

The Potential of Medicinal and Aromatic Plants Cultivation to Develop the Agri-Business in Mizoram

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ABSTRACT

India is one of country which is known for its agricultural products and currently more than 70% population still living in rural area. India is fully blessed with different kinds of agro-climatic regions. Production wise our country is standing at second rank throughout the world. Some of agricultural products from India are very high in demand in many parts of the globe. Counting its agro-climatic regions, the North East Region (NER) is another hot spot acquired a land of agriculture as well as forest area. The each states of NER having its own peculiarity for various agro products. They used to cultivate many crops which include export level to their daily delicacy. Ginger, Turmeric, Chili, Beans and bamboo products are produced in large quantities. As per the statistics,

Mizoram is the highest ginger producing state (8.4 tons/hect) followed by Arunachal Pradesh (7.9 tons/hect), Assam and Nagaland (6.99 tons/hect) among the states of NER. Apart from cultivation, 60% area of NER comes under forest cover, especially Mizoram, where more than 80% of the geographical area of the state is under forest and tree cover. Looking into the prospects of diverse agricultural land settings and forest cover including biodiversity of medicinal and aromatic plants (MAPs), Mizoram could be potential state in relation to agribusiness. There is a tremendous scope for MAPs sector in the state. Valuable MAPs like *Homalomena aromatica*, *Alpinia galanga*, *Cinnamomum tamala*, *C. verum*, *Mentha arvensis*, *Artemisia pollens*, *Ocimum sanctum*, *Elsholtzia communis* and many others are traditionally cultivated on very small scale. Thus, there is a need to introduce good agricultural practices (GAPs) for increasing the raw materials/yield to establish the agri-market in Mizoram.

Keywords Commercial agriculture, MAPs sector, Market linkage, Mizoram .

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INTRODUCTION

Since, India is known for its agricultural produce with specific to their location. Many agricultural products are representing to their agro-climatic zones. In India there are 16 agro-climatic zones having different climate, soil, temperature and other variables for cultivation and processing of aromatic

crops. Such huge agro-climatic condition is boon to farmers for production of essential oils, required for aroma (perfumery), pharmaceutical, cosmetics and aromatherapy (Dagar *et al.* 2021). North East Region of India having very diverse agro-climatic conditions encompasses rich forests (60%), diverse agricultural land settings including shifting cultivation locally known as jhum. Each state has its own ethnic cultures, way of living and agricultural practices. Local peoples used to grow different kinds of MAPs for various purposes (Kumar 2017). Mizoram topography is the prime source for diversity of plants that are used by the local inhabitants for preparing various kinds of medicines. Tribal people of various ethnic groups in the Mizoram state are highly dependent on these MAPs to cure and manage of various diseases (Laldingliani *et al.* 2022).

Hence, it is observed that the Mizoram is one of the biodiversity rich states in the North East region of India which lies in Indo-burma hot spot mountainous region (Rai 2012). Mizoram is a totally hilly terrain state having tremendous potential for the development of small and medium level enterprises in MAPs sector. It has good ecological and geographical conditions to cultivate commercially demanding MAPs (Kadirvel *et al.* 2020). Currently, in global market the demand of essential oils and raw materials are high. In this case the state can initiate to establish good cultivation practices(GAPs) for the *Cymbopogon flexuosus* (Lemon grass), *Elsholtzia communis* (locally known as Lengser), *Pogostemon cablin* (Patchouli), *Vetiveria zizanioides* (Khus grass), *Cinnamomum tamala* (Tejpata), *Mentha arvensis* (Mint), *Homalomena aromatica* (sugandhmantri), *Zingiber officinale* (Ginger), *Curcuma longa* (Turmeric), *Artemisia pollens*, *Alpinia galanga*, *Ocimum sanctum*, *Aloe vera*, *Andrographis paniculata*, *Clerodendrum colebrookianum*, *Tinospora cardifolia* (Giloy), *Pelargonium graveolens* (Geranium), Rose. Still, the state is failed to grow commercially MAPs because of lack of awareness among farming communities, traditional cultivation practices that seldom reach high production, and unscientific collection of wild medicinal and aromatic plants from the wild forest. Furthermore, the farmers are ready to cultivate MAPs but they are not familiar to scientific and commercial experience about cultivation of Aromatic

plants as well as post-harvest processing techniques, value additions. Only three farmers are extracting the essential oils from Lemon grass and Sugandhmantri plant, but they are not in position to have quality and efficient distillation facilities for extraction of their essential oils which result in poor quality and low recovery of oil. Even the extracted oils are very less; it is not up to commercial level. Since, lots of farmers (approximately 100 in number) are ready to know the necessary training about land preparation, cultivation, post-harvest and extraction. Thus, it is an opportunity to the make group of farmers for establishing aroma cluster which will be improve and enable, efficient, low fuel consumption and less time consuming, distillation facilities. Therefore, awareness program will be helpful to protect the forest flora and simultaneously generate livelihood options to local peoples. In case of endangered and endemic species the conservation protocols will strengthen for sustainable utilization in future. Although, Mizoram is rich in biodiversity area but simultaneously its potential is being not explored and realized in terms of socio-economic benefits to rural peoples. Prevailing shifting cultivation is an important driver for forest degradation and biodiversity loss (Rawat *et al.* 2017).

The official website of Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow showed a case study from Andhra Pradesh, where >5000 farmers are cultivating >9500 hectares using improved CIMAP's varieties and technologies. Due to the initiation of CIMAP, the tribal farmers of East Godavari and Visakhapatnam districts of Andhra Pradesh were started cultivation of citronella, lemongrass, yarrow root and long pepper under rainfed agroclimatic conditions and less remunerative groundnut cultivation was replaced with winter cherry under rain fed condition by the drought prone small and marginal farmers of Anantapur district. Moreover, to expand the MAPs business in the state, the center has encouraged for quality herbal production, establishment of herbal extraction units (distillation unit) as well as develops the market linkages between growers, marketing agencies and leading manufacturing companies for employment generation in the state (CIMAP 2019).

At present, by production wise, Madhya Pradesh

ranks first with a share of 44 per cent and Rajasthan ranks second with a share of 19%. On the other side, Karnataka being a potential states for the cultivation of medicinal plants with holding highest producer of Ashwagandha (61.65 %), Amla (9.46 %), sandalwood (9.41%) as well as producer of other oils like Lemon-grass, Citronella, Palmarosa, Jasmine, Tuberose and Vetiver in substantial qualities. So the total exports of herbal raw drugs, including extracts was estimated as 1,34,500 MT and the consumption demand of medicinal plants by domestic herbal industry was estimated at 1,95,000 MT (Chowti *et al.* 2018).

Benefits of MAPs cultivation in Mizoram

The primary objective is to make farmers self-capable to do the cultivation of medicinal and aromatic plants in the state. They can learn the post-harvest for processing of MAPs and their value addition. The implementation of MAPs cultivation will be a great move among the farmers of the state. It will increase the entrepreneurship and generate employment especially for youths and marginal farmers. This MAPs extension activity will be eye opener for the entrepreneurship development for establishing the small scale industries for production of raw materials/essential oils. It will also stop the migration of unemployed youth from the states. The lands which are unused and marginally exploited would be changed into proper commercial agricultural farms. The market scenario related to supply of raw materials from commercial aromatic plants shall lead to the good agribusiness in the state

Key issues for MAPs cultivation in Mizoram

Poor connectivity due to geographical remoteness
 Low awareness about MAPs and its commercial values
 Unscientific harvesting of MAPs from wild
 No infrastructures for processing and value addition of MAPs
 No infrastructures for processing and value addition of MAPs
 No identified proper market linkage

Henceforth there is an urgent need to evolve and develop commercial strategies, scientific practices of cultivation and technologies to promote sustainable development in hilly state of Mizoram.

Demographic potential of Mizoram

The hilly state of Mizoram is one of the youngest states in the Indian union; having been conferred Statehood in February 1987. The state has mountainous regions of great strategic importance in this region; from east to south it shares the international boundary with Myanmar and Bangladesh in the west, it has a total of 404 km boundary with Myanmar and 318 kms with Bangladesh. It is located at Latitudes of 21°58' and 24°35' N, Longitudes of 92°15' and 93°29' E and occupies an area of 21,087 sq kms (North South-277 kms and East West-121 kms). It shares interstate border with Assam (123 kms), Tripura (277 kms) and Manipur (95 kms) (Pachua 2009). Aizawl is the capital district of the state and it bounded with Champhai district in east, Kolasib district in north and Serchhip district in south. This Aizawl city is the headquarters of the district having an area of 3576.31 km², and as per record of District Census 2011 of India, the city is most populated among the 10 districts of the state (Lalparma 2012, Thangjam *et al.* 2022).

The state is mostly comprised with green and steep hilly terrain. The deep gorges are clearly visible between the hills due to various rivers flowing from north or south. There are different ranges of hills in the state, where 1000 meters is the average height. Blue Mountain (Phawngpui) with a height of 2210 meters is the highest peak in Mizoram. Mizoram has a pleasant climate. Temperature varies from 11°C-20°C in winter and 20°C -30°C in summer. The average rainfall is 254 cm per annum. The state is beautified with different kind of landscapes having very rich flora and fauna including diversity of tropical trees.

Mizoram has a population of about 9.0 lakhs and a literacy rate of about 89%. Chakmas, Pawi, Hmar, Ralte, and Kuki are the major tribes. Agriculture is the mainstay of the people. More than 70% of the total population is engaged in Agriculture practicing *Jhum* cultivation. The climatic condition in the state with various soil types have contributed to the occurrence of a wide spectrum of rich and varied flora and fauna, and these resources are still nurturing by most of the rural people to get timber, food, fuel wood, medicinal and aromatic plants to sustain their life. At present

the economy of state is far from satisfactory with very less improvement in the agricultural productivity level. Handloom and handicrafts are the other traditional means of livelihood. The bamboo products of Mizoram are very famous.

Forest of Mizoram

Mizoram, a north eastern hilly state of India, has the recorded forest area of about 19117 km² which is about 90.68% of its geographical area out of which reserved forests constitute 47.31%, protected forests 21.34% and un-classed forests 31.35%. The state has only 134 km² areas under dense forests, 6086 km² area under moderately dense forests and 12897 km² areas under open forests. The state has a climate ranging from moist tropical to moist subtropical due to presence of tropical wet evergreen forest, montane sub-tropical forest, temperate forests, bamboo forests, quercus forests and jhumland (Hegde and Manpoong 2017, Mondal *et al.* 2012).

Moreover, Mizoram has three agro-climatic zones⁹ beneficial for cultivation of a multitude of crops, vegetables and fruits round the year. Based on soil characterization, rainfall and temperature, the three agro climatic zones in Mizoram been identified as under 1. Temperate zone- it includes blue mountain, Halkhan, Turpang; 2. Subtropical Zone- it covers whole except lower valleys, adjoining area of Cachar and lower parts of Chhimtuipuii and 3. Tropical Zone – it covers the northern and western part, Chhimheipuii. Considering all these above factors the Mizoram is really very rich having tremendous potential to grow various kinds of MAPs throughout the state. The hardworking nature of its residents is a plus point to achieve as well as establish the very well organized MAPs market in the state.

So far known channelized markets and projects are 179 in the state supported by either state or central government (Fig. 1). Yet, there is no proper known market is reported for MAPs; but most of the local peoples supply the demanded MAPs either through cultivated source or harvested from wild sources. As per the authority of SMPB (State Medicinal Plant Board), Govt. of Mizoram, there are many traditional healers in each districts of state have their own

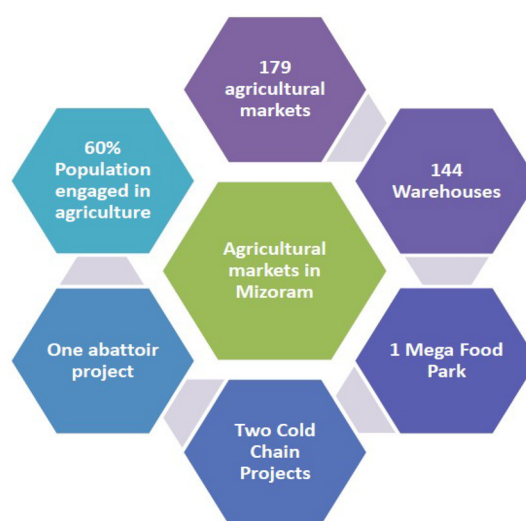


Fig. 1. Existing market scenario in Mizoram (World Food India, 2018, MOFPI).

shops for selling the herbal medicines/medicinal herbs (damdawi) in their local markets including their homes too.

Why cultivation of medicinal and aromatic plants are best in Mizoram

Considering the global production and availability of natural resources, India and China are the two major producing countries, covering 40% of the total global biodiversity and having of rare species, and there is no doubt to say as the home of medicinal and aromatic crops that constitute a segment of the flora, and provide raw materials to the pharmaceutical, cosmetic, fragrance, flavor. industries (Salmerón-Manzano *et al.* 2020).

With reference to Mizoram, Dr T. Janakiram, the Assistant Director General of Indian Council for Agriculture and Research (ICAR) highlighted that horticulture mission was successful in the state, and named as 'the Anthurium state'. Further he added that high quality seedlings and planting materials of vegetables and flowers should provide good agricultural practices (GAP) under Center of Excellence in the state (Business standard 2016). In addition to this, Dan Alluf, the Counsellor of the International Development Cooperation (Mashav), Science and

Table 1. Economics of the some important medicinal and aromatic plants (<https://www.indiamart.com/>; <https://www.alibaba.com/>; Kumar 2019).

Sl. No.	Plants Name	Parts used	Economics of their essential oils in market (in kg)
1	<i>Aloe vera</i> (Gwarpatha)	Leaves	30-75
2	<i>Ocimum sanctum</i> (Tulasi oil)	Leaves	3000-5000
3	<i>Mentha arvensis</i> (Mint oil)	Leaves	1500-3000
4	<i>Pogostemon cablin</i> (Patchouli oil)	Leaves	4000 -5000
5	<i>Artemisia pollens</i> (Artemisia oil)	Leaves	5000-9000
6	<i>Curcuma longa</i> (Turmeric oil)	Rhizomes and Leaves	1500-2000
7	<i>Zingiber officinale</i> (Ginger oil)	Rhizomes	4000-8000
8	Elsholtzia oil (Lengser in Mizo)	Leaves	3000-7000
9	<i>Homalomena aromatica</i> (Sugnadhmantri)	Rhizomes	28000-32000
10	<i>Rauvolfia serpentina</i> (Sarp Gandha)	Roots	300-700
11	<i>Withania somnifera</i> (Ashwagandha)	Roots	500-800
12	<i>Phyllanthus emblica</i> (Amla Powder)	Fruits	300-500
13	<i>Cymbopogon flexuosus</i> (Lemon grass oil)	Leaves	1500-2000
14	<i>Aquillaria agallocha</i> (Agarwood oil)	Stems	500000-1000000
15	<i>Vetiveria zizanioides</i> (Vetiver oil)	Roots	20000-25000
16	<i>Plantago ovata</i> (Isabgol husk)	Leaves	500
17	<i>Cinnamomum tamala</i> (Tejpata oil)	Leaves	1800-2000
18	<i>Cinnamomum verum</i> (Cinnamon oil)	Barks	2000-2500
19	<i>Tinospora cordifolia</i> (Giloy)	Stem and Leaves	22-70
20	<i>Centella asiatica</i> (Leaves)	Leaves	75-200
21	<i>Andrographis paniculata</i> (Kalmegh)	Leaves	21-75
22	<i>Alpinia galanga oil</i> (Siamese ginger)	Rhizomes	4000-5500
23	<i>Pelargonium graveolens</i> (Geranium oil)	Leaves	12000

Technology, Israel Embassy in Delhi also reflected the name of Mizoram in Indo-Israel partnership of agriculture and horticulture sector. Overall, they provided the idea as whole about potential of Mizoram state in field of Agriculture. They also suggested that the vegetables which are growing locally must be promoted, while good market linkage will be develop by addressing the constraints in transportation, labor

and water management with proper contingency plans (Business standard 2016).

In past few years, even the common peoples have also shown interest in the use of herbal medicines as compared to the synthetics. This is because of belief that, the natural products have inherently less side effects, economically cheaper and eco-friendly in nature (Kumar *et al.* 2012). Since, experts view also in favour of cultivation of agriculturally important crops in the state. Therefore, it's a high time to start cultivation of more suitable MAPs which are favourable to Mizoram and to bring the state in main line marketing. Some of the known MAPs and their commercial values are listed in Table 1.

Need to develop market channel

According to Anne *et al.* (2014), in the developed countries, agribusiness is defined as the total output arising from farm production and product processing at both pre and post farm gate levels. While, agribusiness sector incorporates four distinct sub-sectors such as agricultural inputs, agricultural production, agro-processing and marketing and trade or utility to the goods in developing countries like India. This is a measure difference which creates a huge gap not only the production even in the economics of the MAPs and other agribusiness in India. Currently, many cities followed a hub and spoke model and employed a large number of women to perform various operations in the supply chain because super markets use various channels to manage supplies (Chengappa *et al.* 2007). According to Singh *et al.* (2013) in many developing countries, MAPs are playing an increasingly important role in the subsistence economy of rural people. Their production, post-harvest handling and marketing have significantly contributed to increase their income in many rural areas, especially women. There are several opportunities exist to improve rural livelihoods by helping small-scale farmers organize to profitably produce MAPs on marginal lands in an environmentally sustainable manner while maintaining the biodiversity of these natural products. The same model should also require to adopt here in Mizoram. Beside these, it is also necessary to concentrate on the following points to develop the instant markets in the state.

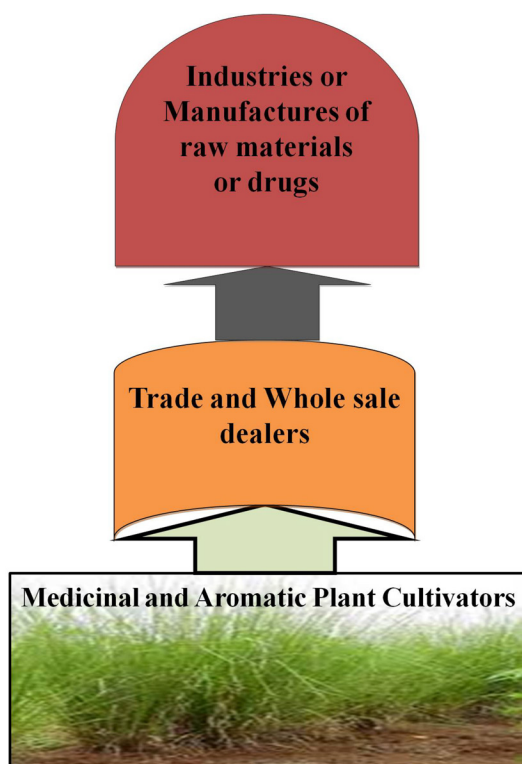


Fig. 2. Feasible model of MAPs marketing in Mizoram.

To develop a web portal for display of active constituents

Further developed profile of extracts/essential oils will be displayed on newly designed web portal like “Association of aromatic plants grower in Mizoram” for attraction of buyers. Because many of the grower

association now days following the same trend in the India. Most of them linked to web portal Bhuvan e-herbs like E-Charak developed by NMPB for direct marketing; even the buyers are not much worried about the quality of their essential oils as well as charges of middle man. Moreover, the success stories will be published in local News papers, Newsletters for promotion as well as distribution of MAPs cultivation.

To provide the market linkage with buyers/sellers

The state official including farmers groups leaders need to provide and negotiate with Buyer/Sellers/Manufacturers/Traders of MAPs of India. It has been observed that many Buyer/Sellers/Manufacturers/Traders personally come to visit the farmers land once the aromatic plants are ready for harvesting and give their valuable inputs for processing and marketing as well. In addition to that, the concern departments should provide the training program for farmers about markets and marketing information in their physical presence or electronically or through distance learning facilities.

In a place like Mizoram where the peoples especially farmers are very innocent, therefore the presence of middle man in the marketing will not be beneficial for the farmers. Thus, state should facilitate the farmers to stabilize the easiest way of a marketing channel for frequent marketing. The feasible model of marketing as per the need of the state is shown in the Fig. 2. Once, the model will be existed the selling of MAPs produce become more popular in the state (Kumar 2017).



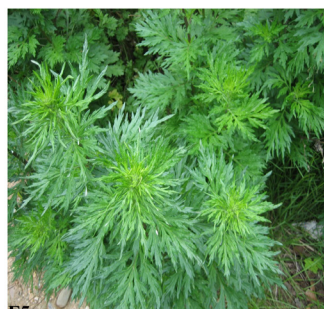
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Fig. 3. *Aloe vera*.

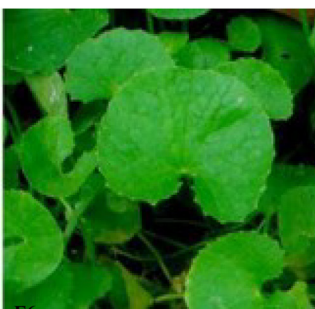


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Fig. 4. *Andrographis paniculata*.



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Fig. 5. *Artemisia pollens*. **Fig. 6.** *Centella asiatica*. **Fig. 7.** *Cinnamomum tamala*. **Fig. 8.** *Cinnamomum verum*.



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F12

Fig. 9. *Clerodendrum colebrookianum*. **Fig. 10.** *Costus speciosus*. **Fig. 11.** *Curcuma longa*. **Fig. 12.** *Cymbopogon flexuosus*.



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Fig. 13. *Elsholtzia communis*. **Fig. 14.** *Pelargonium graveolens*. **Fig. 15.** *Homalomena aromatic*. **Fig. 16.** *Mentha arvensis*.



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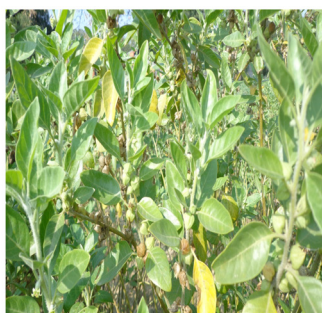


F20

Fig. 17. *Ocimum sanctum*. **Fig. 18.** *Pogostemon cablin*. **Fig. 19.** *Rouvolfia serpentina*. **Fig. 20.** *Stevia rebaudiana*.



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F23

Fig. 21. *Vetiveria zizanoidies*. Fig. 22. *Withania somenifera*. Fig. 23. *Zingiber officinale*.

What to cultivate

As per the geographical location of the state and having different agricultural zones within the state, there are many commercial known medicinal and aromatic plants can be introduce for cultivation such as *Aloe vera* (Fig.3), *Andrographis paniculata* (Fig.4), *Artemisia pollens* (Fig.5), *Centella asiatica* (Fig.6), *Cinnamomum tamala* (Fig.7), *Cinnamomum verum* (Fig.8), *Clerodendrum colebrookianum* (Fig.9), *Costus speciosus* (Fig.10), *Curcuma longa* (Fig.11), *Cymbopogon flexuosus* (Fig.12), *Elsholtzia communis* (Fig.13), *Pelargonium graveolens* (Fig.14), *Homalomena aromatica* (Fig.15), *Mentha arvensis* (Fig.16), *Ocimum sanctum* (Fig.17), *Pogostemon cabli* (Fig.18), *Rouvolfia serpentina* (Fig.19), *Stevia rebaudiana* (Fig.20), *Vetiveria zizanoidies* (Fig.21), *Withania somenifera* (Fig.22) and *Zingiber officinale* (Fig.23). The following figures will provide the clear ideas and it would also helps farmers and local herbal practioners to understand about plants morphology.

CONCLUSION

Some of the important points need to be followed on

urgent basis to explore all its agricultural potential to establish the agri-market in the state for generation of capacity building and livelihood (Singh and Vidyasagar 2015, Kumar 2017).

Map out the cultivated and wild species of medicinal and aromatic plants in the state. Also make the list of potential growers (Cultivators) and their agricultural lands to know the actual area for cultivation and production (small scale or large scale) of raw materials.

Formulate the specific and differential strategies and policies for survey, collection (harvesting) and identification (Documentation) of medicinal and aromatic plants in the state, their actual habitats and field studies for their conservation and regeneration.

State Government should focus on development more research centers for doing the extensive researches on ethnomedicine, and others recent experiments related to medicinal and aromatic plants for the promotion of advance researches.

Invite the industries like agri-industry, phar-

ma-industry and parallelly encourage the local vendors also to set up the micro industries to supply the quality of local raw materials of medicinal and aromatic plants which ultimately leads to form a market.

State Government should also provide the roads for transportation of the raw materials as well as finished products, manpower, and other subsidies like electric charges and water supply.

Introduce some known medicinal and aromatic plants as per the different climatic and edaphic conditions of the state, and also provide the cultivation practices to the growers. Need to emphasise on mixed cultivation.

Start to educate the farmers (i.e., farmers education) with help of academicians, scientists (Agri Deptt, Horti Deptt, and KVKs) and industries professionals about cultivation of crops, their market value, their harvesting as well as post-harvest practices.

In addition to this, it also compulsory to aware and trend them to run the mobile apps for acquiring the agricultural technologies and to sell their products (e-marketing or online marketing).

Provide the interest free loans for the primary level farmers (income <Rs 50000/year) and low interest rate loans for established farmers (income >Rs 50000/year) for preparation of land, cultivation of MAPs and to setup the small scale processing cum production units.

On the basis of above points its concluded that, Mizoram is a totally hilly terrain state having tremendous potential for the development of small and medium level entrepreneur in MAPs sector. It has good geographical condition to cultivate commercially demanding MAPs. Currently, in global market the demand of essential oils and raw materials are highly valuable. In this case the state can initiate to establish good cultivation practices for the Lemon grass, Citronella, Patchouli, Vetiver, Tejpata, Cinnamon, Mentha, Sugandhmantri, Ginger, Turmeric, Alpinia, Aloe, Andrographis, Cleodendrum, Costus, Giloy, Geranium, Rose. Other wildy available medicinal plants can be protected by the Government to utilize

sustainably for future use. The problem arises due to wrong cultivation practices and unscientifically collection of wild medicinal plants from forest. If the state Government can able to protect the forest flora, that can be a good asset for the state for developing the entrepreneur for livelihood of peoples. In case of endangered and endemic species the conservation protocols must be start immediately; because due to over utilization of these plants they becoming vulnerable. Ultimately, it will be a big loss for the state in coming era, where worldwide the peoples have hope from plants only.

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