

Indian Herbal Drugs of Trade and Their Supply Chain Management: A Review

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Abstract

The use of herbal medicines is growing with approximately 40 per cent of population reporting use of herbs to treat diseases within the past year. India has 16 agro-climatic zones, 45000 different plant species out of which 15000 are medicinal plants. The Indian Systems of Medicine have identified 1500 medicinal plants, of which more than 500 species are mostly used in the preparation of drugs in direct or indirect ways and highly potential in the trade related practices in Indian and Global markets. Apart from requirement of medicinal plants for internal consumption, India exports crude drugs mainly to developed countries, viz. USA, Germany, France, Switzerland, UK and Japan. The supply base of 90% herbal raw drugs used in the manufacture of Ayurveda, Siddha, Unani & Homoeopathy (Ayush) systems of medicine is largely from the wild. Present communication reviews and highlights the supply chain management and trade practices of medicinal and aromatic plants (MAPs) in India.

Key words: Supply chain management, Herbal drugs, Medicinal and Aromatic plants (MAPs)

Introduction

It is estimated that 80 percent of the population in developing countries rely largely on plant based drugs for their health care needs, and the WHO has estimated that in coming decades a similar percentage of the world population may well rely on plant-based medicines. Thirty percent of the drugs sold worldwide contain compounds derived from plant material. As a result of the expanding interest in medicinal and aromatic plants, new income generating opportunities are opening up for rural populations. With many of the MAPs gathered from the wild, the collection and sale of MAPs is providing a complementary source of cash for many extremely poor rural households. However, despite the fact that the products collected can have very high value in the final products, the collectors typically receive only a small share of the final value, either because they are unaware of the real value, are unable to market it in the form wanted by buyers or are unable to market to these buyers.

Current trends all-over the world has shown that for one reason or the other, people are not only willing to try natural medicine especially those of plants based but are also actively seeking non-conventional remedies. As a result there is a global resurgence in the trade of herbal medicine. This indicates that

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production, consumption and domestic and international trade in medicinal plants based products is going to grow at a significant rate.

The international market of herbal products is estimated to be US \$62 billion which is poised to grow to US \$5 trillion by the year 2050, but India's share in the global export market of medicinal plants related trade is just 0.5 per cent (Sharma, 2004). India has 16 Agro climatic zones, 45000 different plant species out of which 15000 are medicinal plants. The Indian Systems of Medicine have identified 1500 medicinal plants, of which 500 species are mostly used in the preparation of drugs.

The Indian Systems of Medicine, particularly Ayurveda, Siddha, Unani, & Homoeopathy medicine largely use plant base materials, minerals, metals, marine and products of animal origin. Our ancient texts had documented medicinal uses of a large number of plants. These plants are being used for preparation of medicines for centuries.

The increased demand of herbal medicines has led to a sudden increase in herbal manufacturing units. There is a complex of large number of manufacturing units using herbal material for various purposes. Whereas the largest number of such manufacturing units are registered as 'pharmaceuticals', there are others that are engaged in making plant based cosmetics and food supplements. Even within the pharmaceutical units, there are manufacturers of Ayurveda, Siddha, Unani and Homeopathic formulations with a few even making western medicines. Another group of manufacturing units is engaged in making extracts and distilling oils for use by other industries and for exports. Raw materials for all these diverse industries are largely derived from wild sources.

The trade practices of MAPs and herbal products in India are extremely complex, secretive, traditional, confusing, badly organised, highly underestimated and unregulated. This requires a grand strategic plan to augment the availability of quality raw materials, standardised finished products and proper marketing infrastructure.

Keeping in view, the present review article is designed to find out the current situation and trends of herbal drug sector, supply and demand equilibrium and supply chain management of MAPs and herbal products.

Material and Methods

A field survey of herbal drug dealers was done during the period of 2010 to 2012 and primary as well as secondary data were obtained. Other than the

secondary sources available to provide the relevant information from different companies, government agencies and the libraries, the focus in this study was on the primary source of information which was, collected through survey of the following groups of respondents viz. Dealers/retailers of the MAPs or herbal products, Procurement force of herbal manufacturing unit and Consumers of the MAPs and herbal products. Covering the whole population of India was beyond the time and cost resources. Therefore, the scope of the study was kept limited. It was decided to cover three major herbal markets of Delhi, Uttar Pradesh and Uttarakhand. Respondents were preselected according to the nature of study by using the judgement sampling method. Respondents are mainly far from each other that's why the internet, telephonic and post survey method was applied. Open ended questionnaire were sent to the respondents through email or by post and their answers were recorded. Somewhere, if possible, telephonic interviews were also carried out. After getting the primary data from the questionnaire. These were sorted and analysed.

Results and Discussion

Asia has abundant species of medicinal and aromatic plants (MAPs) and traditional medicine has been practiced in Asia since ancient times. The Chinese and the Indians have made use of medicinal plants to cure ailments for thousands of years. According to the World Health Organisation (WHO), the goal of 'Health for All' cannot be achieved without herbal medicines. While the demand for herbal medicines is growing in developing countries, there are indications that consumers in developed countries are becoming disillusioned with modern healthcare and are seeking alternatives in traditional medicines. There is, therefore, an increasing consumer demand for herbal medicines in developed countries.

During recent years, the global attention of the pharmaceutical industry has switched once more to the natural world and this may be illustrated by reference to three clinical drugs, taxol, etoposide and artemisinin (Phillipson, 1999). Taxol is obtained from the bark of the *Taxus brevifolia* and Artemisinin is an unusual sesquiterpene endoperoxide that has been isolated as the active principle of the antimalarial herb *Artemisia annua* both plants are grown in India.

In the recent years, there has been a boom in the herbal industry globally. According to WHO, demand for medicinal plants by the year 2050 is estimated at US\$ 5 trillion. Demand for nutraceuticals and functional food has been rising in developed markets, particularly in USA, Europe and Japan. Nutraceutical

market in USA is estimated at about US\$ 80 billion to US\$ 250 billion, with a similar market size in Europe, and Japanese nutraceutical market is estimated at US\$ 1.5 billion. Global market for Functional Food is pegged at US\$ 60 billion to US\$ 80 billion, growing by around 10% per year. Indian nutraceutical market is estimated to be around US\$ 270 million growing at a CAGR of 18%, against the CAGR of 7% witnessed in global market (Anonymous, 2010).

India, with approximately 8% of world's biodiversity including plant genetic diversity with medicinal properties, has the potential of becoming a major global player in market for medicinal plants based herbal formulations, medicines and products (Singh, 2006).

Indian herbal medicine market has been growing at a steady pace of between 15% and 20% every year. The market size of domestic herbal industry is currently estimated at over rupees 5000 crore. According to a study the industry is envisaged to grow at a level of rupees 5,500 crore after 2010 Commonwealth Games (CWG), and Ayurvedic industry alone is envisaged to earn a business of rupees 500 crore during the Games. The study also envisages that Indian Spa industry to receive an investment of US\$ 35 billion over the next 3 to 4 years (Anonymous, 2010).

The FRLHT researchers also noted that while amla fruit (*Phyllanthus emblica*) is the highest consumed botanical raw drug by the domestic herbal industry, 70% of total botanical raw material exports (by volume) are made up just a few species, namely psyllium husk (*Plantago ovata*), senna leaf and pod (*Cassia angustifolia*), henna leaf & powder (*Lawsonia inermis*), and the three myrobalans: amla fruit (*Phyllanthus emblica*), belleric myrobalan fruit (*Terminalia bellerica*), and chebulic myrobalan fruit (*Terminalia chebula*) (Ved and Goraya, 2008).

Indian Herbal Drugs in Trade

Although a large number of medicinal plants are described in literature for medicinal use but their commercial exploitation is in limited extent. The species noticed in trade are tabulated a below:

Table 1: Inventory of Indian Herbal Drugs in trade

Trade Name	English Name	Botanical Name	Morphological Part used
Afastatin	Artemisia	<i>Artemisia vulgaris</i>	Whole plant
Agaru	Eagle wood	<i>Aquilaria agallocha</i>	Wood

Trade Name	English Name	Botanical Name	Morphological Part used
Ajalu	Mimosa	<i>Mimosa pudica</i>	Leaves, seeds
Akarkara	Pellitory	<i>Anacyclus pyrethrum</i>	Roots
Alsi	Flax seed/lin seed	<i>Linum usitatissimum</i>	Seeds
Ambahaldi	Turmeric	<i>Curcuma amada</i>	Rhizome
Amla	Indian gooseberry	<i>Emblica officinalis</i>	Fruits
Anantmool	Indian sarsaparilla	<i>Hemidesmus indicus</i>	Roots
Anar	Pomegranate	<i>Punica granatum</i>	Seeds, rind
Anjbar	—	<i>Polygonum viviparum</i>	Roots
Annato	Bixa	<i>Bixa orellana</i>	Seeds
Arjun	Arjuna	<i>Terminalia arjuna</i>	Bark/heartwood
Arlu, shyonaka	Oroxilin	<i>Oroxylum indicum</i>	Root bark
Arni	Premine	<i>Premna integrifolia</i>	Whole plant
Ashoka	Saraca bark	<i>Saraca indica</i>	Bark
Ashwagandha	Winter cherry	<i>Withania somnifera</i>	Roots/leaves
Attis	Aconitum	<i>Aconitum heterophyllum</i>	Roots
Attis mitha	Aconitum	<i>Aconitum napellus</i>	Roots
Babchi	--	<i>Psoralea corylifolia</i>	Seeds
Babuna	Chamomilla	<i>Matricaria chamomilla</i>	Flowers
Bach	Sweet flag	<i>Acorus calamus</i>	Roots
Bach nag	Aconitum	<i>Aconitum ferox</i>	Roots
Baheda	--	<i>Terminalia belerica</i>	Fruit
Bakul	Indian medler	<i>Mimusops elengi</i>	Bark
Balchar	Cat's claw	<i>Nardostachys jayamansi</i>	Rooyes
Bankakri	Podophyllum	<i>Podophyllum emodi</i>	Roots
Banmethi	Melilotus	<i>Melilotus indica</i>	Seeds
Basant	St.john wart	<i>Hypericum perforatum</i>	Leaves
Belladona	Belladona	<i>Atropa belladonna</i>	Roots/leaves
Bhangra	Calendulacea	<i>Wedelia calendulacea</i>	Leaves
Bharangi	Clerodendrum	<i>Clerodendrum indicum</i>	Root
Bhringaraj	Eclipta	<i>Eclipta alba</i>	Leaves

Trade Name	English Name	Botanical Name	Morphological Part used
Bijaysar	Pterocarpus	<i>Pterocarpus marsipium</i>	Bark
Bilva	Stone apple	<i>Aegle marmelos</i>	Pulp
Biranjasaḥ	—	<i>Achillea millefolium</i>	Whole plant
Bisfaij	Drynaria	<i>Polypodium vulgare</i>	Roots
Boswellia	Olibanum	<i>Boswellia serrata</i>	Gum
Brahmi	Gotu kala	<i>Centella asiatica</i>	Whole plant
Chaksu	—	<i>Cassia absus</i>	Seeds
Chakunda	Foetid cassia	<i>Cassia tora</i>	Seeds
Champa	Champa	<i>Michelia champaca</i>	Root
Chandan	Red sandal	<i>Pterocarpus santalinus</i>	Wood
Chaulai	—	<i>Amaranthus Spinusus</i>	Seeds
Chaulmogra	—	<i>Gynocardia odorota</i>	Seeds
Chiraita	Swertia bitter	<i>Swertia chirata</i>	Whole plant
Chirchita	Barbarum	<i>Lycium barbarum</i>	Berries
Chobchini	Smilax	<i>Smilax glabra</i>	Roots/leaves
Chora	Angelica	<i>Angelica galuca</i>	Roots
Cinchona	Cinchona	<i>Cinchona officinalis</i>	Bark
Coleus	Coleus	<i>Coleus forskohli</i>	Roots
Dalchini	Cassia	<i>Cinnamomum cassia</i>	Bark
Daru haridra	Berberis	<i>Berberis aristata</i>	Roots/stem/ prep.
Daryakanaryal	Maldivica	<i>Lodoicea seychellarum</i>	Fruit
Datura	Thorn apple	<i>Datura metel</i>	Seeds
Devdaru	Cedrus	<i>Cedrus deodara</i>	Wood
Digitalis	Grecian foxglove	<i>Digitalis purpurea</i>	Leaves
Dikamali	Gummifera	<i>Gardenia gummifera</i>	Gum
Ergot	Ergot	<i>Claviceps purpurea</i>	Fungal grass
Gajar	Carot	<i>Daucus carota</i>	Seeds
Gajpipal	Scindapsus	<i>Scindapsus officinalis</i>	Fruits
Gazaban	Bracteatum	<i>Onosma bracteatum</i>	Leaves
Ginseng	Ginseng	<i>Panax ginseng</i>	Roots

Trade Name	English Name	Botanical Name	Morphological Part used
Gloriosa	Glory lily	<i>Gloriosa superba</i>	Seeds
Gokhroo	Caltrops	<i>Tribulus terrestris</i>	Fruits/plant
Guduchi	Tinospora	<i>Tinospora cordifolia</i>	Stems
Guggal	Myrrha	<i>Comiphora mukul</i>	Gum
Gul banafsha	Viola	<i>Viola odorata</i>	Flowers/leaves
Gul khair	—	<i>Malus sylvestris</i>	Leaves
Gulab	Rose	<i>Rosa damascena</i>	Petals
Gurmar	Gymnema	<i>Gymnema sylvestre</i>	Leaves
Hansraj	—	<i>Adiantum capillus</i>	Whole plant
Haridra	Turmeric	<i>Curcuma longa</i>	Rhizome
Haritaki	Myrobalan	<i>Terminalia chebula</i>	Fruit
Harmal	Harmalol	<i>Peganum harmala</i>	Seeds
Harsinghar	Nyctanthin	<i>Nyctanthes arbortristis</i>	Flowers
Hauber	Juniper	<i>Juniperus communis</i>	Berries
Hawthorn	Hawthorn	<i>Crataegus oxyacantha</i>	Fruit
Hing	Asafetida	<i>Ferula foetida</i>	Gum resin
Horjora	Quadrangularis	<i>Cissus quadrangularis</i>	Whole plant
Imli	Tamarind	<i>Tamarindus indica</i>	Fruit
Isafgol	Psyllium	<i>Plantago ovata</i>	Husk/seeds
Jal-brahmi	Indian pennywort	<i>Baccopa monnieri</i>	Whole plant
Jamalghota	Croton	<i>Croton tiglium</i>	Seeds
Jangli haldi	Wild turmeric	<i>Curcuma aromatica</i>	Rhizome
Jiwanti	Leptadenia	<i>Leptadenia reticulata</i>	Leaves
Jiyaputra	Putrajiva	<i>Putrajiva roxburghii</i>	Fruit
Kachura	Wild turmeric	<i>Curcuma zedoria</i>	Rhizome
Kaiphul	Myrica	<i>Myrica nagi</i>	Bark
Kakmachi	Makoh	<i>Solanum nigrum</i>	Berries
Kakrashringi	Pistacia	<i>Pistacia integerrima</i>	Fruits
Kalimusli	Curculigo	<i>Curculigo orchioides</i>	Rhizome
Kalmegh	Andrographis	<i>Andrographis paniculata</i>	Whole plant

Trade Name	English Name	Botanical Name	Morphological Part used
Kalonji	Black cumin seed	<i>Nigella sativa</i>	Seeds
Kamila	—	<i>Mallotus philippinensis</i>	Powder
Kanchana	Toddaline	<i>Toddalia asiatica</i>	Seeds
Kapur kachri	Hedychium	<i>Hedychium spicatum</i>	Rhizome
Karanja	Pongamia	<i>Pongamia pinnata</i>	Seeds
Kasni	Cichorin	<i>Cichorium intybus</i>	Seeds
Kavanch	Cowhage	<i>Mucuna pruriens</i>	Seeds
Kesar	Saffron	<i>Crocus sativus</i>	Flower
Khair	Catechu	<i>Acacia catechu</i>	Bark
Khas	Vetiver	<i>Vetiveria zizanioides</i>	Roots
Kikar	Gum tree	<i>Acacia arabica</i>	Gum/bark
Kokam	Garcinia	<i>Garcinia cambogia</i>	Fruit
Kuchla	Nux vomica	<i>Strychnos nux vomica</i>	Seeds/bark
Kulanjan	Galangal	<i>Alpinia galanga</i>	Rhizomes
Kushtha	Saussurea	<i>Saussurea lappa</i>	Roots
Kusum	Safflower	<i>Carthamus tinctorius</i>	Flower
Kutaja	Conessi bark	<i>Holarrhena antidysenterica</i>	Bark
Kutki	Kurroo	<i>Gentiana kurroa</i>	Root
Kutki	Picrorhiza	<i>Picrorhiza kurroa</i>	Roots
Lasora	Dichotama	<i>Cordia dichotama</i>	Fruit
Lobiya	Beans	<i>Phaseolus lunatus</i>	Seeds
Lodhra	Symplocos	<i>Symplocos racemosa</i>	Bark
Luban	Luban	<i>Styrax benzoin</i>	Gum resin
Mahwa	—	<i>Madhuca indica</i>	Flowers/bark
Majuphul	Gallnuts	<i>Quercus infectoria</i>	Fruit
Mal kanguni	—	<i>Celastrus paniculatus</i>	Seeds
Mamira	Copteeta	<i>Coptis teeta</i>	Rhizome
Mamira	Gold seal	<i>Thalictrum foliosum</i>	Root
Manjistha	Rubia	<i>Rubia tinctorum</i>	Roots
Marjal	Iris	<i>Iris ensata</i>	Roots

Trade Name	English Name	Botanical Name	Morphological Part used
Mehndi	Henna	<i>Lawsonia alba</i>	Leaves
Morinda	Morinda	<i>Morinda citrifolia</i>	Fruits
Mulethi	Licorice	<i>Glycyrrhiza glabra</i>	Roots
Murva	Sanservierine	<i>Sansevieria zeylanica</i>	Rhizome
Muskdana	Hibiscus abelmoschus	<i>Abelmoschus moschatus</i>	Seeds
Musta	Nutgrass	<i>Cyperus rotundus</i>	Tubers
Nagkesar	Cobras saffron	<i>Mesua ferrea</i>	Flowers
Nagkesar	—	<i>Ochrocarpus longifolius</i>	Flower buds
Narkachura	Black turmeric	<i>Curcuma caesia</i>	Rhizome
Neeli	Indigo	<i>Indigofera tinctoria</i>	Leaves
Nirmasi	Kyllinga triceps	<i>Delphinium denudatum</i>	Roots
Nisoth	Ipomoea	<i>Operculina turpethum</i>	Roots
Pakhanbed	Bergenia	<i>Bergenia ligulata</i>	Roots
Palas	Flame of forest	<i>Butea monosperma</i>	Seeds
Patha	Cissampelos	<i>Cissampelos pareira</i>	Roots
Pindalu	Dioscorea	<i>Dioscorea deltoidea</i>	Tubers
Pitpapada	Fumaria	<i>Fumaria officinalis</i>	Whole plant
Posta	Poppy	<i>Papaver somniferum</i>	Seeds
Prasarni	Paederia	<i>Paederia foetida</i>	Leaves
Prishnparni	Lagopoides	<i>Uraria picta</i>	Whole plant
Pudina	Mint	<i>Mentha piperita</i>	Leaves
Punarnava mool	Hogweed	<i>Boerhaavia diffusa</i>	Root
Pushkar	—	<i>Inula racemosa</i>	Roots
Rajma	Kidney beans	<i>Phaseolus vulgaris</i>	Seeds
Revandchini	Rhubarb	<i>Rheum emodi</i>	Rhizome
Ritha	Soap nut	<i>Sapindus mukorossi</i>	Fruit/shell
Rudanthi	Cretica	<i>Cressa cretica</i>	Fruit
Rumi mastungi	Lentiscus	<i>Pistacia lentiscus</i>	Gum resin
Rusemari	Rosemary	<i>Rosmarinus officinalis</i>	Leaves
Sadabahaar	—	<i>Vinca rosea</i>	Leaves

Trade Name	English Name	Botanical Name	Morphological Part used
Safed chandan	Sandalwood	<i>Santalum album</i>	Wood
Salacia	Salacia	<i>Salacia reticulata</i>	Roots
Salapmishri	Laxiflora	<i>Orchis laxiflora</i>	Tuber
Salibmisri	Salibmisrie	<i>Eulophia campestris</i>	Rhizome
Samallu	Agnus castus	<i>Vitex agnus castus</i>	Seeds
Sarapgandha	Reserpine	<i>Rauwolfia serpentina</i>	Roots
Satawar	Asparagus	<i>Asparagus racemosus</i>	Tubers
Sathra	Origanum	<i>Origanum vulgare</i>	Whole plant
Saunth	Ginger	<i>Zingiber officinale</i>	Rhizome
Senna	Senna	<i>Cassia angustifolia</i>	Leaves
Shalaparni	Desmodium	<i>Desmodium gangeticum</i>	Whole plant
Shikakai	Soap pods	<i>Acacia consinna</i>	Pods
Shila pushpa	Stone flower	<i>Didymocarpus pedicellata</i>	Fungul leaves
Shilajit	Mineral pitch	<i>Styrax officinalis</i>	Stone
Shirisha	—	<i>Albizia lebbek</i>	Bark
Siyamarin	Milk thistle	<i>Silybum marianum</i>	Seeds
Soanjna	Moringa	<i>Moringa oleifera</i>	Seeds
Somlata	Ephedra	<i>Ruta graveolens</i>	Whole plant
Surya mukhi	Sunflower	<i>Helianthus annus</i>	Seeds
Tabashir	—	<i>Bambusa arundinacea</i>	Crystal
Tagara	Valerian	<i>Valeriana wallichii</i>	Roots
Talispatra	Taxus	<i>Taxus baccata</i>	Leaves
Talmakhana	—	<i>Astercantha longifolia</i>	Seeds
Tikhur	Wild turmeric	<i>Curcuma angustifolia</i>	Rhizome
Til	Seasame	<i>Sesamum indicum</i>	Seeds
Tulsi	Basil	<i>Ocimum sanctum</i>	Leaves, whole plants
Tutmalanga	Nepeta	<i>Nepeta elliptica</i>	Seeds
Udsalap	—	<i>Paeonia officinalis</i>	Tubers
Ustakhadus	Lavendor	<i>Lavandula stoechas</i>	Leaves
Uttanjan	Blepharin	<i>Blepharis edulis</i>	Seeds

Trade Name	English Name	Botanical Name	Morphological Part used
Varuna	Nurvala	<i>Crataeva nurvala</i>	Bark
Vasaka	Vasaka	<i>Adhatoda vasica</i>	Leaves
Vidanga	Embelia	<i>Emblia ribes</i>	Fruits
Vidhara	Aggregata	<i>Argyreia nervosa</i>	Seeds
Vidhara	Santaloides	<i>Santaloides minus</i>	Roots
Zarul	Banaba leaves	<i>Lagestroemia speciosa</i>	Leaves
Zuffa	Hyssopus	<i>Hyssopus officinalis</i>	Flowers

Supply of MAPs

The bulk trade in medicinal plant products takes place at informal markets, and involves the sale of relatively large quantities of unprocessed or semi-processed products. MAPs are sold in various markets: rural, urban, regional, state, national and international. There are two primary sources of MAPs, first wild collection and second cultivated collection.

1. Wild collection

Wild collection is the harvesting of plant material from wild sources. This material can take many forms, such as the bark, leaves, fruits, herbs, flowers, wood or roots. It may be collected from many locations, including open pasture, waste agricultural land, gardens, the roadside or forest land. In some cases the plants may be “weeds” found in agricultural or waste land; in others they may be plants or parts of plants found in horticultural areas or in forest land. The bulk of the material traded (both domestically and internationally) is still wild harvested and only a very small number of species are cultivated.

According to the Planning Commission Report (2000), a critical factor in wild harvesting is the availability of cheap labour to undertake the very labour intensive work of gathering. Because in many cases income from such sources represents the only form of paid employment for inhabitants of remote rural areas, there is a ready availability of workers. Further, contractors who employ the collectors often act as middlemen and traders as well. Collectors are often dependent on contractors as they are poor and often owe money to the contractors. Most countries have few or no regulations and policies which control the wild collection of MAPs. India has banned the export of several wild species in their raw material form, although the export of finished products containing the material is allowed (Anonymous, 2000).

2. Cultivated collection

Cultivated collection is more suitable for large scale uses, such as the production of drugs by pharmaceutical companies, which require standardized products of guaranteed or known content and quality. These quality requirements are becoming increasingly important as drug regulations become more stringent in many countries. Given the higher cost of cultivated material, cultivation is often done under contract. In the majority of cases, companies tend to cultivate only those plant species which they use in large quantities or in the production of derivatives and isolates, for which standardization is essential and quality is critical.

Demand and supply at present is mis-matching. At present 90 per cent of the supply is from forest and only 10% by way of cultivation. Traditionally, the tribes and local communities living in and around forest were allowed to collect minor forest products and there are only 80 medicinal plants in the list of minor forest products. Due to non-identification of entire medicinal herbs from forest, a lot of herbal items are uncollected and lost. Similarly due to unscientific, unsustainable and discriminative collection practices followed, availability of medicinal plants in its natural home has been depleted over the years. Some of the spices even became scarce due to over exploitation. Rapid expansion of area under food crops and commercial crops, conversions of non-forest areas for other alternate land use, degradation of forest through fire, grazing etc. have reduced availability of valuable medicinal plants.

Supply Chain Management

The supply chain of MAPs is often very long with as many as six or seven marketing stages involving primary collectors and producers, local contractors, regional wholesale markets, large wholesale markets and specialized suppliers. The long supply chain contributes to the low prices primary collectors and farmers receive for their products. As wild collection is still more common than cultivation, huge differences in the quality of raw materials occur. The differences concern the amount of active ingredients based on where the plants were grown, what parts of the plants are being used, how the plants were harvested and how they were stored. Raw material is often also adulterated as collection from the wild cannot guarantee the uniformity of raw material. Industry buys from suppliers and wholesalers rather than direct from smallholders because of the substantial quantities and broad range of raw material that is needed. This makes product traceability nearly impossible.

Medicinal herbs, and the products derived from them, also seem to have very varied value chains. However, despite the size of trade in medicinal herbs and herbal products, surprisingly, very few studies have looked at the value chain. The WHO has estimated the demand for medicinal plants is approximately \$14 billion per annum (2006) and the demand is growing at the rate of 15–25% annually. The WHO estimates that by 2050 the trade will be up to US\$ 5 trillion (Sharma, 2004).

The collection and marketing of medicinal plants from the wild is an important source of livelihood for many of the poor in India.

Supply chain of MAPs is start from the forest, because the wild sources are the major producer source of MAPs. Herbs are collected, dried and chopped by the local village person and supplied to the primary middle man, followed secondary middle man, who supplied the material to the local market or national MAPs mandies or direct to herbal vendors. The domestic end user of MAPs is the manufacturing units of herbal products which procure raw material from herbal vendors, MAPs mandies or directly from the farmers if they have contract farming deal with them (Fig. 1 & 2).

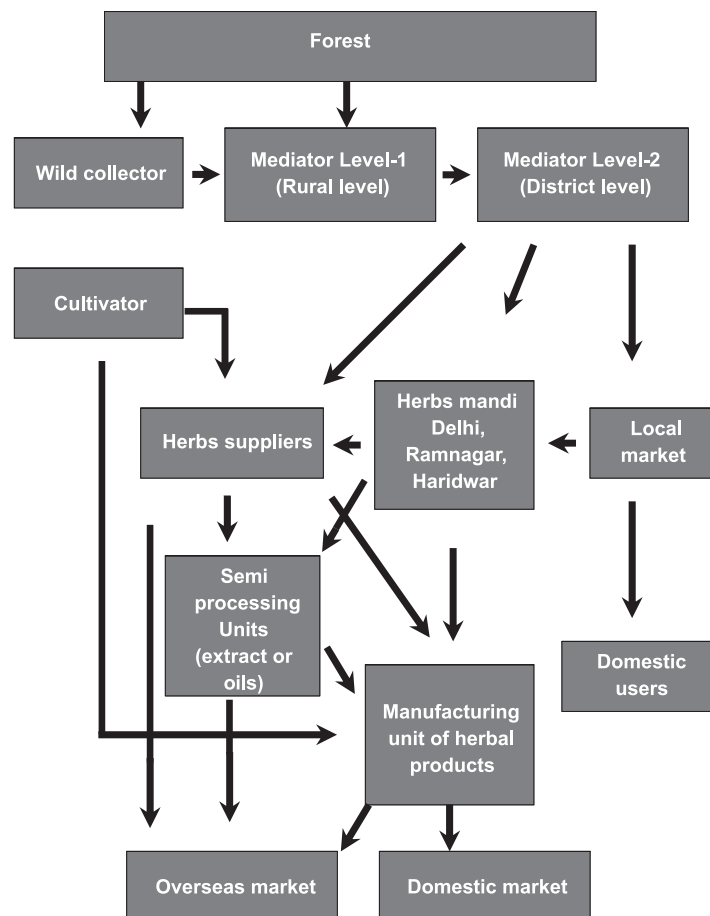
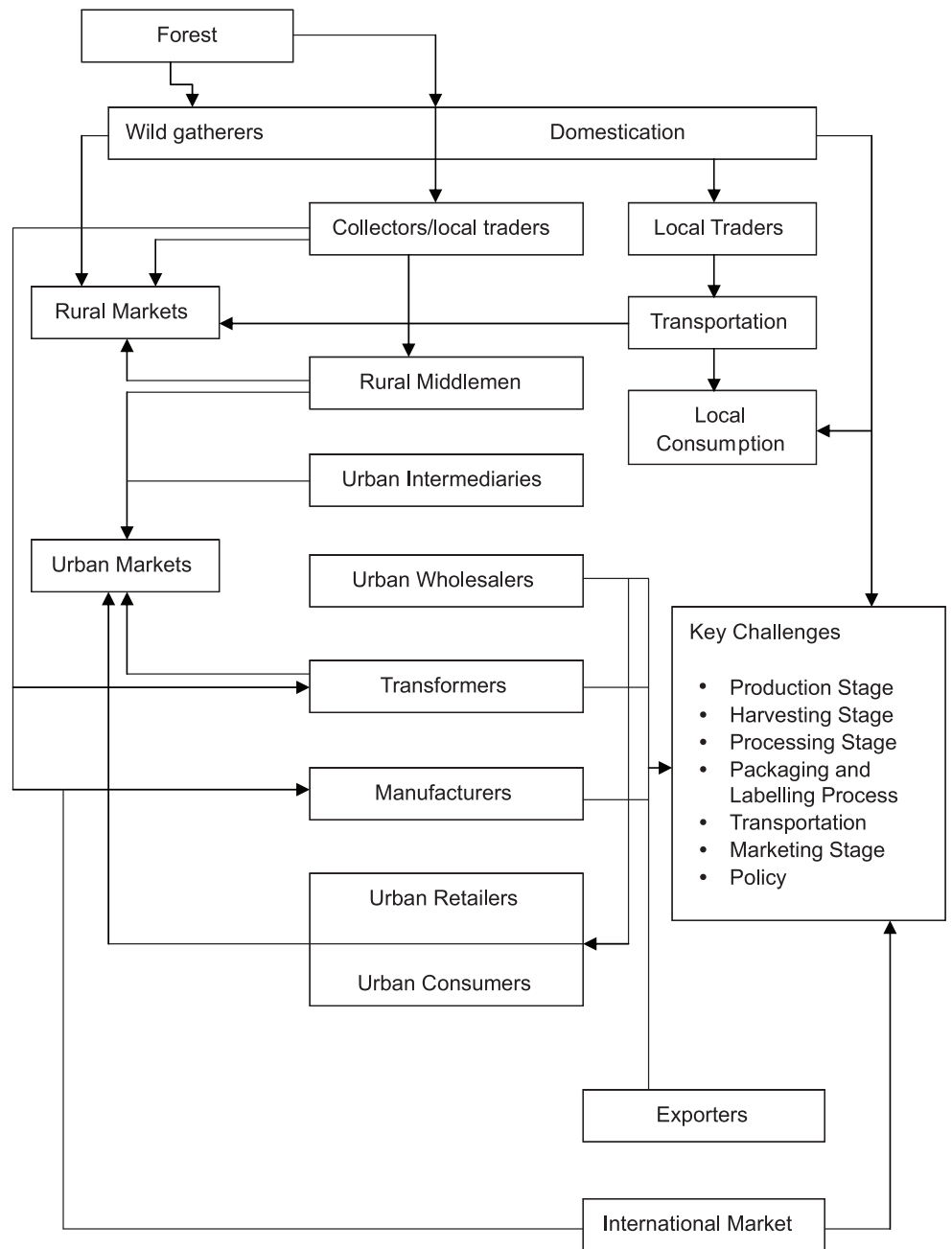


Fig. 1: Supply Chain of MAPs in India



(Source : Adopted from Ahenkan and Boon, 2010)

Fig. 2: The Supply Chain of MAPs

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