Wholesale Prices
Table 4.12
Share of Each Player in the Final Price of the Ayurvedic Medicine (in Rs)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of the Medicine</th>
<th>Cost of production (in Rs.)</th>
<th>Profit</th>
<th>Share of each player in the final price of medicine (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw Material Cost</td>
<td>Labour Cost</td>
<td>Infra. cost</td>
<td>Commission to dealers</td>
</tr>
<tr>
<td>1</td>
<td>Triphala Choornam</td>
<td>2.5</td>
<td>6.4</td>
<td>4.8</td>
</tr>
<tr>
<td>2</td>
<td>Gulgulu Pancha Bala Choornam</td>
<td>2.8</td>
<td>1.4</td>
<td>1.1</td>
</tr>
<tr>
<td>3</td>
<td>Amruthadi Kashayam</td>
<td>16.8</td>
<td>8.4</td>
<td>6.3</td>
</tr>
<tr>
<td>4</td>
<td>ManiBhdram Lehyam</td>
<td>16.8</td>
<td>8.4</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Source: Survey Data, 2009.
The value share analysis is done in two stages as explained by the two tables given above. The table 4.11 introduces the medicines selected, its retail price, net weight when sold, and the medicinal plant composition necessary for its making. The amount of medicinal plants required for preparation of the drug was obtained from the Sahasrayogam. The text mentions about the amount of ingredients required in the making of a particular quantity of the drug. From this information the amount of medicinal plant required for the preparation of the drug in the packed quantity was calculated\(^\text{10}\).

The columns six to nine of the table shows the share of each player in the supply chain. To substantiate, the primary collector’s and the private trader’s share in the sale of Kadukka, required in the preparation of Triphala Choornam comes to 0.10 paise, when they sell the same for Rs.5/- kg and Rs8/-kg. The commission agents gets a share of 0.20 paise and the final consumer, the manufacturer buys it for Rs40/-. Similarly the shares of all other ingredients are calculated. The total monetary share of each player in the making of Triphala Choornam varies from Rs1/- to Rs4/- between the primary collector and the final consumer. This means that the primary collector contributes monetarily Rs 1/- in the making of the medicine which is sold at Rs 32/- and whereas others contribute Rs.2.20 paise, Rs3.60 paise and Rs3.90 paise respectively.

In the case of the second medicine, Gulgulupanchabala choornam which is sold at Rs7/- the total share varies from 0.30 paise to Rs3.70/- in the case of Amruthadi Kashayam the share varies from Rs1.60 paise to Rs13.50 paise. Finally for Manibhadra Lehyam the share comes to Rs1.60 paise to Rs26.20 paise. Thus what we can conclude from the table is that the monetary share of each player increases as we
move from one player to players at higher level. Needless to say this is due to the relative increase in the rate at which medicinal plants are sold by each player.

The table 4.12 is a continuation of the table 4.11 given above. Here an attempt is made to calculate the share of each player in the final price of the drug. This helps to trace the final gainer and the looser. The percentage of cost in the total cost was estimated from the primary survey with the leading manufacturers. The corresponding amount spent towards each item was calculated to estimate the total cost and to derive at the final profits. The table reveals that the share of the primary collector who contributes medicinal plants at the rate of Rs 1/- in the final price of *Triphala Choornam* is only 3.1 percent. The share of the private trader is double the share of the former. The difference in the share of the commission agent and the final consumer ranges between 11 percent and 12 percent respectively.

In the case of the *Gulgulu panchabala choornam* the share of the private trader increases more than the primary collector. Similarly the share of the commission agent increase four times the share of the private trader and the share of the manufacturer shows a small increase than the share of the commission agent. This is not different in the case of the third medicine. Here the share of the primary collector in the final price comes to eight percent while the corresponding share increases more than double in the case of the private trader. The estimates show that there is no significant difference in the share of the commission agent and the private trader. Where as the share of the manufacturer comes to 32 percent which is more than the double the share of the commission agent. In the case of the *Manibhadram Lehyam*, the drug that consists of the non medicinal plants such as jaggery and ghee in high composition the
share of the first three players are significantly low where as the producer gains thrice more the share of the commission agent.

From the computation of the value share analysis it is evident that the monetary contribution of the primary collector in the supply of medicinal plants and in the final price of the medicine is very insignificant. This is due to the weak bargaining capacity of the primary gatherers. At the same time the relative share increases as we move to the higher players in the node of supply chain. This portrays the relative upper hand, the private trader and commission agent has in the medicinal plants trade.

The monetary profit to the final manufacturer estimated in the eighth column of the table 4.12 depicts that the manufacturers earn normal profits only. This occurs due to the high raw material costs. It is to be substantiated that proper mechanism for reducing the domination of the intermediaries is essential. It is here that the renewed role of the Federation assumes greater importance. Thus redesigning the supply chain is the only way in which the interest of the core Ayurvedic consumers and the manufactures can be protected.

The foregoing discussion attempted to understand the emerging social and economic patterns in which the distribution of medicinal plants and production of Ayurvedic medicines are organised. Supply chain study recognizes the possibility of upgrading the production processes.

End Notes

1. Medicinal and Aromatic plants.

2. AVS, the pioneer in this has launched a herbal garden in Kottackkal and Nagarjuna has initiated a buy back system of medicinal plant trade. Here they distribute the medicinal plants to the farmers and when it is time to harvest the firm itself buys the entire output. The practice is still continuing successfully and Nagarjuna is planning to spread it across the state.
3. GMP standards pertain to infrastructural and physical requirements that are to be met by the manufacturing units which include that there should be adequate space for receiving and storing raw materials, manufacturing process areas, quality control section, finished goods store, office and rejected goods store. This was implemented in June 23, 2000 by the Government of India. This means at least a million rupee investment and document work.

4. Industrial and Technology Consultancy Organisation of TamilNadu is a governmental agency that conducts feasibility studies for industrial promotion in the State. It is based at Chennai.

5. Chanda is local name for market

6. Local health healers locally known as nattu vaidhyars. They are not officially qualified physicians but have excellent knowledge of the various treatments. Popularly they are birth attendants, bone setters, visha vaidyas (snake, scorpion and dog) and tribal medicine practitioners.

7. Kanni name of a tribe in Kerala. They hold the patent in Agrogya pacha a health supplement. In association with AVS they have formulated the patented medicine called Jeevani.

8. It was a potential source of profits for most of the medicinal plant traders in Kerala as it was discovered that Safed Musli had the power to stimulate hormones for the treatment of infertility among men. It was even called herbal Viagra.

9. The survey data revealed that the cost of transporting the medicinal plants from their supply source to the factory premises of large firms are borne by the suppliers themselves, whereas in the case of the Federation the buyer themselves have to arrange the transportation.

10. Matsyafed Short name of the 'Kerala State Co-operative Federation for Fisheries Development (KSCFD). The headquarters of Matsyafed is at Trivandrum. This is the Apex Federation of the Fisheries Co-operatives in the state. A three tier system of fisheries co-operatives with 594 primary co-operative societies at the base, is functioning in the State. Matsyafed implements various schemes on the following: Monitoring and Marketing of fish landings through primary co-operatives. Supply of various fishing implements such as craft, gear, engine etc to the active fishermen. Besides housing schemes and insurance schemes for fisher folk are introduced.

11. Sahasrayogam lays down the mode of preparation. For instance in the case of Amruthadi Kashayam which is specified in the net weight of 96ml, needs chittamruthu of 24g, Kadukka 16g, Chukku 8g. Accordingly to obtain the quantity of chittamruthu needed for preparing 450ml of Kashayam, the following method was adopted. (24/96* 450 = 112.5 g chittamruthu). Similar computation was done for all other medicines.