HortFlora Research Spectrum
Vol. 7, Issue 1; 24-32 (March 2018)
www.hortflorajournal.com
ISSN: 2250-2823
NAAS Rating : 3.78

PROSPECTS AND RETROSPECT FOR PROMOTION OF MAPs CULTIVATION IN BIHAR

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ABSTRACT : Medicinal and Aromatic plants (MAPs) contribute significantly to rural economy and health security of the country. More than 90% of the formulations under the Indian systems of medicine contain plant-based raw materials. India exports herbal materials and medicines to the tune of nearly 600 corers annually and herbal based drug industry in the country is valued more than 4000 corers annually. In Bihar, area under MAP cultivation is 2600 ha only which is far below the national average. Thus, the status of Medicinal and Aromatic Plants cultivation is still negligible in Bihar. Though commercial cultivation of *Mentha* and *Lemon grass* are picking up in the state but still a lot of efforts are required to observe the real impacts of MAPs cultivation. Presently, Medicinal and aromatic plants (MAPs) are increasingly perceived as diversification crops in Indian agriculture. Development of suitable agronomic practices for MAPs is crucial to convert these plants into economically viable components in existing cropping systems of Bihar. Therefore, it is necessary for individual state to develop agro-technologies for medicinal plants and motivate farmers towards profitable cultivation of MAP crops for their livelihood security.

Keywords : *MAPs, status, prospects, retrospect, promotion.*

Medicinal Aromatic Plants (MAPs) can be defined as botanicals that provide people with medicines to prevent disease, maintain health or cure ailments. Medicinal Aromatic Plants (MAPs) are an integral component of many local trade supply chains. They are part of traditional medicine systems found in numerous local communities around the world, and comprise a wide range of species which have different sources, characteristics and uses. Since time immemorial, Medicinal and Aromatic plants occupied an important position in the socio-cultural, spiritual and medicinal arena of rural people of India. Their sustainable management and harvesting can conserve biodiversity, sustain human and environmental health. The cultivation of MAP crops provides sustainable means of natural source of high value industrial raw material for pharmaceutical, agro-chemical, food and cosmetic industries and opens up new possibilities for higher level of gains for farmer with a significant scope for progress in rural economy. The Medicinal Plant Specialist Group of the World Conservation Union (IUCN) predicts that at least 15000 plant species used in herbal products could be threatened. An estimated 40,0000 tones of MAPs are traded annually and more than 70 percent of the plant species used in herbal medicines cosmetics, and other plant-based products are harvested from the wild, and the demand for them is globally increasing (Leaman, 6).

Article's History:
Received: 17-02-2018 ***Accepted: 12-03-2018***

The demand for medicinal plants in India, to meet both domestic and export market, comprising of 162 species, is expected to increase at about 15 to 16% between 2002 and 2005 (CRPA, 5). Despite being a major player, the share of India in global trade of MAPs is merely 0.5 per cent, It is estimated that India exports herbal materials and medicines to the tune of nearly 600 corers annually (Anon, 1) whereas the countries, like China exports plants and raw drugs, therapeutics and other MAPs worth ₹ 18,000 corers annually (Singh, 8). In the country, medicinal plants and aromatic plants are cultivated over more than 1.10 lakh ha and 2 lakh ha, respectively. India has one of the richest sources of many kinds of MAPs but it has achieved only a limited success in tapping the potentials of these plants because of low level of awareness not only among the farmers of Bihar but also framers of whole country about the economic potential and returns (Singh, 9) from these plants.

Current status of MAPs cultivation in Bihar:

Medicinal Aromatic Plants (MAPs) play a valuable and important role in economic, social, cultural and ecological aspects of local communities of the Bihar. Medicinal Aromatic Plants (MAPs) grow in almost all terrestrial and some aquatic ecosystems around the world. However, increasing demand on plants and their habitats are threatening. In Bihar, total gross cropped area is 84.04 lakh ha. Out of which, Medicinal and Aromatic Plants were cultivated only on 2600 ha area

and about 43.0% area is rain-fed as well as 4.36% lands are remains barren and non-cultivable which can be utilized for MAPs cultivation. Commercially, *Mentha* and *Lemon grass* have emerged as the major players and shared more than 95% total area and production of MAPs in the state. Thus, the status of medicinal and aromatic plants in Bihar is still negligible. Commercial cultivation of some of the species of MAPs (*Mentha* and *Lemon grass*) are picking up in the state but still a lot of efforts are required to observe the real impacts of their cultivation. Impetus in terms of planning, funding, production, processing, and strong market linkage is essential to harness the potentials of commercial production of MAPs.

The problems related to medicinal and aromatic crops are lack of location specific research related to these medicinal and aromatics crops suited to the soil and climate of different agro-climatic conditions of the Bihar. Therefore, ample opportunities exist in the state for generation of scientific data on various good agricultural practices (GAPs) aspects for MAPs cultivation. Also, all efforts have still been made to assess the area being cultivated and understand their economics of cultivation as preferred by the farmers. Thus, systematic cultivation of high value medicinal and aromatic plants under prevailing agro ecological condition is one of the sincere efforts in the direction of sustainable development. A detail of area and production of various MAPs cultivated in Bihar is given in Table. 1.

Table 1: Area and production of various MAPs cultivation in Bihar

Medicinal Plants	Area (ha)	Production (tons)
Lemon Grass	185.00	25.90
Java Citronella	38.00	4.75
Mentha	2100.00	252.00
Palma Rosa	20.00	2.00
Tulsi	32.00	3.20
faultJama Rosa / CN – 5	35.00	5.25
Safed Musli	16.00	24.0
Kalmegh	15.00	45.0
Sarpgandha	12.00	19.2
Shatawar	17.00	127.50
Buch	6.00	19.20
Jatropha	29.00	145.00
Others	95.00	-
Total	**2600**	

(Source : Anon, 2)

Prospects due to Potentiality of MAPs cultivation in Bihar:

Being located in the middle Gangetic plain region, there is scope of multiplication of precious plant genetic resource for utilization of raw genetic material for drug development and Biotechnology Industry. A rough estimate shows that cultivation of medicinal plant in Bihar is expanding in 2600 hectare (Anon, 2). Among all the species of medicinal plant, Mentha and Lemongrass have major share about more than 95% of the total area in the state. Almost in all the 38 districts of the state Herbal plants are growing out of in which district like Bhojpur, Saharsa, Begusarai, Buxar, Kaimur and Nalanda have given the best result. Govt.of Bihar had given assurance about 50% subsidies on the production of Sarpgandha, Chitrak and Kalihari, Bael while 75% subsidy on Guggul (Anon, 2).

As far as income generation from the production of MAPs are concern, Chanchal (4), cited many example regarding economics of MAPs cultivation. For examples, cost of Mentha cultivation was 20,500 ₹/ha while gross income was ₹ 33,750 and net income was ₹ 15,50/ha. Similarly gross income derived from the production of Lemongrass was ₹ 42,000/ha and net income ₹ 19,500/ha and production cost was ₹ 22,500 per ha. At the same time, production cost of Tulsi was ₹ 11,500/ha and gross income and net income were ₹ 20,000 and ₹ 8,500/ha, respectively. However, the situation is somewhat different in the production of Shatawar because its cost of cultivation was 25000 ₹/ha and its gross income was 50,000 per ha while the net income was ₹ 25,000 per ha. Therefore, we can say that there is wide scope of increasing production of medicinal plant in Bihar towards achieving the goal of doubling farmers income.

Medicinal and aromatic plants (MAPs) are increasingly perceived as diversification crops in Indian agriculture. Development of suitable agronomic practices for MAPs is crucial to convert these plants into economically viable components in existing cropping systems (Rao, 7)

Inter-cropping enhance yield per unit area and the total income from the produce. Commercially viable herbs with the cultivation of food crops have the potential to manifold the returns. Some of the viable options available are Mint-sugarcane, Ashwagandha-sugarcane, Safed Musli- rabi leguminous crops, pulse (lentil, chickpea and field pea) in Java citronella.

Accommodation of Medicinal and Aromatic plant species in traditional rotations has a good scope to improve the farm income as bonus crop. Rice-Wheat

cropping system is dominant in all the three agro climatic-zones. Introduction of mediculture and agriculture in the state is thus, expected to generate commensurate economic change in the state. Preliminary experiments reveal that cultivation of mint after the main rabi crops such as wheat, potato, tori, gram etc. is profitable and the area under the cultivation is extending. Some other mint based rotations are: Paddy-potato mint, Paddy-mint, paddy-mustard-mint, Ocimum-potato-mint, Maize-potato-mint, Late paddy-pea-mint, Arhar-mint and Mint-methi and mint potato

Prospects of increasing production in Bihar can be justified with following reasons :

(i) Agro-climatic condition in the state is favorable

(ii) Use of plant as drug is quite common among rural masses from generation to generation here by rural physicians, bone-setters etc

(iii) Availability of manpower is quite common feature here about 10-15 lakh labour-force migrates every year.

(iv) In developed countries, the cost of production is high while in the state it is 1/3.

(v) Govt. is also encouraging and providing fund for the growth of this sector

(vi) Innovative nature of farmers forced them to discover new herbs as they avoid going to physician and adopting modern medicine.

(vii) About 4.36% land share barren and non-cultivated which can be used for the production of herbs and medicinal plants.

(viii) Within the state about 57% of 84.04 lakh ha. of gross cropped area is irrigated and the rest 43% is rain-fed cultivation of medicinal plant can be in rain-fed area.

Retrospect for promotion of MAPs cultivation in Bihar

A huge area is available to the farmers of the state as fallow land or waste land which can be utilized for production of aromatic crops. MAPs cultivation offer several opportunities in rural areas towards crop diversification to fetch the maximum income to the poor farmers engaged in growing less profitable crops, generate employment which may check the migration problem and enhance income through value addition at every stage for livelihood security of the rural communities in the future. Aromatic crops can be grown easily with the life span of more than one year. Hence the planting of crop is not required every year, so farmers may adopt this technology easily by going through following opportunities:

(A) Agri-entrepreneurship opportunities

(B) Global marketing opportunities

(C) Outsourcing Possibilities

(A) Agri-entrepreneurship opportunities: MAPs offer several opportunities towards developing agri-entrepreneurship. Some of these are enumerated as under:

1. The farmer's holding small land can grow these crops in rotation or as intercrop with cereals or vegetable crops to enhance per unit area return. Some of the MAPs are also suitable for cultivation in degraded salt-affected soils, stressed conditions and as under crops in orchards thus ensuring optimal use of the available land and other resources to the economic advantage of the growers.
2. Putting up of the processing facilities in the aromatic plants growing areas is another income generating opportunity for a farmer who can extend the facility to the fellow growers.
3. Production of truthfully labeled seeds and progules in collaboration with the research organizations can open new avenues in the area where possibilities of MAPs cultivation are gaining momentum.
4. Companies or industries requiring quality raw material of MAPs in bulk are now coming forward to join hands with the research organizations for acquiring knowhow for cultivation and promoting the MAPs cultivation through contractual cultivation.
5. Providing technical guidance and consultancy to the farmers by the qualified entrepreneurs and establishing testing facilities and agri-clinics are some of the important areas of emerging opportunities in this sector. Agriculture and horticulture department's recent initiatives in developing scientifically trained human resource through various regular farmers-scientist interaction programmes are likely to make a visible impact in this regard.
6. Establishing GMP compliant processing, manufacturing and value addition facilities are some of the high-tech areas requiring attention in the near future to capture the global business opportunities.
7. It would not be out of place to mention that with the innovation in production, processing, value addition and marketing, several new opportunities are bound to emerge which can place India on the front line in the global arena

(B) Global marketing opportunities : Export opportunities of natural products are tremendous, as the world is looking towards natural sources for the purposes of therapeutic use as well as nutritional dietary supplements. The global herbal remedies market can be classified into five strategic areas:

1. **Phyto-Pharmaceuticals :** The plant based drugs containing isolated pure active compounds used to treat diseases.
2. **Medicinal Botanicals / Dietary Supplements:** The whole plant or plant-part extracts used for maintenance of health by affecting a body structure and its function.
3. **Nutraceuticals:** The food containing supplements from natural (botanical) sources, that deliver a specific health benefit, including prevention and treatment of disease.
4. **Cosmeceuticals:** The cosmetic products which contain biologically active ingredients having an effect on the user and
5. **Herbal raw material**

(C) Possibilities for Outsourcing : With the increase in demand of quality material for pharma, perfumery and flavour industries the research and development activities in MAPs have found place in the mandate of several research institutes, government organizations and promotional agencies (CSIR, ICAR, NMPB, DBT, DST, ICMR, etc.), state and central agriculture universities and even in private sector. Central institute of Medicinal and Aromatic Plants (CIMAP), a pioneer institute of CSIR, has exclusive mandate for R and D in MAPs contributing significantly to the overall development of these in the country for the last about five decades. These organization / institutes can be contacted for outsourcing of improved knowhow for cultivation (agro technology), quality planting material, training, processing technology, quality testing, literature and other available services. It is always essential to have marketing tie -ups in order to avoid financial loss and the institute like CIMAP can help the growers to forge linkage with buyers/ industries in some selected MAPs depending upon their requirement and market demand. For seeking financial assistance, schemes and subsidies, the growers and processors can approach National Bank for Agriculture and Rural Development (NABARD) and other nationalized banks, National Horticulture Mission (NHM) and state horticulture mission for funding and promotion of MAPs cultivation in Bihar.

Existing infrastructure facilities for promotion of MAPs cultivation

1. **Nurseries :** There are 17 departmental progeny nurseries each having 10 hectares of land. Besides there are 233 block nurseries situated adjacent to block head quarter with 0.8 ha area. As the establishment of block nurseries is very old which need to be rejuvenated in all aspects. Apart from the departmental nurseries, Agriculture University has four progeny nurseries located at DRCAU, Pusa, BAU, Sabour, ARI, Patna and BRC, Islampur
2. **Training Centres :** Two training centres have been established at Dr. Rajendra Prasad Central Agricultural University, Pusa and other at Bihar Agricultural University, Sabour for Mali and supervisor's training. At present these two training centres have been functioning. Two new training centres one at Agwanpur (Saharsa) and other at College of Horticulture, Noorsarai are being proposed during 2010-11.
3. **Market Information System :** People are getting different kinds of direct and indirect benefits from the MAPs cultivation that they use for their own consumption as well as commercial utilization. The role of marketing information system is to create effective linkages between resource managers, collectors, processors and end users. Marketing study helps in understanding:
   i. Market opportunity in the form of market needs and demands analyze competition.
   ii. Develop appropriate strategies and approaches to reach identified market.
   iii. To ensure profitable income.

4. National and State Horticulture Mission : The launching of National Horticulture Mission has come as an opportunity for the state to develop concentrated pockets of plantation, rejuvenation of MAP crops and creation of post harvest and marketing infrastructure. Accordingly, concentrated pockets of major MAPs crops have been identified in clusters (Table 2 and 3). Bihar Government has given subsidy amount once in three years under state horticulture mission for promotion of MAP cultivation in a cluster way. Each cluster contain group of 5 farmers of 3 village having at least 2.0 ha land/ cluster.

Table 2 : MAP crops suitable for different Agro-climatic Zones of Bihar

Agro climatic zone	District	Medicinal crops
Agro-climatic Zone I (Soil is mostly calcareous or sandy loam and loam, Average rainfall is 1040-1050 mms)	West-Champaran, East Champaran, Siwan, Saran, Sitamarhi, Sheohar, Muzaffarpur, Vaishali, Madhubani, Darbhanga,Samastipur, Gopalganj and Begusarai	Buch, Kilmegh, Shatawar, Artimisia, Shwet musli, Amla, Tulsi, Stevia, Ashwagandha, Sarpgandha, Kalihari, Mint and Cybopogan spp.
Agro-climatic Zone II (Soil is mostly loam and clay loam. Here average rainfall is from 1200-1700 mms).	Purnea, Katihar, saharsa, Supaul, Madhepura, Khagaria, Araria and Kishanganj	Buch, Artimisia, Tulsi, Pippli, Patherchur, Mint and Cybopogan spp.
Agro-climatic Zone III A and III B (Soil is sandy loam, clay loam, loam and clay. This zone receives annual rainfall around 990-1300 mms).	Rohtas, Bhojpur, Buxer, Bhabhua, Arwal, Patna, Nalanda, Nawada, Shekhpura, Jahanabad, Aurangabad, Gaya, Munger, Bhagalpur, Banka, Jamui and Lakhisari	Buch, Ghrit kumari, Kalmegh, Shatawar, Brahmi, Artimisia, Ratalu, Amla, Gudmar, Tulsi, Stevia, Ashwagandha, Tejpat Dalchini, Patherchur, Bael, Sarpgandha, Chitrak, Kalihari, Gugal, Mint & Cybopogan spp.

(Source: Anon., 2.)

Table 3 : MAP Crops identified for different district of Bihar

S.No	District	Identified MAP
1.	W.Champaran, E.Champaran, Samastipur, Darbhanga, Purnea, Katihar, Saharsa, Supaul, Madhubani, Rohtas, Bhojpur, Kaimur, Bhagalpur	Buch
2.	Rohtas, Bhojpur, Buxor, Kaimur, Patna, Nawada,Shekhpura, Aurangabad, Gaya, Jamui, Lakhisarai	Ghrit kumara
3.	Siwan, Saran, Sitamarhi, Muzffarpur, Vaishali, Gopalganj, Rohtas, Buxor, Kaimur, Nawada, Aurangabad	Kalmegh
4.	East & West Champaran, Saran, Muzffarpur, Vaishali, Samastipur,	Shatawar
5	Bhojpur, Patna	Brahmi
6	Buxar, Gaya	Punarnava
7.	East Champaran, Muzffarpur, Vaishali, Samastipur, Begusarai	Safed musli
8.	Samastpur, Gopalganj, Begusarai, Khgaria, Bhojpur, Buxor, Patna,	Artemisia
9.	Saran, Siwan, Rohtas, Buxor, Kaimur	Amla
10	Rohtas, Buxor, Gaya	Gudmar
11	Samastipur, Begusarai, Khagria, Nawada, Buxor	Tulsi
13.	Purnea, Saharsa, Supol, Madhbani	Pippli
14	Gopalganj, Patna, Nawada	Stevia
15.	Siwan, Saran, Nalanda, Nawada	Ashwagandha
16.	Rohtas, Buxor, Kaimur, Nawada, Aurangabad, Munger, Bhagalpur, Banka, Jamui, Lakhisarai	Cynomonum spp.
17.	Katihar, Saharsa, Rohtas, Buxor, Kaimur, Nalanda	Patherchur
18.	Samastipur, Vaishali, Darbhanga, Muzaffarpur, Khagaria, Madhubani, Begusarai, Nalanda and Nawada	Betelvine

(Source: Anon., 2 and 3)

Strategy adopted for promotion of MAPs cultivation in Bihar

1. Holistic approach
2. Visioning and preparing road map
3. Training strategy and communication strategy
4. Community oriented group based approach
5. Grading and storage facilities
6. Technology intervention for MAPs and betelvine cultivation
7. Marketing Network and Market Development
8. Strategy towards Protection of Magahi Pan under GI act
9. Inclusion of Magahi Pan under “organic corridor” `scheme
10. Exposing stories of successful farmers towards motivation of other farmers

1. Holistic approach

National Horticulture Mission (NHM) is being implemented in Bihar to promote holistic approach of the horticulture sector covering medicinal, aromatic plants and betelvine including fruits and vegetable crops

2. Visioning and preparing road map

Agriculture Road Map of Bihar was prepared for development of MAPs cultivation towards right direction in mission mode. Govt. of India, need based components of particular districts in cluster approach, has been selected.

i. Seed production programme in Public Sector and Private Sector, has been prepared and is being implemented.

ii. Quality planting material of MAPs crops will be made available for for promotion of MAPs

cultivation both through the public sector as well as private sector participation.

iii. Area expansion and enhancement of production and productivity of MAPs crops have been planned and is strategically being followed.

3. Training strategy and communication strategy:

State Horticulture extension machinery as well as private sector extension agency will arrange travelling programme for the departmental officers as well as the farmer at state / district / block level on different aspects of NHM. Training of Horticultural Officers, Supervisors and Gardeners have been conducted at Dr. Rajendra Prasad Central Agricultural University, Pusa and Bihar Agricultural University, Sabour and its Stations (AICRP on MAPB Islampur centre). Apart from these training programmes, selected farmers from different districts are being sent outside the state for their specialized visit cum training at places of repute for MAPs crops.

4. Community oriented group based approach

Community Oriented group based approach will be followed for achieving the target. For achieving this, the private sector will be encouraged through contact farming arrangement. The state machinery as well as the private sector through contact arrangements will have a role in extension, supply of quality planting material and provision of technical support services.

5. Grading and storage facilities

Development of proper grading and storage facilities ensures maximum returns. Improvement of the supply chain, facilities for sorting/ grading/packaging/storage and transportation will be promoted. Provision will be made for development of collection centers and transportation to local /distant market. Asian Development Bank sponsored comprehensive project is designed to strengthen the agri-business infrastructure which was is under progress. This project envisages creating marketing infrastructure and cold chain for MAPs including other horticultural crops.

6. Marketing Network and Market Development

Development of market linkages through promotion of a chain of marketing operator viz. consolidators, traders, and commission agents will be attempted. For this purpose, necessary regulatory frame work will be put in place through amendment of APMC Act so that value chain is maintained. The marketing channels in MAPs are are as follows:

1.	Growers/cultivators	⇒	Agents of oil or raw products purchasers	⇒	Traders/ wholesaler	⇒	Manufacturers
2.	Growers/cultivators	⇒	Traders/ wholesaler/ Agents	⇒	Manufacturers		
3.	Growers/cultivators	⇒	Manufacturers				

10. Exposing stories of successful farmers towards m motivation of other farmers:

Directorate of extension education, Bihar Agricultural University, Sabour, Bhagalpur has compiled successful story of farmers in the form of publication entitled “Success Stories: A KVK farmer imitative for growth”. In this book, success story of MAPs farmers were also given and highlighted their work. This will definitely serve the purpose of exposing successful farmers for the benefit of other farmers towards motivation and adoption of MAPs cultivation as a source of inspiration. The list of some successful MAPs farmers is given in Table 4 and traders in Table 5.

Problems that hinders promotion of MAPs cultivation

1. Non availability of suitable and adequate planting material at the right time severely constrains the adoption by farmers of these crops. More nurseries in different parts of the State need to be developed to make planting material easily available to farmers.
2. Lack of adequate number of analytical laboratories capable of handling detailed analysis are not easily available.
3. Lack of knowledge on these issues such as, better method of harvesting, storage, Grading has been an important constraining factor that limits in realizing the returns from MAPs cultivation.
4. Does not appear to be much coordination amongst different institutions (State and Central institutions and research centres) as a result of which there are some overlaps and duplication of efforts on the part of these agencies.
5. An authentic data base in respect of medicinal and aromatic plants is not available in Bihar. The current agricultural statistics collection in the State is confined only to the major field crops and few horticulture crops.
6. There appears to be little or no direct contacts between collectors / cultivators and processors/ final consumers. This is in large part attributed to

Table 4 : List of MAPs growers in Bihar

Sl. No.	Name of Company/ Farmer	Address	Contact No./ Mb. No.	Crops
1.	Sri Narmadeshwar Mishra	Vill- Chanda, P.O-Mainpura, Block- Kaler , Dist- Arwal	09835988939	Lemongrass, Mentha, Tulsi and Citronela
2.	Sri Jitendra Kumar Kushwaha	Vill- Danasar, Block- Jalalgarh, Dist- Purnea	086511362509	Palmarosa, Mentha, Stevia, Sarpgandha, Aloevera
3.	Sri Neeraj Sahu	Vill- Sahu parvatta, Block- Naugachia, Dist- Bhagalpur	09430457003	Medicinal Plants
4.	Sri Gyaneshwari Bariyat	Vill. & P.O. Karjain, Block- Raghopur, Dist. Supoal	09430586940	Lemongrass
5.	Dr. Jyoti Kumar Bharti	Vill. & P.O. Kadirganj, Dist. Nawada-805104		Medicinal Plants
6.	Fragrance Herbs	302-B, Third Floor, Sukriti Complex, S.P. Verma Rd, Patna-800001	0612-2238254	Medicinal Plants
7.	Sustainable Agro Research Dev. Association	Ramsahay Lane, Mahendru, Patna-800006	0612-3127084	Medicinal Plants
8.	Sri Laxmichand Prasad	Vill- Baurisarai, Nalanda, Bihar	8407823236	Betelvine
9.	Sri Ranjeet Chaurasia	Vill- Dhebri, Nawada, Bihar	9430056949	Betelvine
10.	Girendra Narayan Sharma	Bihta , Dist. Patna	9934265784	Medicinal Plants
11.	Kaushal Singh	Vill- Bishunpura P.O.- Bishunpura Dumariya P.S.- Koelwar District- Bhojpur, Bihar-801314	9234219290	Satawar, Tulsi, Aloevera, Safed Musli, Lemongrass, Ashwagandha etc.
12.	Ajawan Narayan Singh	Vill- Mahakampur, P.O: Bishunpura Dumariya Dist- Bhojpur, Bihar-801314	8873149534	Satawar, Tulsi, Lemongrass etc.
13.	Murari Singh	Vill- Bishunpura P.O: Bishunpura Dumariya Dist- Bhojpur, Bihar-801314	9472813211	Satawar, Tulsi, Aloevera, Safed Musli

lack of knowledge and awareness about markets with no institutional arrangement available to bridge this information gap. Generally traders or their representatives, visiting local areas are the only source of market information available to these people. Lack of availability and access of market information is thus an important factor constraining improvement of returns to producers of medicinal and aromatic plants.

7. The processing of medicinal and aromatic plants is generally done in either one or two stages. The first stage is semi-processing while the second stage is conversion in to formulations. While conversion in to formulations requires appropriate infrastructure facilities and technical knowhow and may be beyond the reach of an ordinary farmer,
8. Unorganized market channels have lead to monopoly of few individuals and industries controlling and dictating the market and depriving the farmers of a more remunerative price for his produce.

Suggestive measures for promotion of MAPs cultivation:

1. As a first step this would require identification of those species which are under more serious threat of extinction and which are in relatively greater demand than the others both in the domestic market and for international trade.
2. Research priority in the first instance should focus efforts in developing suitable planting material and associated package of practices for cultivation of such species.
3. Systematic cultivation of medicinal and aromatic plants need specie-specific and location specific cultural practices, depending on prevailing soil, water and climatic conditions at a given location. Hence research and development work and cultivation techniques have to be tailored keeping these in view, though efforts need to be made towards standardization of cultivation practices and harvesting times to get the desired quality of medicinal and aromatic plants
4. While developing cultivated varieties, efforts need to be made towards genetic enhancement of at

Table 5 : List of traders in medicinal plants from Bihar.

S. No.	Name of traders/	Address	Contact No.
1.	Herbal Industries	Rajju Sah Lane, Ramna, Muzaffarpur-842002	0621-2240723
2.	Kalyani Chemicals	Kahalgaon, PB 18, Bhagalpur, Bihar-813203	06429-222279
3.	Shree Baidyanath Ayurved Bhawan Pvt. Ltd.	Baidyanath Bhawan Rd, Patna-800001	0612-2353647
4.	Tirupati Traders	Dankbanglow Compound, Raxaul, Champaran (E)	06255-224240
5.	Aditya & Brothers	Maroofganj, Patna City, Patna-800008	612-2643422
6.	Ankit Stores	Marufganj, Tel. Patti, Patna City, Patna-800008	612-2644486
7.	B.C. Agrawal & Co.	Maroof Ganj, Patna City, Patna-800008	612-2616632
8.	Fragrance Herbs	302-B, Sukriti Compex, S.P. Verma Rd, Patna-800001	612-2238254
9.	Girivar Gaurav	Maroof Ganj, Patna City, Patna-800008	612-2641701
10.	Hari Shankar Prasad Krishnamohan Prasad	Maroof Ganj, Patna City, Patna-800008	612-2617062
11.	Jai Prakash Jaiswal	Maroof Ganj, Patna City, Patna-800008	612-2617772
12.	Aditya & Brothers	Maroofganj, Patna City, Patna-800008	612-2643422
13.	Kamla Kirana Company	Maroof Ganj, Patna City, Patna-800008	612-2640591
14.	Laxminarayan Sharwankumar	Maroof Ganj, Patna City, Patna-800008	612-2641502
15.	Sustainable Agro Research Development Association	Ramsahay Lane, Mahendru, Patna-800006	612-3127084

least some of these species, as compared to that of species found in the wild, by different methods of breeding including through traditional genetic transformation and use of biotechnology. The efforts of different agencies involved in the development of these plants need to be better coordinated and closely integrated

5. Non availability of suitable and adequate planting material at the right time severely constrains the adoption by farmers of these crops. More nurseries in different parts of the State need to be developed to make planting material easily available to farmers.
6. Widespread field demonstrations of species developed for cultivation will motivate the farmers to adopt cultivation of medicinal and aromatic plants. Some of the improved production technologies developed at research stations have not been transferred to the field to the required extent due to lack of sufficient extension personnel and infrastructure. More efforts need to be invested in this direction
7. There is a need for setting up a network of regional analytical labs to facilitate the analysis of the constituents of the medicinal plants so that quality certification could be done. This will help build buyer's confidence and encourage farmers to go in for cultivation of medicinal and aromatic plants. Some of the labs could be authorized to issue certification as a means of building buyer confidence as also for product standardization.
8. If appropriate cultivation practices are developed and the crop economics is favorable, efforts can also be made to popularize cultivation of medicinal & aromatic plants in green houses as well as inter-crops
9. There is a need for capacity building of farmers and extension workers so that returns from cultivation can be improved.
10. There is a need for an added interaction and coordination between national and international MAP research institutions and marketing and processing agencies so that a proper market feedback could be obtained and research efforts could be prioritized accordingly
11. Database pertaining to area and production of medicinal and aromatic plants need to be developed. In addition, there is also a need for creating a data base on such variables as species wise demand, supply, end users etc.
12. There is a need to set up a market intelligence unit to regularly collects, analyze and widely disseminate latest and reliable information relating to markets, marketing channels, prices, trade including imports and exports and make this information available to all concerned in a timely fashion.
13. In addition, to meet the domestic as well as international quality standards, post harvest marketing operations e.g., harvesting, grading and standardization, system of certification,

packing and transportation need to be improved. For international regulations it may also be necessary to have ISO systems of certification.

14. Efforts thus need to be made to encourage semi processing of these crops by encouraging setting up of diversified small scale enterprises/ cottage industries in remote and far-flung areas either through formation of cooperatives or through encouragement of small private entrepreneurs. This will also help in reducing the transportation and packing costs of raw materials and also provide additional employment to local people
15. To promote large scale cultivation of these crops, the state would have to intervene either through formation of farmers marketing cooperatives or promoting contract farming under a legally binding enforceable contracts and monitored by a regulatory authority.

CONCLUSION

Though commercial cultivation of some of the species of MAPs are picking up in the state but still a lot of efforts are required to observe the real impacts of their cultivation. Impetus in terms of funding towards research, extension, production, processing, and strong market linkage is essential to harness the potentials of commercial production of MAPs in Bihar. Cultivation of medicinal and aromatic crops need to be promoted not only to conserve the fast extinction species found in the wild but also to meet the ever growing demand for consumption of these plants both within the state and country as well as from abroad. Encouraging cultivation of MAPs crops require concurrent policies and effective actions aimed at regulating collection of medicinal plants from wild; research, development and extension efforts aimed at developing newer plant varieties suitable for cultivation and their propagation and adoption by farmers; organizing effective post harvesting marketing and trade operations including their processing and exports and developing an efficient marketing infrastructure, and building an efficient information

The trade is currently non transparent, inefficient, imperfect, informal and opportunistic and often carried out in a hush-hush manner. As a result the farmers are able to realize only a very small fraction of the price paid by the ultimate consumer of final product resulting in lower crop profitability and not providing enough incentive to the farmers to go in for its cultivation. Policy intervention aimed at promoting cultivation of medicinal and aromatic plants has thus to consider marketing as a major component base, including marketing intelligence, and its proper and timely dissemination

ACKNOWLEDGEMENT

We acknowledge the Directorate of Medicinal and Aromatic Plants Research, Anand, Gujarat and Directorate of Research, Bihar Agricultural University, Sabour (Bhagalpur) for his insightful comments and co-ordination towards preparation of this review paper.

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Citation : Das S., Pandey A.K. and Kumar P. (2018). Prospects and retrospect for promotion of MAPs cultivation in Bihar. *HortFlora Res. Spectrum,* **7**(1) : 24-32.