



INNOVATIVE STRATEGY FOR TRANSFORMING VILLAGES INTO VIBRANT & PROSPEROUS ENTITIES

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ABSTRACT

Agriculture is economically, nutritionally, and socially vital to India. It contributes 23 per cent of the GDP, feeds over a billion people, & employs 66 per cent of the work force¹. 70% of India's population lives in villages, translating into a potential consumer base of over 700 million individuals. The rural consumer is no different from urban consumer in terms of aspirations for a better lifestyle. He is constrained by intermittent cash flows, poor infrastructure, non-availability of quality products & services and high dependence on feeder towns & cities.

The focus of consumer studies in India has largely been on urban consumers. Recently, many MNCs are investing in the rural retail sector to tap the vast potential of the market. The rural market growth is faster than its urban counterpart & accounts for close to 70 per cent of toilet-soap users and 38 per cent of all two-wheelers purchased.

The medicinal plant sector is often projected in the traditional livelihood strategy as one of the potential sectors of employment promotion especially in the current context of growing herbal product market and increasing relevance of indigenous medicines in healthcare. The paper while tries to portray the dynamics of Indian medicinal plant sector, necessarily points to the need for a regulated market structure and improved linkage of Tribal development societies and ayurvedic manufacturing firms, which in turn, will improve the livelihood for the forest dependent communities' especially medicinal plant collectors. The study which basically use the supply chain framework, focuses on the Southern Western Ghats, gives the picture of the lopsided sharing of income in the medicinal plant chain and hence the side streamed tribal collectors. There are mainly two types of supply chains, which exist in the medicinal plant sector. While in the first one largely unequal distribution of income prevails because of the existence of a large number of mediators, the second supply chain network where the major player is tribal co-operatives include less number of players and seems relatively efficient. The latter is less visible in Kerala because of some specific internal and external factors. Hence the supply proposes the need for intimation of more and more tribal medicinal plant co-operatives and

better linkage with the ayurvedic manufacturing firms, which looks environmentally sustainable and more efficient from the view of both firms and plant collectors.

Key words: Linkage, rural livelihood, tribal co-operatives, ayurvedic manufacturing, supply chain, medicinal plants, sustainable development. The growth of medicinal plant sector cannot be alienated from the growth of ayurvedic sector, since the demand for medicinal plants is a derived demand of the latter. So the study starts with the background of the growth of ayurvedic sector and its linkage with the medicinal plant sector and then follows to the dynamics of medicinal plant market, taking Kerala as a case.

GOAL

A PATH TO END EXTREME POVERTY: Just six months ago, the World Bank Group endorsed two goals

(a) To end extreme poverty by 2030,

(b) To boost shared prosperity for the bottom 40 percent of the population in the countries.

To plan the activities for above, most effective workable strategy needs to be initiated in a phased manner so that we become a Solutions Bank with results for the extreme poor as our central benchmark.

The medicinal plant sector is often projected in the traditional livelihood strategy as one of the potential sectors of employment promotion especially in the current context of growing herbal product market and increasing relevance of indigenous medicines in healthcare.

World Bank organized Global citizens Festival at New York USA – “To call for the end of poverty, can visit Global Poverty Project at website www.zeropoverty2030.org

We cannot let over a billion people suffer in extreme poverty when we have the tools and resources to change their lives for the better/improved state. The scheme well evolved can create an opportunity for the poor while creating a new profit opportunity for retail organizations willing to take the risks and correct the inefficiencies through long term planning and effective strategizing. The variety of benefits identified and quantified in some cases are:

- Consumer will get wider choice and better quality at competitive prices.
- This will trigger consumer demand and increase the flow of customers to such outlets.
- Retail chain developing own labels will create bulk volume outlet for processors and producers resulting in lower wastages and higher yields.
- Retail chains will also invest in own supply chain infrastructure thereby reducing inefficiencies and providing better returns to the farmer.
- Larger rural based investments and agro-based employment opportunities would result into a more affluent society.
- Organized retails have built in mechanisms for upgrading the skill sets of employees, thereby enhancing the retail productivity by 3 to 4.5%

BACKGROUND

It has been observed that there has been an increasing demand for more and more drugs from plant sources especially from developed countries. During the past two three decades, World demand for herbal products

including natural products of medicinal value, pharmaceuticals, food supplements and cosmetics has been growing steadily at the rate of 10% to 15% per annum in the last decade (WHO, 2002).

This revival of interest in plant-derived drugs is mainly due to the growing belief that *green medicine is safe* and more dependable than the synthetic drug of which many have adverse side effects. This seems to be backed by the nature attitude of consumerism. According to WHO, about 80% of the world population depends on one or another form of indigenous medicine? Currently the global market for herbal products, which includes medicines, food supplements, herbal beauty and toiletry products is estimated at around US\$ 62 billion. Out of this, the market for herbal medicine alone is estimated at US\$5 billion and is expected to reach more than US\$19 billion by 2020 (EXIM Bank, 2002). In India there is inadequate information about the medicinal plant and Ayurvedic drug market. INDIAN SCENARIO: According to a rough estimate, in the total market for the herbal products, India's share is less than 2% i.e., about Rs. 2000-2500 crores considering the formulations beauty and toiletry products made by the emerging companies like Zandu, Dabur, Himalaya etc. (EXIM Bank 2002). Out of this, Kerala provides more than 230 crores.

In this era of rapid environmental degradation, ayurvedic concepts like herbal systems provide the comfort of being in total harmony with nature. India like Malaysia, China, Pakistan and UAE is increasingly finding way forward by making use of the traditional system. In the new consumer culture, the commodity side of the herbal systems are getting more popularity than the curative side of it. This opens more possibilities for Ayurvedic market. About 84 percent of the market for indigenous drug market is occupied by the ayurvedic system.

The three states viz. Uttar Pradesh, Kerala and Gujarat together constitutes more than half of the ayurvedic manufacturing units. According to the Indian Systems of Medicine and Homeopathy (ISM & H web site, 2000) there are 8405 licensed manufacturing units and a large number of small scale processing house to meet the requirement of 4.6lakh registered practitioners of ISM & H and other users in the country. As mentioned earlier, this necessarily points to the large chunk of raw material used up by ayurvedic sector and medicinal plant trade in the world, it is estimated as high as \$16 billion per annum (Lambert, 1997) and in India it was roughly calculated as about Rs1000 crores and is further expected to enhance with the need, mindset and lifestyle.

RURAL ECONOMY

In order to spend you have to earn. The rural sector has been growing in terms of spending capacities as shown by the growth in the earnings. With the decline of Agriculture's contribution to the GDP (40% in 1980 to around 25% in 2000), the non-farm sector has been growing steadily (from 31.6% of NDP in 1970-71 to 47.22% in 1993-94 {based on National Accounts Statistics data as presented in the Economic Times Intelligence Group report}) leading to a balance and improvement in the rural economy. Within the non-farm sector, a very high value adding service sector has contributed more (27%) than the manufacturing sector (16%) or the agriculture sector (57%, dropping from a 72.4% in 1970s) to the total rural NDP. (NAS 2000 data). As the formal rural non-farm employment opportunities grow (The common Minimum Programme of the Man Mohan Singh government), the rural population will benefit and the result will be a higher spending power of the rural population.

THE RURAL MARKETS

Agriculture sector contributes 23 per cent to the GDP, feeds over a billion people, & employs 66 percent of the work force. Competitiveness of Indian agriculture sector in the world trade is amongst the poorest (Business Consulting Group Analysis). This leaves so much that can be done to improve the capabilities of the Indian farmer. The government needs to awaken to the 'need for formulating policy mixes and programmes for capacity building of the small farmers and providing them with the pre-requisites to exploit the production potentialities such as technologies, infrastructure and credit. Considerable scope exists for the diffusion of innovations in the field of biotechnology, geographic information system, remote sensing, informing technology and so on that could prove useful in improving the living conditions of the poor so that all the constraints on the upward mobility of the small farmers along the income ladders are duly released', (Mr. Y.C. Nanda, Chairman, NABARD, in interview with the Economic Times Intelligence Group). Since even today almost 70% of Indian population lives in villages, it translates into a potential consumer base of over 700 million individuals. The rural consumer is no different from urban consumer in terms of aspirations for a better lifestyle. He is constrained by intermittent cash flows, poor infrastructure, non-availability of quality products & services and high dependence on feeder towns & cities. But with the initiatives of the government, higher education levels in the rural masses, and of course the blessings of the rain Gods, rural India is poised for a leap forward.

AYURVEDIC INDUSTRY AND MEDICINAL PLANT SECTOR

Easy and continuous availability of raw material i.e. medicinal and aromatic plants, is the most important one among the factors, which determines the growth of ayurvedic industry. Hence an analysis of the working of medicinal plant market is important.

Since Kerala state in India possess large variety of flora and fauna with manufacturers in equal measure and the medicinal plant market in Kerala is well developed over the last few years as a result of the increase in the number of manufacturers. This is evident from the large number of traders and middlemen who provide an uninterrupted supply of raw material to the main ayurvedic manufacturing units. The ayurvedic pharmacies of Kerala use around 500 plant species for the manufacture of medicinal formulations. Around 95 percent of these medicinal plants, which are in use by the Ayurvedic industry, are directly collected from the wild. Less than 20 species are under commercial cultivation. There has been an increasing demand for the major medicinal plants in Kerala over the last decade (*Suneetha and Chandrakanth, 2001*). Secondary studies show that price elasticity is positive in all the major medicinal plants demanded by the manufacturing firms of Kerala (Devi and Joby 2003). This is true for plants endemic (the plants, which cannot be found any other parts of the world) to Kerala also. This shows the unhindered growth of the demand for medicinal plants in Kerala.

Though the ayurvedic medicines, do contain the food items like jaggery, spices, cardamom, oils, sugar, salt, milk, ghee, animal products, preservatives, animal products, honey, fresh and dry fruits, around 80-85 per cent of the total raw materials are plant based or in one or the other way related to plant materials. Adequate and timely provision of raw materials, quality of the same are most important for the manufacturing units, as the nature of the industry is concerned.

Table-1 gives the backward linkage ratio for the ayurvedic industry and its change over the period 1993-2002 which shows the relation between the ayurvedic industry and medicinal plant sector. Since more than 85

percent of the raw material used in the sample units consists of medicinal plant, the simple ratio of raw material expenditure to the value of total output is calculated, it can be used as a proxy for interdependence.

Until 1998 the share of raw material expenditure in total output is almost stagnant. Since then ratio has been declining, yet it still accounts to a high proportion of almost 37 percent. One possible reason for this decline may be the fact that while the price of ayurvedic medicine increased by 3 percent and 9 percent respectively in 1998 and 2004, a similar increase did not occur in the case of medicinal plants though there was slight change. In short the growth of nominal value of raw materials.

It is important to note that about 40 percent of the income in ayurvedic industry is trickling down to the medicinal plant sector.

TABLE 1

Backward Linkage ratio of the ayurvedic industry in Kerala

Year	Value of output	Raw material expenditure (in lakhs)	Share of raw material to total output (in percent)
1992-93	3789.43	1719.22	45.37
1994-95	5605.70	2621.17	46.76
1997-98	8564.90	3887.12	45.38
1999-00	12275.33	5256.40	42.82
2001-02	13848.76	5097.04	36.80
2002-03	14349.85	5288.60	36.85
2003-04	14788.65	5408.65	36.57

In Kerala state in India, the major market for medicinal plants exist in Thrissur, while Thiruvananthapuram, Palakkad and Ernakulam are considered to be the minor markets. For Pankaja Kasturi and other South Kerala – based pharmacies, the tribal belt of the southern parts of the Western Ghats are the major providers of medicinal plants, particularly from areas like Palode and Kottur. Primary information collected from Kottakkal Arya Vaidya Sala (AVS) and Pankaja Kasturi shows that different sections of suppliers of raw materials exist in this field. Arya vaidya Sala mostly depends on conventional suppliers i.e. the age-old suppliers (contractors) who have been supplying herbal raw material for the past few decades. But of late, the conventional suppliers have not been able to meet the increased requirements because of the bulkiness of the quantity needed and the non-availability/extinction of some of the raw materials that they used to supply. In the case of AVS, NAFEED (National Agricultural Federation of India) is one of the major sources of medicinal plants like Chukku, kurumulaku (pepper) etc. Now suppliers from other states increasingly interfering in the Kerala market with their raw material supply potential.

SUPPLY CHANNELS AND EMPLOYMENT PROMOTION

The tribal belt of Kerala is richly endowed with medicinal plants and most of the tribes are dependent on the collection of medicinal plants and their sale to the traders, community groups or directly to the small and large industrial units. So in the medicinal industry, it is very pertinent to understand that the relations exist in the supply chain of the medicinal plants and if necessary to rearrange the relations as a part of better livelihood strategy.

In the Kerala medicinal plant market, there are mainly two types of supply channels

One: It involves a large number of agents (chain 1).

Second: It constitutes the tribal co-operatives or their federations (chain 2). For above refer the Fig: 1. It gives an idea about the various intermediaries in different chains in detail. This is mainly a buyer driven supply chain and many intermediaries are involved and influence the market decisions and the final price. The second type of chain involves the co-operatives, which collect the medicinal and aromatic plants, sell it to the co-operatives and then co-operatives, which in turn supplies it to NAFED. Pharmacies obtain the raw material from the NAFED.

A discussion of the intermediaries in the different chains will give us an idea of who controls the major transfers in the industry. The major agents in the first chain are discussed below:

The collectors are usually tribal or the rural poor, depend on the forests for their basic needs like fuel and fodder. Most often those who go in to the forest for firewood will also collect the herbs. Collection from the wild is a labour intensive activity often involving entire families. *There is no co-relation between the payment given to these collectors and the market price of the commodities.* The rates paid to the collectors of the herbs are extremely low, often just a fraction of the price paid by the final consumer. It is very much evident that it is mainly because of the large number of tiers in the supply chain. FIGURE 1 is given below:

Supply chain in the medicinal plant market

CHAIN 1		CHAIN 2	
(a) Primary medicinal plant gatherers /rural people		(a) Tribals rural community	
(b) Small collectors at regional level		(c) Tribal co-operative society	
(c) Collectors at district level / bulk traders		(d) Scheduled caste / tribe co-operatives	
(e) Retail outlets		(e) Small or large industrial groups	
(e) Small or large industrial groups			
Farmers / medicinal plant cultivators			

The local agent or trader / traders who buy the raw material from the collectors, form the second tier in the supply chain. They often operate in different villages simultaneously. They operate most commonly in groups and take the collected medicinal plants at a cheaper rate and transport and sell it to the district based traders at higher rates. The margin they get is invested in the further purchase of the herbs from the rural people. With the growth of the ayurvedic pharmaceuticals the strength of these agencies have increased, which in turn, increases the stress on primary collectors.

The traders have two ways of increasing their profit margin, either reduce the purchasing cost or increase the selling cost. Traders usually select the first method to gain more profit. This is because of less bargaining

ability and ignorance of the collectors regarding the market dimensions. So the traders opt the way of exploiting the primary collectors to increase the profit margin.

This will ultimately end up in further exploitation of natural resources but less money benefits to the collectors. In a study by a group some of the plant collectors were got interviewed, they told that sometimes they travel all the way to the towns in bicycles to sell the herbs that they collected, since money, what they get from the traders is not at all sufficient to cover the physical and social cost they put. But it is a cumbersome effort to go to the cities and sell their herbs, especially when the collection is not large enough to cover the daily expenses.

The third tier of the chain is mostly concentrated in the cities. They are generally big business men (bulk traders). The urge for high profit starts here. In fact they are the initiators of the business in the sense that they place the orders with the commission agents or the manufacturing units and this results in the backward chain, which extends till the collectors. Sometimes value addition also takes place at this stage, because there are some commission agents or traders, who collect herbs in a raw form but convert it into the semi-finished form and then sell it to the pharmaceutical companies. These traders own machines and integrated factories, which convert the raw material into the exact form, which the company needs. They simultaneously sell their raw herbs to the districts outlets. So in any chain there may or may not exist all of the tiers. But the general working of the supply chain in the medicinal plant sector in the major towns of Kerala follows this pattern.

There is another chain (chain two), which follows from **tribal collectors** to tribal cooperatives. Many of the tiers that come in the earlier chain do not prevail here. In this case the tribal co-operatives sometimes supply to the SC/ST co-operatives at the state level and sometimes to the pharmaceutical units directly. One study has pointed out that the tribal cooperatives of Kerala provide only a very small percentage of the total requirement of Kerala manufacturing units (Meerabi, 2001). In Kerala the marketing is taken in a relatively organized manner, though a large number (34) of tribal co-operatives operate in different districts through Medicinal Plant Society's four branches in Thiruvananthapuram, Adimali, Thrissur and Kalpetta.

But the private traders still do most of the trade. Some of the tribal societies have established collection depots but inadequate storage facilities form a major hurdle. In spite of the efforts made by this federation, the private traders control 60 to 70 percent of the medicinal plant trade. These private traders will offer the collectors a higher return for their product to compete with the federation, but still less than their subsistence needs. In the places like Kottur and Bonakkad in Kerala these tribal communities sell their products through direct auction in the market.

Although the chain working through the federation is more beneficial to the collectors and the pharmacies, either the lack of tribal cooperatives or the under functioning of the cooperative remains a major hurdle for this medicinal plant market chain. The survey of three pharmacies shows that most of them have very little connection with the tribal cooperatives. While AVS depends on the conventional suppliers and buy-back arrangements, Pankaja Kasturi gets its medicinal plants mainly from traders.

Advantages in getting the medicinal plants from the traders rather than from the co-operatives : Many officials in the sampled manufacturing firms have pointed out that there are advantages in getting the medicinal plants from the traders rather than from the co-operatives. These are mainly easy and timely availability, complete information about the stocks, age-old relations with the suppliers etc. There is a lack of

linkage between the tribals and the pharmacies and especially the co-operatives and the pharmacies. *This asymmetry of information puts the tribals in the lowest tip of gainers.*

Table: 2 show the difference between the selling prices through two chains. A large price difference is evident here. In most of the medicinal plant items, the purchasing cost of the firms is 100 percent higher than the selling price of federations. This alone shows the loss of benefits due to the lack of linkages. This co-ordination problem between the manufacturing units and the potential suppliers affects the companies and the consumers equally adverse.

The structure of relationships between collectors, middle men, traders and wholesalers can be highly complex, involving various elements of exploitation, risk, co-operation, collusion and resistance, the character of these relationships can shift through time, from locale to locale and at different points along the marketing chain. Lack of access to information, transport and credit and storage facilities combine to keep collectors at a lower tip of advantages in the market place. And these conditions provide plenty of opportunities for intermediaries to position themselves as almost unavoidable links in the marketing. Extension of the chain through more tiers may either distribute the benefits unevenly by keeping the sum of the benefits same, or in some cases can lead to an increase in the raw material cost also.

TABLE 2

Purchase rates (Rs/Kg) of medicinal items by the ayurvedic medicinal Manufacturing units and selling price of the same by Co-operatives – comparison

Sl. No.	Medicinal items	X	Y	Z	R
1.	Tuber Crops	57.6	24.55	33.05	134.62
2.	Root items	13.5	6.33	7.17	113.27
3.	Fruits	10.6	3.3	7.3	221.21
4.	Barks	92.7	5.66	87.04	1537.81
5.	Bushes and Creepers	19.3	7.07	12.23	172.98
6.	Liquids	52.1	38.61	13.49	34.94
7.	Seeds	17.3	9	8.3	92.22
8.	Flowers	50	35.56	14.44	40.61
9.	Oil seeds	9	4.02	4.98	123.88
10.	Kundirikkam	76	31.24	44.76	143.28
11.	Spices	428	128.16	299.84	233.96
12.	Miscellaneous	82	54.86	27.14	49.47

(Source: Meerabai 2001)

Note: 'X' denotes the average purchase rate of medicinal items by the Ayurvedic manufacturing units of Kerala from 1990-91 to 1993-94, 'Y' denotes the average sales rate of the medicinal items by the SC/ST federation from 1990-91 to 1993-94, 'Z' denotes the price difference and 'R' denotes the percentage of difference.

FEATURES OF THE MEDICINAL PLANT MARKET

Both in supply side and in demand side, the market imperfections are apparent in the case of medicinal plant trade. There is an 'asset specificity' character attached to the supply side, because full information about the supply function is not possible. Here asset specificity is in the form of the difference in the quality and the form in which they prefer raw materials (whether in semi-finished form or fresh form) etc. The information about the right quality material, right maturity and availability of the plants for the production will not be

available with all the suppliers or gatherers, but only with some (Chandrakanth and Suneetha, 2001). This works as a hindrance for the new entrants in the tiers of the market and the firms will prefer their conventional supplies. In a way this helps the traders as well because they are forced to be very careful in the selection of the agents. In the second chain, this problem will be sorted out with effective checking mechanism in co-operatives.

The major problem in the medicinal plant trade is that the price is determined not by the receiver, but by the player of the next tier and is characterized by exploitation. This is somewhat different from what is expected, because the major advantage of linkages is considered to be the 'trickling down' of benefits. Analysis by the experts suggests that 'percolation' of the benefits of the booming industry is not occurring to a large extent, but only a 'drizzling down' is taking place. The price of the producer (collector) is determined by the trader who gets it from him and the price of the trader is determined by the wholesale dealer of the medicinal plants. A relatively rich producer can bargain for a better price. But as a collector comes mainly from a tribal community he will not be in a position to bargain. This can be clearly seen from the Table 3 given below:

Table shows share of the final price that the medicinal gathered get by trading different medicinal plants, which have high demand among ayurvedic manufacturing units. In most cases, the gatherers do not get even half of the final price (see column 6). If we compare with the price charged at the open outlets, the share becomes even less, indicating that the traders corner the rest of the share.

TABLE 3
Gatherer's Share in the final price of the medicinal plant trade
(Prices and denoted in Rs. per Kg)

No.	Scientific name of med. Plants (1)	Malayam name (2)	Avg. Price in firms (3)	Price in private outlets (4)	gatherers (collectors) price (5)	percentage to firm's price (6)	Percentage share of gatherers to private outlets (7)	traders margin who supplies to firms (8) (100- column 6)
1.	Withania Somnifera	Amukkuram	30	135	23.5	78.33	17.41	21.67
2.	Adatoda Vassica	Adalotakam	22	60	13.5	61.36	22.50	38.64
3.	Sidda spp	kurunthotti	21	35	4.5	21.43	12.86	78.57
4.	Tinospora cordifolio	amruthu	6	15	3.5	58.33	23.33	41.67
5.	piper longum	thippali	115	165	57	49.57	34.55	50.43
6.	Tragia involucrate	kodithuva	15	60	8.5	56.67	14.17	43.33
7.	Comnifora Mukul	guggulu	180	325	75	41.67	23.08	58.33

8.	Tricosanthes cucumerina	Kattu padavalam	120	150	45.5	37.92	30.33	62.08
9.	Phyllanthesus emblica	Nelli	24	75	19	79.17	25.33	20.83

(Source Primary Survey, 2003, column 8 is calculated as (100-column 6))

Most of the times of wholesale traders intercept these gatherers and they collect the materials before they reach the pharmacies and offering them prices, which are reasonably satisfactory promising them more business. Since the material collected individually, the quantities with them at a particular time will be very little. This deters them from approaching pharmacies, since they believe that these pharmacies require bulk amounts. Generally, the manufacturing units get the medicinal plants at a lower rate because the purchase in bulk. *Being unaware of the exact price, the tribals sell their collection at a lower price.* Wholesale traders put together the material obtained from the different gatherers and sell it to the pharmacies in bulk at a higher price and obtain a large share of the final price (see column 8).

Organization and control of production may also be encouraged if consumers or retail buyers express preference for supplies that come from socially and environmentally sustainable production.

For sustaining production and ensuring better returns, a number of issues need to be addressed like;

- a) Better information about the current status and potential production of medicinal plants, which would provide a baseline from which a strategy for sustainable production could be developed.
- b) More transparent supply chain information in order to improve the bargaining power of those near the start of the chain and to help ensure good quality raw materials.
- c) Organization of collectors at the local level help to put in place mutually enforced codes of collection and sharing of market benefits.

From the point of view of profitability of the firm, the restructuring of the value chain needs attention and should be a matter of primary concern, because the data obtained from the firms shows that a major expenditure item of the firms is that on the raw material and in most of the firm it constitutes more than half of the total expenditure. It is evident that it can be reduced to a larger extent if the chain is restructured. But there is not much effort from the part of the firms towards this, mainly because of the loss in terms of procedures and transaction costs.

WAY FORWARD: if the local gatherers are to secure a fair price for their work and participate willingly in sustainable harvesting and local cultivation, new model of trade are called for it will shorten the tiers of the supply chains. The link between co-operatives of gatherers and bio-enterprises might offer new possibilities. This could offer enhanced levels of returns to local communities and at the same time a sounder basis for the sustainable use of the resources.

The present picture of dependence of firm on major suppliers and co-operatives is shown in Table 4. There is employment creation in each tier of the supply chain through millions of tribal collectors, traders, loaders and co-operative employees.

Table gives a better picture of the backward linkage of the manufacturing units with the raw material suppliers. Column 3 explains the number of major suppliers of medicinal plants. There are 20 major private medicinal plant suppliers(mostly collective traders) from the state. Though the manufacturing units depend on the suppliers from outside as well, the major dependence is still on the suppliers within Kerala(45 pharmaceutical units are linked to the private suppliers) .

TABLE-4

Indication of backward linkage: Major supplies of raw materials to the ayurvedic medicine manufacturing units in Kerala

State	Location	Number of major suppliers	Number of manufacturing units in Kerala having linkage	Major items supplied
Kerala	Thrissur, Kozhikkod, Thiruvananthapuram	20	45	All materials
Tamil Nadu	Coimabatore, Salem, Madras, Kunnathoor	7	40	Root items, gur, oils, ghee, and fruits
Punjab	Ludhiana, Jalandhar, Chandigarh	6	23	Gulgulu, Amukkuram, Kottam, Karpooram, Saffron, Kunthirikkam
Kerala SC/ST federation	Thiruvananthapuram	1	6	Root items, tuber items

(Source: Abraham 2003)

Indication of the backward linkage: Major suppliers of raw materials to the ayurveda medicine-manufacturing units of Kerala suppliers (mostly collective traders) from the state. Though manufacturing units depend on the suppliers from outside as well, the major dependence is still on the suppliers within Kerala. 45 pharmaceutical units are linked to the private suppliers. Another point to be noted here is an increasing interference by suppliers from outside the state. But the number of the tribal co-operatives is relatively low in number. They connect with only 6 manufacturing units and point the need for increasing the linkage with the tribal federations. This is the point where we need improvement.

UPGRADING SUPPLY CHAIN AND ENVIRONMENTAL SUSTAINABILITY

The neo classical demand curve (i.e. higher the price, lower the demand) is not applicable in the case of the demand for medicinal plants. The demand for medicinal plants is such that the huge demand is unresponsive to the price change. The firms adopt a strategy of vertical integration of raw material. Thus only it is a substitution of the source that occurs, while the total demand moves up. But at the same time there is not increase in the natural supply. The reason for increase in the demand for medicinal plants is the same as that for ayurvedic medicines, the demand for medicinal plants being derived demand. In other words, increased demand for medicinal plants are a corollary to the increasing number of patients opting for ayurvedic treatment and the ineffectiveness of allopathic medicines in alleviating certain chronic diseases like diabetes, blood pressure etc.

Table 5 gives an exact picture of the direct relation between price and quantity demanded portrayed by Devi and Joseph. All the figures in the price elasticity column are positive. This aspect has led to the non-availability of many of the medicinal plants. Unscientific collection in many places and encroachments in to the forests are leading to the extinction of many rare species. The same table above shows the scarcity ratio of the respective medicinal plants. Except Sida spp (Kurunthotty) and Tinospora Cordifolia (chittamruthu), all

the plants are highly scarce. Scarcity of different plants leads to substitution by other parts of the same plant instead of the right parts, adulteration with the plant that has the same organoleptic properties or same vernacular name, use of exhausted plants etc. So ensuring the high remuneration at the initial phase as mentioned earlier ensures the sustainable gathering of the medicinal plants.

Another way of promoting the rural livelihood is contracting out the cultivation of medicinal plants.

TABLE 5

Market analysis of the major medicinal plants

Name of the plant	Quantity demanded (in tons)	Price elasticity of demand	Scarcity ratio (ratio of availability to needed)
Sida spp.	608	0.54	2.79
Tinospora cordifolia	282	0.35	0.00
Terminalia chibula	164	3.31	-3.20
Withania somnifera	149	0.60	-4.02
Adathoda sp	141	1.46	-1.60
Cedrus deodara	138	1.98	-3.80
Woodfordia frutisoca	123	0.42	-5.16

In the case of the ayurvedic industry, there is a constraint regarding the complete vertical integration unlike the other industries because of the specific character of the plants. Now various efforts are on from the part of research institutions and from the part of the government for ex-situ cultivation through seed bank, pollen bank, DNA libraries etc. Tropical Botanical Garden and Research Institute (TBGRI) of Palode in Kerala is making an great effort in the combination of ex-situ and in-situ preservation through gene banks etc. This effort has found expression through contracts and fallback arrangement that they have made with the major pharmacies like AVS and pankaja Kasturi etc.

Along with this, the alternatives for an economically efficient and sustainable way of cultivation, conservation and utilization can be framed. There are many approaches like, eco-system approach, sociological approach, technological approach, economic approach, and some holistic resource approaches for better conservation (Wilder, 2000). But a bio-partnership approach is becoming very important in recent years. This is a sustainable and efficient way of sharing the benefits through the partnership of two agents, here the community that is gathering the medicinal plants and the herbal drug industry. A closer involvement with local communities and a clear indication for the targets can attract increased public investment for the R and D, technology transfer and marketing opportunities. Intensive management of plant resources will create new employment opportunities to the rural people and ultimately lead to development of primary processing units in rural areas.

INDIAN EXPERIMENTS such as :Food world, e-Chaupal, **Project Shakti**, **DCM Sriram –Hariyali** can also be looked into for sustainable development to enhance the livelihood.

To make sense of the approach in the context of the ayurvedic drug industry, it will be necessary for the industries to follow the sustainable practices by striking a balance between various activities as above and enhancing the livelihood by reducing the tiers of transactions thus reduction in various transactions cost using the past experiences for (a) collection and harvesting of the medicinal plants (b)sustainable cultivation of medicinal plants (c)large number of collection resources (d) improve supply relations forward and backward

linkages in the medicinal plant market. This will actually increase the productivity of entire sector, hence sustainable development.

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