Medicinal and Aromatic Plants for Enhancing Farm Income: The Case of Bihar

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Abstract

The MAPs provide opportunities for developing a variety of safe and cost effective, prophylactic, and curative medicines for a number of maladies. It is estimated that the primary health care of over 80 per cent of the world's population still depends on plant based traditional medicines (WHO, 2002). Growing consciousness about health and side effects of modern medicines has again set the stage for innovation and use of herbal medicines. Evidence shows that the total domestic potential for crude drugs and oil extracts in India is worth Rs 3 billion, of which the requirements of over-the-counter products. Realizing the vast untapped potentials of MAPs and impediments in their development. ATMA has follwoed a systematic approach while taking MAPs for pilot testing. It made assessement about the local conditions and requirements, and demand for MAPs; strengthened capacity by traing various stakeholders; played role in supporting individuals and institutions; developed relevant literature in local language; emphasized on group approach by organizing the growers; encouraged cultivation through the organized sector with linking the unorganized farmers; and evolved a pricing mechanism with buy back arrangement with partner industry under public-private partnership(PPP). The present study tries to outline some of the steps taken to promote MAPs in Bihar for better income to the farmers.

Key words: Medicinal plants, Aromatic plants, Farm income, Bihar

Introduction

The history of cultivation and use of medicinal and aromatic plants (MAPs) in India is quite ancient. In one way or other, many of these plants have been an integral part of Indian health and livelihood systems. The MAPs provide opportunities for developing a variety of safe and cost effective, prophylactic, and curative medicines for a number of maladies. It is estimated that the primary health care of over 80 per cent of the world's population still depends on plant based traditional medicines (WHO, 2002). Growing consciousness about health and side effects of modern medicines has again set the stage for innovation and use of herbal medicines. The global market for herbal products is continuously expanding and it is expected to touch the mark of US$ 5 trillion by the year

2050, from the US$ 62 billion in 2004 (Purohit and Vyas, 2004). Despite being a major player, the share of India in global trade of MAPs is merely 0.5 per cent, whereas the countries, like China exports plants and raw drugs, therapeutics and other MAPs worth Rs 18,000 crores annually (Singh, 2005). 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 among the farmers about the economic potential and returns (Purohit, 2004, Singh et al. 2007, Singh, 2008, Singh, 2009) from these plants.

Economic Potentials of MAPs

Estimates show that that the potential returns to farmer from cultivation of medicinal plants are quite high (Nautiyal, 1995; Rao and Saxena, 1994). The cultivation of certain high altitude Himalayan herbs could fetch products price anywhere between Rs. 7,150 to 55,000 per hectare (Nautiyal, 1995). Although it is not clear that at which stage of the marketing chain these prices are paid but it is obvious that despite varying returns production of medicinal plants could raise the income of farmers to a great extent. Rao and Saxena (1994) reported an average annual income of Rs. 120,000 per hectaec through mixed cropping of high altitude medicinal herbs. Even the low altitude MAPs assume signicant economic importance and can be judiciously cultivated to bridge the current gap between demand (40 thousand tons) and supply (20 thousand tons) is estimated to be 40,000 to 200,000 tons, which is expected to rise to 152,000 to 400,000 tons by 2005 (Planning Commission, 2000 & CRPA, 2001) to improve the income and status of the rural farm household.

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, 2001). Evidence shows that the total domestic potential for crude drugs and oil extracts in India is worth Rs 3 billion, of which the requirements of over-the-counter products. Including cosmetics and ethical and classical formulations, are of Rs 1.2 billion each; whereas traditional medicines of Vaidyas and hme reedial formulations acount for about Rs. 400 million and 200 million, respectively (Exim Bank, 1997). Medicinal plants cultivation and management therefore, could become highly remunerative both in

financial and economic terms for the small-scale growers. Not only the plants are in increasing demand by major herbal drug industries as an essential raw material of their drugs, but also its collection, production, processing, packaging and transportation requires high labor input, which can create job lead growth in job-starved state of Bihar. Collection from wild and selective harvesting in addition to primary processing is mostly done manually, and even at the secondary and tertiary levels, MAPs have substantial labour requirements. Moreover, not only do MAPs-based industries expand jobs, enhancing traditional uses through value added processing can increase cash earnings to the local people.

Expanding world markets for MAPs are further opening up new vistas of opportunities. So far, Germany has been the largest market for MAPs but now the European market is growing rapidly at the rate of over 4% per annum for herbal remedies and even faster for herbal supplements. The size of European market for herbal supplements is estimated at over US$ 2.7 billion and for herbal remedies, a further US$ 0.9 billion. The US herbal market is, though nearing saturation but it is expected to peak at US$ 6-8 billion in the next few years. Thus the global demand for medicinal plants is expected to expand continuously, fuelled by the growth of sales of herbal supplements and remedies. Their basic uses in medicine will continue in the future, as a source of therapeutic agents, and as raw material base for the extraction of semi-synthetic chemical compound such as cosmetics, perfumes and food industries. All these pose a unique opportunity for India to penetrate deep into the world market to harness the untapped potentials of MAPs.

Multi-faceted Importance of Medicinal and Aromatic Plants

What are medicinal plants?

A considerable number of definitions have been proposed for the term 'medicinal plant'. According to the World Health Organization, "a medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemophar-maceutical semi synthesis".

This definition allows for a distinction between the already known medicinal plants whose therapeutic properties or character as a precursor of certain molecules have been

established scientifically, and other plants used in traditional medicines and regarded medicinal, but which have not yet been subjected to thorough scientific study.

Plants for Health

Today's healthcare systems rely largely on plant material. Much of the world's population depends on traditional medicine to meet daily health requirements, especially within developing countries. Use of plant-based remedies is also widespread in many industrialized countries and numerous pharmaceuticals are based on or derived from plant compounds. Similarly, cosmetics and other household products may contain plants of medicinal or therapeutic value.

The pharmaceutical industry is both large and highly successful. Sales of plant derived drugs are expected to reach $30 billion worldwide in 2002. At present about 50% of the total plant-derived drug sales come from single entities, while the remaining 50% come from herbal remedies. Although the latter have greater volumes of consumption, the relatively low volumes of single entities, which are mostly prescription products, are more than compensated by their higher prices. Single entity plant drugs, which mostly treat serious medical ills, include atropine, digoxin, morphine, paclitaxel, pilocarpine, reserpine, scopolamine, topotecan and vincristine, among many others. Several of the compounds have outlived their usefulness in light of better alternatives, however, and are exhibiting decline in sales. On the other hand, as a consequence of new drug developments, single entities overall are projected to increase their market share of the combined total future dollar sales.

Why Should the Bihar go the Herbal Way?

Social Perspective

Use of medicinal plants in primary health care and nutrition needs is traditional and imbedded in all cultures. No major problems of acceptability regarding familiarity with the usage of plant products, methods of cultivation of many commonly grown plants and technologies required for processing into items of common household uses and value. Med-plants have also been used to develop family-based health and livelihood oriented enterprises in rural areas. Medicinal and Aromatic Plants help in:

a) Preserving the traditional medical knowledge,

b) Provide easily adaptable enterprising opportunities for unemployed youth and rural poor who can learn the trade from their parents and peers and earn not only their livelihood but also contribute to the society.

Protection of Traditional Knowledge

The urgency and need to protect the fast disappearing medicinal plants-based traditional knowledge, which is still abundant in Bihar, cannot be overemphasized. If proper values can be added to the traditional medical knowledge-based health practices and subsistence-oriented HMAP applications, a large number of jobs can be created in the rural areas. Even at current level of conversion of traditional medicinal knowledge into economic opportunities, enterprise-based application can account for thousands of jobs in rural areas of Bihar. Thus, med-plants have high potential in creating jobs and pushing economic growth in resource-constrained areas suffering from limited educational opportunities, lack of infrastructure, and underdeveloped med-plants-based trade and commercial activities. The conversion of socio-cultural traditions and indigenous knowledge into livelihood means and economic opportunities also has the advantage of preserving the rapidly eroding cultural knowledge and practices which are increasingly threatened due to globalization and homogenization of people and communities.

Environmental Perspective

The growing apathy toward products made from chemical products becoming ethically unacceptable. This has created new markets for quality, certified and organic herbal products. Medicinal plants have the potential to fill these needs as they provide green health alternatives and a number of other eco-friendly products of domestic and industrial usage. Found as trees, shrubs, grasses and vines, these plant species abundantly growing in the plains of Bihar. Its entry into the world food and drug market as the environment friendly botanical products is looked upon as an emerging and new opportunity. The development of medicinal plants-based economic incentives is being increasingly applied to enlist greater participation of people in conservation of forest ecosystem.

Potential of Equitable Commercialization

The HMAP sub-sector has immense potential as the sustainable commercialization can benefit farmers and industry both by providing higher price and by opening up national and global markets for new products from the region. Private sectors stand to benefit by ensuring sustainable supply of quality raw materials to benefit their industry and trade if they can be facilitated to build partnerships with farmers. Many of the species are shade tolerant and others are climbers, trees, shrubs and herbs that can be grown in different configurations of crop geometry.

Trade and Enterprise Development

The demand for medicinal plants in India – to meet both domestic and export market - comprising 162 species, is expected to increase at about 15 to 16% between 2002 and 2005 (CRPA, 2001). Medicinal plants cultivation and management therefore, can become highly remunerative both in financial and economic terms for the small-scale growers. The current gap between demand and supply is estimated to be 40,000 to 200,000 tons, which is expected to rise to 152,000 to 400,000 tons by 2005 (Planning Commission, 2000 & CRPA, 2001). Not only the plants are in increasing demand by major herbal drug industries as an essential raw material of their drugs, but also its collection, production, processing, packaging and transportation requires high labor input, which can create employment in job-starved state of Bihar. Collection from wild and selective harvesting in addition to primary processing is mostly done manually, and even at the secondary and tertiary levels, med-plants have substantial labour requirements. Moreover, not only do HMAP-based industries expand jobs, enhancing traditional uses through value added processing can increase cash earnings to the local people.

World Market Trends

The European market for herbal supplements is estimated at over US$ 2.7 billion and for herbal remedies, a further US$ 0.9 billion. Germany is by far the largest market. The market is growing rapidly at over 4% per annum for herbal remedies and considerably faster for herbal supplements. The US herbal market is nearing saturation and is expected to peak at US$ 6-8 billion in the next few years. Demand for medicinal plants is expected to continue to expand rapidly, fuelled by the growth of sales of herbal supplements and

remedies. Their basic uses in medicine will continue in the future, as a source of therapeutic agents, and as raw material base for the extraction of semi-synthetic chemical compound such as cosmetics, perfumes and food industries.

Domestication and Cultivation of HMAP

Some of the practical applications integrating medicinal plants into traditional farming systems have taken an obligate relationship in backstopping upland agriculture. Other important opportunities and advantages of cultivating HMAPs include ease of their incorporation in the existing cropping systems due to availability of a large number of species and choice of plant types. Cultivation of carefully selected species as a mixed, inter or companion crop in agro and farm forestry conditions following a soil-improving crop rotation is highly feasible livelihood enhancing activities in Bihar. However, this will require an improved input and service delivery system including marketing, and post harvest technologies. Cultivation needs to be done on a business platform by a chain of small and micro-enterprise-based groups and individuals. In order to achieve an economy of scale and desired impact, it may need to be concentrated in selected pockets in an intensive manner as cluster of activities and micro-enterprises.

Stakeholder's participation

Local communities, especially weaker and marginalized groups or ethnic minorities need to be involved in planning, designing, development and implementation of the research activities and learning studies in the project. The NGOs and GOs should consult and work with community-based organizations and engage them into participatory process to involve collectors, producers and traders including ultimate users, women and disadvantaged groups in project implementation. In each of the selected villages or communities, stakeholder represented CBO, NGO or PRI should implement and/or supervise the execution of projects. Their involvement from the very beginning of the project development process is expected to enhance people’s participation in the project and provide benefit to a wide range of users.

Marketing Perspective

In order to understand the complex market and marketing related issues, market-related information, scooping of problems & opportunities, successful case studies with `good practice' tag need to be surveyed and studied to develop a marketable product portfolio. The tool proposed is value-chain or Production-to-Consumption & Marketing (PC&M) model. The outcome of these studies can be useful to plan equitable commercialisation, identify potential small & micro enterprises, and assess available raw material resources and product mix.

Steps taken

Taking cognizance of such enormous and grossely untapped potentials of MAPs, the Government of India has accorded high priority to the R&D and cultivation of MAPs in the country. A number of techniques have been developed to increase the quality and yield of many of the cultivated species. It is estimated that Indian public sector research institutions have developed standardized practices for the propagation and agronomy of a total of about 40 species.

Much of the research progress to date has resulted from the decision of the Indian Council for Agricultural Research (ICAR) to establish an All-India Coordinated Research Project on Medicinal and Aromatic Plants (AICRPMAP), in 1972, under the auspices of the National Bureau of Plant Genetic Resources (NBPGR). Efforts have mainly focused on the development of agro-technology techniques, including propagation methods for medicinal and aromatic plants. Aromatic plants have however tended to receive more attention, perhaps because their market values are in general more widely known. ICAR works through a network of research stations, including the National Research Centre for Medicinal and Aromatic Plants located in Anand, Gujarat, which specializes in domestication, and has created structural links between the NBPGR and its Plant Breeding Division in order to develop improved varieties of some of the medicinal plant species used in allopathic preparations.

The Council for Scientific and Industrial Research (CSIR), has also played a significant role with regard to cultivation of medicinal plants, by establishing the Central Institute of Medicinal and Aromatic Plants, in Lucknow (CIMAP). CIMAP is now an eminent

institution in India focusing on agro-technology as well as basic studies; improvement and enhancement of the resource base, and chemistry and related research regarding product development from plants.

Apart from these, the Government of India launched a scheme for the development of MAPs during the 8th Five Year Plan (1992-97). The scheme attempted to include production quality planting materials, establihment of herbal gardens and regional analytical laboratories with the help of 16 state agricultural universities, state horticulture and agriculture departments, regional research laboratories and the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT). There are other actors also who are playing important role in the development and production of MAPs. For instance, Ministry of Health & Family Welfare (Department of ISM&H) and a number of private agencies/ companies are also encouraging development of agrotechnique for important species with the help of Govt/semi-government organisations having expertise and infrastructure for this work.

In addition, the centre and state (governments) have made provisions for adequate financial supports in the forms of subsidies and loans to the growers of MAPs throgh various agencies like National Medicinal Plant Board (NMPB), National Bank for Agricultural and Rural development (NABARD), Agricultural and Processed Food Products Export Development Authority (APEDA), National Horticultural Board (NHB), Agri-Export Zone (AEZ), etc. The NMPB supports several promotional as well as commercial programmes and provides cent per cent financial assistance to promote MAPs in the country. The Integrated Development of Medicinal and Aromatoc Plants, Ministry of Agriculture is also a commendable step that supports production to processing as well as training of the farmers with limited financial assistance.

Current status

Table 1 shows details of area, production and yield of various aromatic plants in 2009-10 in Bihar. It is obvious that cultivation of medicinal plants is quite limited and only 2410 ha of land was under cultivation of these plants. Among different commercially growing species of aromatic plants, mentha and lemon grass have emerged as the major players and shared 95 per cent in total area and production of aromatic plants in the state.

Table 1. Details of aromatic crops being grown in Bihar (2009-10)

MAPs	Area (ha.)	Total oil production (tons)	Oil yield (kg./Ha.)
Lemon grass	185	25.90	140
Java citronella	38	4.75	125
Mentha	2100	252.00	120
Palma rosa	20	2.00	100
Tulsi (basil)	32	3.20	100
Jama rosa/CN-5	35	5.25	155

Source: Author's calculation

As far as the status of medicinal plants in Bihar is concerned (table 2), it is still negligible. Merely 380 tons of medicinal plant produces are being produced over 95 ha of land. Evidence indicates that 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 (Singh, 2007). Impetus in terms of planning, funding, production, processing, and strong market linkage is essential to harness the potentials of commercial production of MAPs.

Table 2. Details of medicinal crops being grown in Bihar(2009-10)

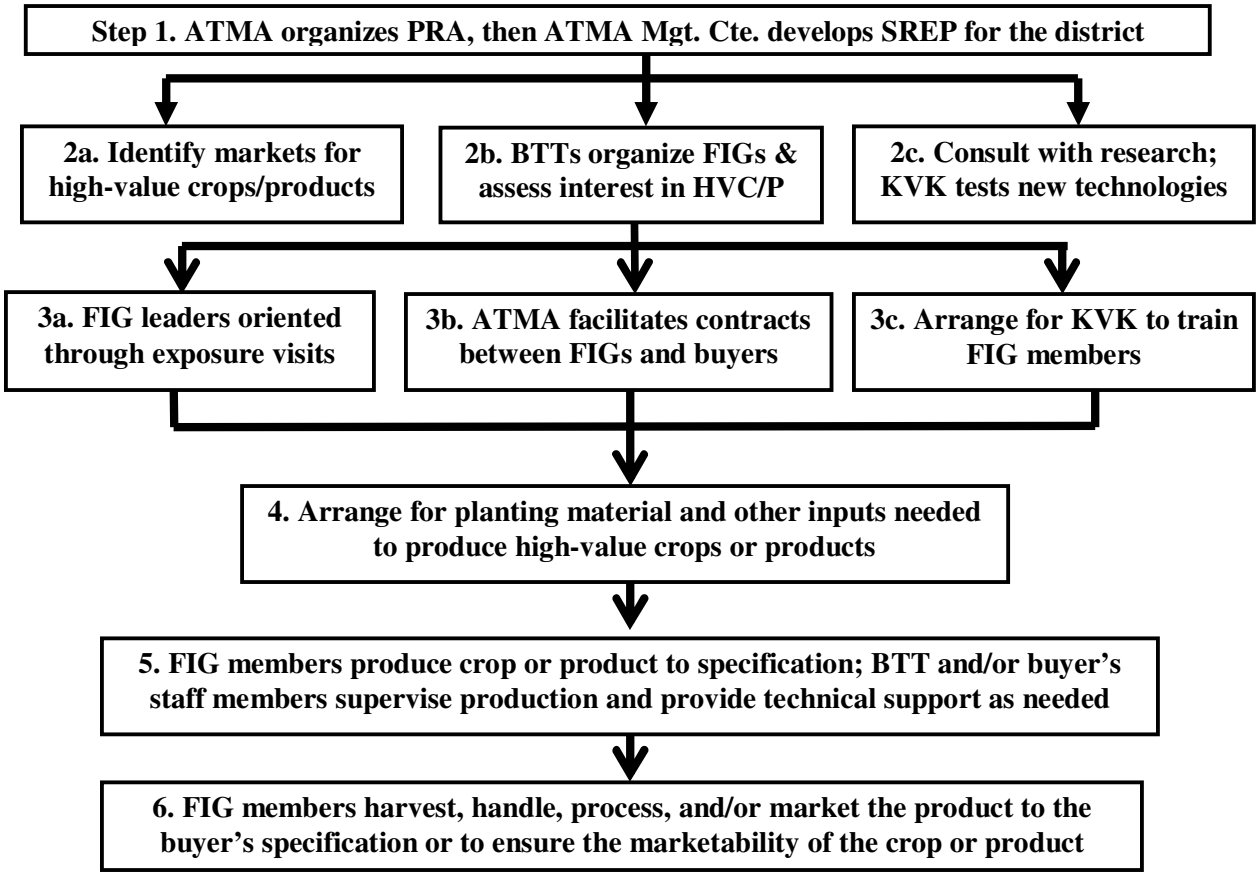
MAPs	Area (ha.)	production (ton)	yield (kg./Ha.)
Safed musli (Chlorophytum borivillinum)	16	24.0	1500
Kalmegh (Andrographis penniculata)	15	45.0	3000
Sarpgandha (Rauwolfia serpentina)	12	19.2	1600
Shatawar (Asparagus racemosus)	17	127.5	7500
Buch (Acorous calamus)	6	19.2	3200
Jatropha (Jatropha curcas)	29	145.0	5000

Source: Author's calculation

Efforts to popularize Medicinal and Aromatic Plants in Bihar

Realizing the vast untapped potentials of MAPs and impediments in their development, Bihar Agricultural Management and Training Institute (BAMETI) has made remarkable efforts to promote MAPs in the state under ATMA, Patna. ATMA has follwoed a systematic approach while taking MAPs for pilot testing. It made assessement about the local conditions and requirements, and demand for MAPs; strengthened capacity by traing various stakeholders; played role in supporting individuals and institutions; developed relevant literature in local language; emphasized on group approach by organizing the growers; encouraged cultivation through the organized sector with linking the unorganized farmers; and evolved a pricing mechanism with buy back arrangement with partner industry under public-private partnership(PPP).

Figure 1. Steps taken by ATMA, Patna to Develop Supply Chains of MAPs in Bihar



Source: Singh and Swanson, 2006 and Singh, Swanson and Singh, 2006, p. 212)

Economics of MAPs vis-à-vis other field crops

The comparative economics of MAPs and a few major field crops reveals that returns from MAPs are comparable with any of the field crops. The returns from medicinal plants like safedi musali, sarpgandha, satawari, are fairly high. Similarly, returns from aromatic plants like lemon grass, rosa species, etc. are yield better returns and also their cost of cultivations are lower in comparasion to many of the field crops. The irony is that over 80 percent of the Bihar population is smallholder (<2ha of land size) and therefore, they generate very small marketable surplus. Such a small scale production and tiny marketable surplus fail to attract markets.

Table 3. Economics of some MAPs Cultivation in Bihar

Crops	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income Rs/ha/ year
Lemon grass	22500	42000	19500
Java citronella	19500	33750	14250
Mentha	20500	36000	15500
Palma rosa	22500	40500	18000
Tulsi (basil)	11500	20000	8500
Jama rosa/CN-5	25000	50375	25375
Safed musli (Chlorophytum borivillinum)	65000	102000	37000
Kalmegh (Andrographis penniculata)	58000	65000	7000
Sarpgandha (Rauwolfia serpentina)	30000	64000	34000
Shatawar(Asparagus racemosus)	25000	50000	25000
Buch (Acorous calamus)	25000	40000	15000
Jatropha (Jatropha curcas)	17000	30000	13000
Paddy-wheat	42947	58853	15906
Sugarcane	48343	84323	35980

Source: Author's calculations

The Efforts so far by ATMA, Patna:

The efforts by ATMA, Patna to promote the MAP sector can be summarized in the following manner:

1. Assessment of Local Conditions and Requirements:
2. Assessing the Demand for Medicinal and Aromatic crops
3. Training and Capacity Building by ATMA, Patna
4. Role of Supporting Individuals and Institutions
5. Development of Relevant Literature in Local language
6. Emphasis on Group Approach
7. Organizing the Growers
8. Cultivation through the Organized Sector and linking the unorganized farmers
9. Pricing Mechanism and Buy Back Arrangement with partner industry

Medicinal Plants Suitable for Selective Commercialization in Bihar

- Sadabahar (*Catharanthus roseus*)
- Gurmar (*Gymnema sylvestris*)
- Sarpgandha (*Rauvolfia serpentine*)
- Kalmegh (*Andrographis paniculata*)
- Kalihari (*Gloriosa superba*)
- Brahmi (*Centella asiatica*)
- Buch (*Acorus calamus*)
- Pippli (*Piper longum*)
- Shatawari (*Asparagus racemosum*)
- Chitrak (*Plumbago zeylanica*)

Aromatic Plants Suitable for Selective Commercialization in Bihar

- Lemon grass (*Cymbopogon fleuosus*)
- Palma rosa (*Cymbopogon martinii*)
- Java citronella (*Cymbopogon winterianus*)
- Mentha (*Mentha arvensis*)
- Tulsi (*Ocimum basilicum*)
- Vetiver (*Vetiveria zizanioides*)

Bio-Partnership to link Rural Communities with Industry

Links established with growers, traders, processors and consumers at different levels in a value-chain or production-to-consumption system framework. Equitable Bio-partnership arrangements between processing and marketing; health-care companies and community-

based organizations developed to ensure dependable markets for the producers and quality supply for the industry. Industries have shown interest in direct collaboration with producer groups/associations and many are committed to a fair and ethical commercialisation.

Response from the Farmers

Presently with support of ATMA, Patna about 500 acres of land has been brought under the cultivation of MAPs in Bihar. The number of farmers and area under these crops is likely to increase in future as a large number of farmers have expressed an interest in medicinal plant cultivation. In Bihar, there is already a Growers Association promoting cultivation of medicinal plants for enhancing livelihoods promoted by ATMA, Patna.

Marketing Strategies Adopted

Given the scarcity of the medicinal plants such as Vinca rosa (Sadabahar or *Catharanthus roseus*), Sarpgandha (*Rauvolfia serpentina*), Buch (*Acorus calamus*), Brahmi (Centella asiatica), Shatawar (*Asparagus racemosum*), Pippli (*Piper longum*), Gurmar (*Gymnema sylvestris*), Patharchoor (*Coleus froscolli*), etc sourced from farms, drug companies have assured the full-purchase price of these herbs. ATMA, Patna negotiated several formal bio-partnerships between certified farmers and Ayurvedic pharmaceutical companies, like Baidyanath Ayurved Bhawan, Patna; Ayurved Shri Herbals Ltd, Ahmedabad, Fragrance Herbs, Patna etc. The arrangement ensures that farmers with a guaranteed market and a fixed fair price for their harvest, in exchange for exclusive rights to the produce as the sole buyer.

Future Strategies

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 (Singh, et al. 2007, Singh, 2009). Impetus in terms of planning, funding, production, processing, and strong market linkage is essential to harness the potentials of commercial production of MAPs. Formal bio-partnerships between certified farmers and Ayurvedic pharmaceutical companies, like Baidyanath Ayurved Bhawan, Patna; Ayurved Shri Herbals Ltd, Ahmedabad, Fragrance Herbs, Patna needs to be explored. The arrangement should ensure farmers with a guaranteed market and a fixed fair price for their harvest, in exchange for exclusive rights to the produce as the sole buyer.

The other agencies like departments of Forest, Agriculture, Horticulture, Health and Family Welfare can come together to offer technical, market related and other input supply services to the various stake holders so that sector as a whole can grow and dependence on outside sources for primary health care is minimized. Use of farmer Interest Groups for dissemination of technology and market information can also be explored in the state.

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