Economic Importance of Medicinal Plants in Asian Countries

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Walia Zahra, Sachchida Nand Rai, Hareram Birla, Saumitra Sen Singh, Aaina Singh Rathore, Hagera Dilnashin, Chetan Keswani, and Surya Pratap Singh

Abstract

Due to their characteristic benefits and medicinal value, medicinal plants are gaining importance worldwide. It is becoming famous, and people are using herbal therapy as an alternative medicinal therapy. Because of their increased traditional use and cultural acceptability, these medicinal plants are greatly admired and also have minimal side effects and thus are gaining global importance. Herbal drugs which are cost-effective than synthetic drugs in many cases are being promoted by most of the developing countries, and they have started discovering and filing patents on the medicinal plants and their derivatives. Many drugs still have not undergone the process of drug approval and are not yet validated for their safety and efficacy. These medicinal plant-derived drugs can be formulated by medicine-based industries. The international trade of medicinal plants and their products was estimated to be USD 60 billion in 2010, and by 2050, it is expected to reach USD 5 trillion. Asian countries are very rich in medicinal plant species and are the major exporters of these plants and their products. These medicinal plants can be popularized and used to improve the economy of low-income countries of Asia and create livelihoods for its people. Moreover, overexploitation of these medicinal plants should be limited, the valuable species of high marketing value should be conserved, and their cultivation should be promoted for future use.

Keywords

Medicinal plants · Herbal drugs · Traditional knowledge · Herbal drugs · Asian countries · Global consumption

W. Zahra · S. N. Rai · H. Birla · S. S. Singh · A. S. Rathore · H. Dilnashin · C. Keswani
S. P. Singh (✉)
Department of Biochemistry, Institute of Science, Banaras Hindu University, Varanasi, India

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19.1 Introduction

In both traditional and modern medicinal systems, the interest in using medicinal plant-derived drugs has increased. Due to this, the increment on the demand for medicinal plants has also occurred on global basis resulting in the collection of these plants from their native place. These plants play an important role in maintaining the economy of the low-income countries as the medicines derived from them are quite essential in keeping the population healthy which in turn is valuable for sustaining the economy of the countries. Cultivation of medicinal plants within these countries offers employment to the poor people, hence helping in their livelihood. Valuable medicinal plants are reported to grow in South Asian countries, mostly in fragile ecosystems which are particularly inhabited by rural peoples and native communities. Humans are familiar with these plants since olden times, and the ancient literature suggests the use of these plants in religious ceremonies and for curing diseases in the countries like India. The use of medicinal plants in low-income countries should be promoted to make them self-reliable on their pharmaceutical resources which would also be quite effective in managing the endemic diseases condition. This can also be helpful in alleviating the challenges of poverty, hunger, ill-health, and illiteracy which are being largely faced by these Asian countries. These plants and their derivative drugs are prescribed in both developing and developed countries, and the global trade based on these drugs was estimated to be USD 32–43 billion. This should be considered as priority for other developing countries too in order to enhance their self-reliability on their own pharmaceutics which will strengthen their economy. To accomplish this, the developing countries of Asia must realize the value of their inhabitant medicinal plants and their economic importance. The advertisement of their valuable plants can then attract the investors in the field of the pharmaceutical production and help in the production of their own medicinal products. This strategy will end up in boosting the economy of the developing countries by offering jobs to the poor and improving the healthcare delivery system which will allow the population to purchase the medicine at affordable prices. Thus, the use of their inhabitant treasure, i.e., medicinal plants, will not only address the increased income of the country but will also allow access to the medicines by the population enhancing the country's health services. Some of the valuable medicinal plants found in Asia-Pacific region include the species of *Cassia*, *Atropa*, *Podophyllum*, *Rauvolfia*, *Psoralea*, *Catharanthus*, *Hyoscyamus*, and *Papaver.*

19.2 The Growing Need to Spend Money on Pharmaceutical Development

Kaplan and Mathers (2011) have suggested that countries throughout the world are nowadays threatened with the shift of the diseases from acute to chronic which directly set the allegations toward the supply and demand of the pharmaceutical products. The growing population of the developing countries is seen mostly to

undergo the abovementioned situation. The unavailability of essential medicines is observed, and the distribution of the medicinal products for both communicable and noncommunicable diseases does not meet to the need of large number of people in the population of developing countries (Cameron et al. 2009; Kaplan and Mathers 2011).

Although countries have spent large amount of money on the development of pharma products, a little impact on the citizens' health has been observed. The experience was considered to be harsh, and the balanced approach toward the manufacture, delivery, and consumption of medicine was thought to be done with cost-effective methodology. This approach has possibly improved the situation of the developing countries and has considerably reduced their expenses of the medicine production. Still, some countries especially from the Southeast Asia were unable to implement the approach and failed in reducing the high pharmaceutical expenditures. Accordingly, India (18.8%), Burma or Myanmar (24.5%), Nepal (44.3%), Thailand (30.5%), and Bangladesh (63%) were observed to have high percentage of pharmaceutical expenses (Bukar et al. 2016). Due to this unpleasant experience, it was suggested that these developing nations should identify their resources to become self-reliable and effectively implement this to raise their economy. This can be acknowledged as most people in developing counties rely on medicinal plants to be used as medicines irrespective of their reasons of cultivation, cost, and accessibility (Bukar et al. 2016). Nigeria has set the example of such developing countries in which medicinal plants are widely used (Okoli et al. 2007; Dahlberg and Trygger 2009). These developing countries are wealthier in the sense that they have valuable resources in the form of medicinal plants that can be potentially subjected for medicine production (Messiaen and Rouamba 2004; Okoli et al. 2007; Bukar et al. 2016; Rai et al. 2017; Singh et al. 2018; Birla et al. 2019).

This can allow citizens of developing nations to afford the cost-effective pharmaceutics and have the liberty to choose them. The production of these products in developing countries might also allow them to increase their global pharmaceutical production which was observed to be higher in the high-income countries, i.e., 89.1% in 1985 and 92.9% in 1999, as compared to the combined shared value of 10.9% and 7.1% during the same time in low-income countries (Bukar et al. 2016). Hence, the dependency of the developing nations on their counterpart developed countries can be reduced as the import of the pharmaceutical products would not be much needed.

19.3 Global Consumption of Pharmaceutical Products from Developing Nations

"High-value minor crops" is the phrase given to herbs, spices, and medicinal and aromatic plants that are generally the small contributors to the agricultural output of a country (Sher et al. 2014). Resurgence of the traditional medicine system at the global level has led to the increased rate of marketing of herbal drugs. Accordingly

by 2050, the world herbal trade is expected to reach USD 7 trillion. Reports have widely suggested the inability to fulfill the need of essential medicines due to either unavailability and higher importation cost or their inadequate distribution in developing countries (Bukar et al. 2016; Keswani et al. 2017). Though being the small individual contributors, these medicinal plants have helped in reaching their global trade to be USD 60 billion in 2006 (Sher et al. 2014). From Asia and Africa, Europe has been found to import about USD 1 billion in medicinal and aromatic plants (Sher and Hussain 2009; Ghimire et al. 2004). This trade is assumed to be expanded significantly by the year 2050 as herbal medicines are attaining high popularity these days (Kuipers 1997; Al-Quran 2008; Khan et al. 2011). Despite contributing a smaller portion of the agricultural output, these medicinal plants have the highest value per weight among the traded plants. These are referred to as the pharmaceutical cash crops that have high potential ability for their respective countries based on their agricultural practices and contributing to the regional economy (Dubey et al. 2004; Kuniyal et al. 2015). The south and western countries of Asia have been addressed for collecting, cultivating, and trading the medicinal and aromatic plants from centuries (Ali-Shtayeh et al. 2000; Lev and Amar 2002; Ghorbani 2005; Al-Quran 2008; Mati and De Boer 2011).The cinnamon leaves from Meghalaya, an Indian state, have been reported to be about 2800 tons which is closer to about a million dollar as reported by a study (Karki et al. 2003). Nepal has also been found to export medicinal raw materials of an estimated USD 18–20 million to India and other countries (Schippmann et al. 2006). China is said to be rich in about 4941 medicinal plant species out of a total 26,092 species, while India is found to be rich in 3000 medicinal plants out of 15,000 plant species. Malaysia, Indonesia, and Nepal have comparatively lesser number of plant species than India and China. In the fast growing global trade, India only shares about 1.6% in the field of herbal medicine (Wakdikar 2004). The Indian share of world export though has grown by 4.95%, whereas the growth of China was found to be 7.38% between the years 1991 and 2002 (Verma and Singh 2008; Keswani et al. 2017). AYUSH has suggested that in 2009, India ranks as the second largest exporter after China (Keswani et al. 2017). The Indian herbs exported in the year 2007–2008 was about USD 96 million, while in 2006–2007 it was about USD 76.9 million (Schippmann et al. 2003).

Malaysian industry of herbs has the business of USD 315 million per annum and is reported to be growing steadily at the rate of 20%. In 1994, the estimated market value was estimated to be USD10 million in 1994 which has grown up to USD 15.8 million in 1996. The products mostly demanded from Malaysia are garlic, evening primrose oil, and *Ginkgo*. About 1000 manufacturers are involved in the production of herbal medicines, and the global market for phytomedicines is about USD 20 billion which has an average growth rate of 15–20% in the year 2012 (Nirmal et al. 2013).

After Brazil, Indonesia is known as the second largest biodiversity center. Generally, about 40% of the population of Indonesia consumes herbal drugs for their healthcare requirements. The herbal industry has developed rapidly in Indonesia in the recent years, and 468 registered industries have grown to the

number of 807 in the year 2000 from 1992 which reflects the increased consumption of herbal medicines in the country (Nirmal et al. 2013).

Cambodian people have a tradition of using traditional medicine to fulfill their healthcare needs, and the nation is capable of providing the raw material obtained from more than 500 medicinal plants (Nirmal et al. 2013).

Thailand is wealthy in the case of medicinal and aromatic plants. About 1400 species of medicinal and aromatic plants are present in about 10,000 species of plants. 248 manufacturing units in Bangkok and 451 in rural areas have contributed in the production of traditional drugs in Thailand in the year 2000. The market value is being targeted by Thailand's Public Health Ministry to rise the marketing of herbal products from USD 9.69 million to USD 16.15 million (Nirmal et al. 2013).

The national health and development is very much dependent on the medicinal plants and herbal drugs in Vietnam. Almost 10,000 tons of medicinal herbs are harvested, and 40,000 tons are being imported annually. Around 3850 species of medicinal plants are present in Vietnam. Vietnam has earned millions of dollars by exporting the valuable medicinal herbs (Nirmal et al. 2013).

In Sri Lanka, also the medicinal plants are widely used in traditional medicine systems. India has exported about USD 10 million worth of medicinal plants in Department of Ayurveda, while about 60 species of medicinal plants of annual value of USD 1.27 million are imported in Sri Lanka from India and other countries in 1996. The herbal market value in 2007 was about USD 20 billion, and it is expected to reach USD 5 trillion in the coming future (Nirmal et al. 2013).

19.4 Research and Economic Priority of Medicinal Plants

A report given by the WHO in 2003 has indicated the sale of about 30% of the pharmaceutics throughout the world, which were derived from medicinal plants. The global sale of herbal products was of about USD 600 million with 80% of population of developing countries using the products for fulfilling their healthcare needs in 2002. Therefore, interest of the low-income countries could be safeguarded by commercializing medicinal plants strategically (Kala 2005b). By bio-hunting of the new drugs derived from these plants and due to the more costly prescribed drugs for personal health, interest in medicinal plants has been aroused as witnessed by the World Bank (Lambert et al. 1997) and Hoareau and DaSilva (1999). According to their opinion, they have suggested that medicinal plants will continue to play an important role in the health aid system based on the previous research. Also, development in information technology and upgrowing interest in medicinal plants have fueled the need for the electronic information about the medicinal plant and their emergence as promising health aid. This has resulted in arranging the screening program to identify the bioactive components from these medicinal plants and developing newer drugs from them (Hoareau and DaSilva 1999; Meena et al. 2009). The pharma products derived from the plants also show promising aspects for their commercial development as they are advantageous in terms of production scale and easy to store and also allow to deliver cost-effective drugs to the low-income

countries (Ma et al. 2005; Pandey et al. 2013). The conditions and trend related to medicinal plants have been reported by FAO (Bukar et al. 2016), which talks about their production and market value and informs the world about both the possibilities and difficulties associated with the trade of medicinal plants.

Also, without incorporating the medicinal plants, it is impossible to implement the health policies prevailing in developing countries that mostly deal with health problems in which the infectious diseases play a prominent role (Farnsworth et al. 1985; Liu 1995). Thus, the blending of the policy practice with that of the cultural way to cure a disease is much relevant to the context (Reynolds and Sofowora 2007). China has thus set an example in this regard as medicinal plants are widely used in about 40% of the cases when the primary healthcare is needed (Sofowora et al. 2013). This fact seems to be quite convincing as over 80% of the world population is dependent on the plants and herbs of medicinal values as primary medicinal system. About 5 billion people worldwide address plant-derived products as the remedy of both acute and chronic diseases. Thus, medicines originated from medicinal plants should be implemented in modern medicinal system and should be practiced clinically. Thus, when the disease pattern in the geographical area will be investigated, cooperation between the policy makers and the scientists will be there and overdependence on the imported pharmaceuticals will be reduced, and when there is a strong political will, the deteriorating health of the population of the low-income countries will be alleviated, and the economy of the countries will be strengthened (Bukar et al. 2016) (Table 19.1).

19.5 Importance of Medicinal Plants

19.5.1 The Social Point of View

In many Asian countries, medicinal plants are being used for centuries to fulfill the nutritional needs and provide the primary healthcare as part of their culture and tradition (Farnsworth and Soejarto 1991). Thus, the heritage is quite familiar with the native people and they are very much accustomed about their cultivation, harvesting, processing them into the products they need and fulfill their requirements was according to the household or medicinal necessity. The cultivation and management of medicinal plants easily go with the fact of making the rural women employed. Women are usually acknowledged of successfully administrating the chores required as the activities related to medicinal plant production fit with the daily requirements and work schedules of women. They are involved from collecting the raw materials to drying it and transporting it to the market. They also get training from the herbal drug industry for administering the tasks. Thus, medicinal plants provide the livelihood in the rural areas and help in fulfilling the basic healthcare need. Arya Vaidya Sala (AVS), Kottakkal, Kerala, makes the example of such employment generator which allows doing business and providing traditional medicine service simultaneously. These industries are thus helpful not only in strengthening the social network but also in preserving the traditional knowledge of

Table 19.1 Some plants of medicinal values (Balasankar et al. 2013; Ghosh and Patil 2010; Khushbu et al. 2011; Gawade and Fegade 2012; Umadevi et al. 2012; Dastagir and Rizvi 2016; Lim 2016)

S. no.	Common name	Scientific name	Family	Features	Native countries	Treatment
1.	Periwinkle	*Catharanthus roseus*	Apocynaceae	A 40–90 cm tall, everblooming, drought-resistant, perennial crop with white or purple flowers	Native: Malagasy	Leaves: cancer
					Grown in India, Malagasy, Israel, USA	Roots: high blood pressure
2.	Senna	*Cassia senna*	Fabaceae	60–15 cm tall, drought-resistant, perennial crop	Native: Somalia, India, and Arab	Leaves and pods: constipation
					Grown in India, Arabia, Egypt, Sudan	
3.	Winter cherry or Ashwagandha	*Withania somnifera*	Solanaceae	30–150 cm tall, drought-resistant, annual crop	Native: India and Pakistan	Roots: used as stimulant or tonic
					Grown in India	
4.	Indian long pepper	*Piper longum*	Piperaceae	90–120 cm tall, perennial, climber	Native: India, Nepal, Indonesia	Roots: respiratory disorder
					Grown in Indonesia and India	Fruits used as spices
5.	Serpentine root	*Rauvolfia serpentina*	Apocynaceae	30–100 cm tall, perennial crop	Native: Bangladesh, Indonesia, Myanmar, India, Thailand, Sri Lanka	Roots: mental disorder, insomnia, high blood pressure
6.	Medicinal yam	*Dioscorea alata*	Dioscoreaceae	4–5 m tall, perennial climbers	Native: Africa, Asia, America	Tubers: for manufacturing steroidal drugs
					Grown in Mexico, India, China	
7.	Liquorice	*Glycyrrhiza glabra*	Fabaceae	A 60–200 cm tall, drought-resistant, perennial crop	Afghanistan, China, Italy	Rhizomes and roots: as flavoring agent and for treatment of cough, ulcers

medicines and in providing opportunities to the native youth to get employed. In this way, they not only inherit the knowledge from their elders but also are capable of earning their livelihood and providing strength to their society (Karki et al. 2003).

19.5.2 Traditional Knowledge Protection

The traditional knowledge regarding the use of medicinal plants is vanishing day by day, and it is very much important to take the measures to preserve it for its implementation. The mountains of Himalayas are the greatest source of traditional medicines and form the basis of Ayurveda. The native people from Himalayas are aware of their valuable healthy traditions, and the traditional heritage has been explored and practiced for years to provide proper medication to the inhabitants (Hamilton 2004; Karki et al. 2003). Thus, if proper measures are taken and if the traditional knowledge of the medicines can be investigated, a large number of employments can be produced within the rural areas. If the enterprise is incorporated, thousands of jobs can be produced to harness the traditional medicinal knowledge with economic opportunities. Thus, medicinal plants are helpful in contributing to the economic growth in the areas which have limited resources, educational options, lack of infrastructure, and underdeveloped commercial activities (Singh et al. 2016a, b, 2019a, b). Himalayas being rich in the biological and cultural diversity which is a result of the millions of years of evolution should be protected for their indigenous cultural and medicinal values (Ramakrishnan 1992).

19.5.3 The Environmental Point of View

The production of good-quality certified drugs of herbal origin has become a necessity these days as population is most concern about using the nonchemical-based products. Medicinal plants appear to be the most eco-friendly alternative in terms of production of the drug and providing health products useful in households and can be industrialized (Balunas and Kinghorn 2005; Karki et al. 2003). The shrubs, trees, and grasses of medicinal origin are found abundantly in South Asia. The tropical and subtropical forests of the area hold important medicinal value and can be harvested to yield the environment-friendly drugs of botanical origin. By promoting the community-based conservations, these forests can be preserved for its entry in the world drug market. People are also greatly encouraged to lend their participation in conserving the forest ecosystem by developing the medicinal plant-based job opportunities.

19.5.4 Commercialization of Medicinal Plants

The commercialization of medicinal plants in South Asia holds high economic importance as it allows the local traders to sell their traditionally renowned products

at higher prices and open a national or global market for the products that are newly identified for their medical importance. If the partnership develops in between the local traders and the private sectors owing to produce the drugs in the industries, both the partners get equally benefitted. By growing the desirable crops, with their associated species and the intercrops alongside, the cultivators ensure to complement the medically important trees and conserve the forests simultaneously. Many medicinal plant roots help in stabilizing the soil of their areas and inhibit the soil erosion from hilly slopes. Medicinal plants have the quality to grow in adverse environmental conditions such as in poor soil fertility and low rainfall and hence are naturally regenerated. The mix plantation is allowed on enormous land areas including the shifting fallow land. Different configurations of crop geometry can be adapted to grow the plants of medicinal value as mostly the species are shade tolerant and others include trees, shrubs, herbs, and climbers (Rao et al. 2004; Chapman and Chomchalow 2003; Karki et al. 2003).

Nowadays, the demand for medicinal plants is increased by major herbal drug industries as an essential raw material. Thus, there is a high opportunity to create jobs for the unemployed people as the collection; processing transportation of these plant products requires high labor input. Thus, cash earnings can be increased for local people by enhancement of traditional processing by the industries (Karki et al. 2003).

In certain states of South Asia, medicinal plants can be cultivated simultaneously with traditional farming systems, i.e., through mixed farming. This helps in the growth of medicinal plants in the existing cropping system enabling them to grow in different eco-physical conditions when the selected species are cultivated with mixed or companion crops. The improvement of the soil quality by crop rotation enhances the livelihood in South Asia (Schippmann et al. 2006; Meena et al. 2009) (Table 19.2).

19.6 Conservation of Medicinal Plants

Medicinal plants are generally collected from the forests in large amount which ranges in between 70% and 99% in most of the countries (Parrotta and Agnoletti 2007). This has led to depletion in the number of plants as the demand for herbal drugs has become high. As a result, most of the medicinal plant species face the threat of extinction. According to the International Union for Conservation of Nature and Natural Resources (IUCN), about 300 medicinal plant species are at the threat of extinction (Gurib-Fakim 2006).

There are numerous reasons to conserve the medicinal plants:

- The harvesting practices for collection of medicinal plants from the wild have become rather destructive. Hence important measures have to be taken to save the species by nondestructive, high-quality collection methods.
- A steady decline in the use of medicinal plants by local communities has been observed which is directly related to their loss of interest in the plant conservation.

Table 19.2 Recent patents on medicinal and aromatic plants (Keswani et al. 2017)

Patent number	Title	References
USPP12030P2	Hybrid mint plant named "Neerkalka"	Kumar et al. (2001)
USPP12426P2	Mint plant named "Kosi"	Kumar et al. (2002)
USPP13336P2	High-yielding and stable plant of *Cymbopogon flexuosus* called "Chirharit"	Patra et al. (2002a)
USPP12791P2	Novel, high-yielding stable *Mentha arvensis* plant named "Damroo"	Patra et al. (2002b)
USPP13279P2	Mint plant named "Saksham"	Khanuja et al. (2002)
US PP13110 P2	*Lippia alba* plant named "Bhurakshak"	Kumar et al. (2002)
US6534696B1	"Rakshit," a poppy plant	Dhawan et al. (2003)
US6548746B1	"Dhawal," a high alkaloid-producing periwinkle plant	Kulkarni et al. (2003)
USPP14090P3	Peppermint plant named "Pranjal"	Dwivedi et al. (2003)
US6831214B2	"Vaishnavi," a high-yielding self -pollinated *Cymbopogon martinii*	Patra et al. (2004)
USPP14538P2	Mint plant named "Sambhav"	Khanuja et al. (2004)
USPP16566P3	Mint plant "Kushal" for late transplanting	Khanuja et al. (2006b)
US20050150027P1	Mint plant named "CIM-Indus"	Khanuja et al. (2006a)
USPP16712P3	Citral-rich high-yielding lemongrass plant "Nima" of *Cymbopogon flexuosus*	Lal et al. (2006)
US20090191292	High essential oil- and eugenol-yielding cultivar of *Ocimum sanctum* "CIM-Ayu"	Lal et al. (2007a)
USPP17505P3	*Plantago ovata* plant named "Mayuri"	Lal et al. (2007b)
US7442854B2	High-yielding multiple disease-resistant/stable variety "Madakini" of opium poppy	Shukla et al. (2008)
US7435877B2	Distinct type cultivar of *Ocimum basilicum* "CIM-Saumya"	Khanuja et al. (2008a)
US7375260B2	High artemisinin-yielding artemisia plant named "CIM-Arogya"	Khanuja et al. (2008b)
US20050050593A1	High herb-, phyllanthin-, and hypophyllanthin-yielding cultivar of *Phyllanthus amarus* "CIM-Jeevan"	Gupta et al. (2008)

(continued)

Table 19.2 (continued)

Patent number	Title	References
US20150056255 A1	Product comprising a plant for medicinal, cosmetic, coloring, or dermatologic use	Ragot et al.(2014)
US PP24545 P3	*Heuchera* plant named "Ginger Snap"	Egger and Terra Nova Nurseries, Inc (2014)
US 20140259228 A1	*Cannabis* plant named "Avidekel"	Cohen (2014)
US20140245494 A1	*Cannabis* plant named "Erez"	Cohen (2015)
USPP26474 P3	Autotetraploid *Vetiveria zizanioides* plant useful for carbon sequestration and soil conservation named "CIMAPKH40"	Lavania et al. (2016)

The rural people should be encouraged and should be provided job opportunities in the conservation field so that the native species can be consereved.

- As the demand for medicinal plants is high for their commercial sale and the international demand for the products is high, hence actions should be taken to conserve the species and export them in limited amount.
- The collectors are often offered with minimal prices, and the difference from the market price is in between 50% and 255% in India, while in Mexico the collectors are only offered with about 6% of final market price (Duke 1990; Rao et al. 2004).

19.7 Contribution of Medicinal Plants to the Livelihood

Medicinal plants in a particular area play a key role in maintaining the health of the native communities. Also, they are subjected to produce income sources for the "localities." Thus, they provide the livelihood for a large number of people living in that area. Since large proportions of plants are being collected from the forests which is non-sustainable, the pressure on the resources has become high. Thus, cultivation of demanded species of medicinal plants can be subjected to provide the alternative livelihood source to the farmers of that area. Countries including India have made some policies to enhance the promotion of medicinal plants (Gurib-Fakim 2006). Almost 1.5 million traditional medicine practitioners prescribe herbal medicines for curing different diseases in India (Vaidya and Devasagayam 2007; Verma and Singh 2008).

Though only fewer number of medicinal plant species are being cultivated on larger scale, the cultivation in many cases includes those plants too that do not have high global demand (Balunas and Kinghorn 2005; Gurib-Fakim 2006). China being the major cultivator of medicinal plants only cultivates about 100–250 species at the larger scale, and 80% of the medicinal plants are obtained from the wild habitats (Schippmann et al. 2003), while Europe has been seen to cultivate only 130–140

species of medicinal plants out of 1200–1300 species of inhabitant native plants (Wurtele et al. 2012).

While cultivation of medicinal plants holds greater potential, it is also limited by different issues. Because farmers are often offered with lower prices, it becomes difficult for them to take the initiative in the field of medicinal plant cultivation, whereas underdeveloped cultivation technology, scarcity of planting material, longer growth periods, and lack of industries in the area are the other different reasons for inability of doing cultivation practices. Thus, by removing these barriers, cultivation practice to increase the number of medicinal plants can be seen as new approach to earn livelihood in the rural areas of low-income Asian countries. Farmers are generally challenged with the difficulties of cultivation as they have no experience in it. Therefore, there is a powerful need to develop the technologies which can aid the farmers in cultivation, harvesting, and storage of medicinal plant products. Many research institutes are also researching on the medicinal properties of these plants, but to farmers it has not been much helpful which is because of the following reasons:

1. As research is being done on larger number of plant species, the resources provided for the research are not evenly distributed. Thus the research done in this area is not much successful. So as to use the resources in an efficient way, the research has to be constricted on lesser number of species, and this can be achieved by omitting the lack of coordination in between the institutes. Moreover, when the coordination will be done by one agency with close collaboration with other institutes, the research would be done with greater effort.
2. Researchers are focused on the development of the cultivation technology. The problems that occur here are with the packaging, storage, and transport of the products with retention of its quality. Measures should be taken thus to overcome these problems in order to achieve high quality of products.
3. The association between the research institutes and medicinal plant farmers are not as strong as most of the research is being done in laboratories. Research involving farms is negligible, so the farmer's contribution is insignificant in the research. Due to this, the problems faced by the farmers on land are not properly addressed, and researchers are unable to benefit by the experience of the farmers. Thus, the gap between the researchers and farmers has to be fulfilled, and farmers should be trained by experienced researchers to enhance the cultivation technology of medicinal plants.
4. There is also a lack of collaborations in between the research institutes and industries. The industries are quite uncertain of collaborating with the research institutes as they are unsure about the commercial return.
5. Researchers have also suggested about the shortage of planting materials to be cultivated in larger areas. Farmers have reported that the material provided by the governmental agencies is of bad quality. Thus, the involvement of private sectors is being proposed for better quality production and marketing of planting materials.

6. Moreover, researchers are often focused on the development of cultivation technology for species that are facing threat. It is suggested to promote the cultivation of economically important species by the farmers supported by the research programs (Lubbe and Verpoorte 2011).

19.8 Contribution of Medicinal Plants of the Himalayan States of India

More than 8000 species of medicinal plants are reported to treat different health problems in India (Das et al. 2017).The regions of Himalayas are specially gifted with large number of medicinal plant species (Kala 2000). The diverse agroclimatic conditions ranging from rainforests found in the northeast to the dry deciduous and alpine meadows found in the northwest are responsible for the diversity. Though only 15% of the country's geographical region is occupied by the Himalayas, then there are about 30% widespread medicinal species found in India which are predominantly rich in the medicinal value (Dahanukar et al. 2000; Kala 2005a).

The states of India that are in vicinity of the Himalayas are rich in large variety of medicinal plants. For example, Himachal Pradesh is found to be rich in about 500 medicinal plants out of about 3000 plant species, while Uttaranchal, Meghalaya, and Arunachal Pradesh are also gifted with greater number of medicinal plants. Medicinal plants have contributed to the rural income particularly in the region of Himalayas. The Great Himalayan National Park in the Kullu Valley has set an outstanding example for this as around 11,000 people are habitant of 5 km-wide belt around the park. Because of the limitation of other employment in such area, the medicinal plant collection serves as an important source for the native people. In 1997, the medicinal plant in combination with guchhi has provided Rs. 10,000 per family to the villagers around the park (Khare 2008).

Also, most healers of the area use these medicinal plants to resolve the health issues and depend on their traditional knowledge. Bhotia people living at high altitude of the central Himalayas use about 150 different medicinal plants to treat different number of diseases (Maikhuri et al. 1998). Although India is quite diverse, there is still high pressure on prevailing resources. Thus, conserving the medicinal plants has become a necessity as they on one hand provide health benefits to the community, while on the other hand they are used to fulfill the demand of newer and safer drugs of natural origin throughout the world.

19.9 Other Important Recommendations

1. Strong policies should be made and implemented for the collection of medicinal plant species which should be transparent. Improvement of the performance by the government agencies such as forest department is strictly required as they are involved in the collection and transportation of medicinal plant species.

The unnecessary and illegal collection of plant species can only be prohibited when the agencies will perform their duties honestly.

2. For the conservation of the traditional knowledge, popularization of medicinal plants is necessary. State government should take measures to aware the population about the importance of these plants of medicinal value. The resources should also be increased to improve the healthcare-based systems. This will provide the motivation to the growth of the relevant sector.
3. The effective participation off the native rural people should be promoted.
4. The farmers involve in the cultivation of medicinal plants face many difficulties. Moreover, the amount of resources and the production of planting material should be increased.
5. The collection and cultivation points should be provided with processing facilities so that earning of the farmers and cultivators are increased, and the quality of the product is enhanced.
6. Farmers should be offered with good marketing facilities. The innovative marketing techniques should be implemented so that difficulties faced by the farmer is reduced and their income is improved.
7. Insurance scheme should be introduced to reduce the risk faced by the farmers.
8. The species selected to be cultivated should be based on the availability of the technology and its economic importance. It should not be based only on the criteria of conservation.
9. The information regarding the prices and the demand for various species is not reliable which should be corrected.
10. The threat of illegal patents is often faced by medicinal plant conservation and local communities. The local farmers must be aware by the respective government agencies.
11. As civil society plays a key role in establishing the medicinal plant sector, policies should be introduced that can facilitate its role.
12. Finally, the conservation and cultivation of these plants should be promoted, and the central government should provide technical, and final support for this to the respective state government of medicinal plants is a national issue (Cunningham 1998; Firenzuoli and Gori 2007; World Health Organization 2007).

19.10 Conclusion

Medicinal plants are valuable for different reasons. For the basic healthcare needs the rural population of Asian countries require high quality raw material for the production of drugs from medicinal plants. The large number of people in the rural areas can also be provided with income opportunities by incorporating them in the processing and collection of medicinal plants. Since enormous varieties of the plants species are found in the Himalayan region, thus they play evident role providing the livelihood to the native communities. The demand for the medicinal plants

has grown faster in the recent years, and it has led to their unlimited collection, thereby extreme pressure on the wild resources has been observed. Due to this, many of the species are at the threat of extinction. Measures to limit the excessive exploitation of these medicinal plant species should be thus inherited, and the cultivation of economically important plant must be proposed. Although, the government is taking newer initiatives, but the implementation of the policies remains to be poor. Overexploitation can only be stopped when these policies will be implemented and hence significant improvement of the product from cultivation to marketing will be viewed.

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