Promotion of Medicinal and Aromatic Plants Cultivation for Improving Livelihood Security: A Case Study from West Himalaya, India

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Abstract: Conservation of medicinal plants is receiving increased attention all across the globe keeping in view the resurgence of interest in herbal medicines. Especially in the entire Himalayan region, rural and traditional societies are using medicinal and aromatic plants (MAPs) for health care and economic benefit. Keeping this in view, five potentially medicinal and aromatic herbs viz. Rosemary (Rosmarinus officinalis), Satawar (Asparagus racemosus), Ban-tulsi (Ocimum basilicum), Tagar (Valeriana jatamansi) and Chamomile (Matricaria chamomilla) were selected for cultivation at farmer’s field of selected village clusters i.e. Dharaunj, Mudiyani and Gumod through participatory action research approaches. As a result, a total of 120 farmers initiated cultivation of selected MAP species in 14 hectare land. Towards, capacity building of the farmers, a series of meetings among farmers and the trader’s and other stakeholders were conducted. Simultaneously, a Memorandum of Understanding (MoU) was facilitated between traders and farmers. These efforts provided opportunities to the farmers to develop skill, knowledge and self-confidence for cultivation of MAPs. This will help in fulfilling the raw material demands of pharmaceutical industries and enhance the livelihood security of the local farmers. The present study is an attempt to analyze yield and cost-benefit of selected MAPs adopted by farmers in the Champawat district of Uttarakhand state in India.

Keywords: Conservation; cost benefit analysis; livelihood; medicinal plants; value chain; yields.

Introduction

Medicinal and aromatic plants (MAPs) are known to ensure the healthcare needs of and enhance livelihoods of millions of rural people, however, 70-80% of the market demand is met from wild (Prasad and Bhattacharya 2003). This has severely affected the availability of MAPs in their natural habitat and likely to be vanished in coming years, if not managed to safeguard their regeneration (Maikhuri et al. 1998). In this context, cultivation and domestication of wild MAPs plants is often suggested as a way to meet the growing market demand and also to create a balance between the use and conservation of MAPs (Maikhuri et al. 2003; Muhammad et al. 2006). The first initiative to cultivate medicinal plants as an income-generating activity took place in India during the Second World War when an acute scarcity of drugs led to the cultivation of a good number of species (Chopra et al. 1958). Since then various government and non-government organizations initiated medicinal plants cultivation in different parts of the world. In India, MAPs are selected as a notable livelihood-focused venture along with traditional farming system, which can provide farmers a regular income (Uniyal et al. 2000; Negi et al. 2010). In North-western Himalaya cultivation of MAPs become livelihood security option for rural inhabitants.

Uttarakhand is bestowed with varied vegetation types ranging from tropical deciduous to alpine pastures. It has been estimated that over 350 species of plants are vulnerable and threatened in the state, of which 161 species belongs to rare and threatened categories (Phondani 2010). The state is considered rich source of important medicinal and aromatic plants (MAPs); however, various factors such as habitat destruction, over exploitation, illegal exploi-
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tation, changing climate, etc. decreased the availability of MAPs in wild (Maikhuri et al. 1998; Vashistha et al. 2006). Cultivation/domestication of MAPs is therefore, considered as one of the important method for conservation and uplifting the socio-economic conditions of rural inhabitants. This will certainly reduce the pressure on wild MAPs populations, ensure regular supply of raw material to industries and uplift economy of local farmers (Muhammad et al. 2006; Sahoo et al. 2010). Uttarakhand has suitable climatic conditions for cultivation of MAPs and recently some industries has been established for promoting MAPs products and in this way farmers find it a lucrative option for livelihood enhancement as against the traditional farming (Nautiyal et al. 2004). The present study is an attempt to (a) promote large-scale cultivation/domestication of economically potential medicinal plants as an alternative option of livelihood (b) capacity building on cultivation, harvesting, value addition, packaging and marketing of selected MAPs species, and (C) evaluate the yield and cost benefit analysis of MAPs species under cultivation.

Materials and methods

Study area and socio-economic profile

Uttarakhand state (latitude 29°26'-31°28' N and longitude 77°49' E-80°06' E) covering an area of 53,483 sq. km. with a total human population of the state is around 85 lakhs of which 78% is rural. The present study was carried out in three different clusters viz. Dharaunj, Mudiyani and Gumod in Champawat district of Uttarakhand state in India. The district Champawat is consisting of four development blocks (Champawat, Lohaghat, Barakot and Paati) and 691 revenue villages. The forest cover of the district extended to about 44% of the area and agriculture is practiced on 11% area while 30% area is under pasture, fallow and cultivable wastelands. Small and marginal land holdings dominate the 57% of the area. The total population of the studied clusters was 1980 having 340 households with 5.82 average family sizes. The rural settlements are located at an altitudinal gradient between 1000 to 1800 masl. The average temperature was recorded highest in May and June (30°C to 40°C) and lowest in the month of January (10°C to -15°C). Heavy rainfall occurs during June to September accounting nearly 61% of the total annual rainfall.

Methodology

Four basic approaches were adopted for promoting large scale cultivation of medicinal and aromatic plants at farmer’s field for livelihood enhancement.

(i) Baseline survey:

Participatory Rural Appraisal (PRA) method was adopted for the field study (Sahoo et al. 2010). In each of the three clusters, the villagers were asked to develop their own method of stratifying the population based on income, family size, landholding to assess the dependence of MAPs. Baseline survey was conducted to gather information on cultivation of MAPs in all three clusters. From each stratum, sample households were drawn on random basis and the detail information pertaining to MAPs was collected through personal interviews, structured questionnaire and group discussions during the period of 2007-2011.

(ii) Nursery development:

Five mother nurseries were developed through participatory approach in all three clusters for capacity building, demonstration, and germ plasma distribution to the farmers. After detailed discussion with farmers and traders, five economically high value medicinal and aromatic plant species viz. Rosmarinus officinalis, Asparagus racemosus, Ocimum basilicum, Valeriana jatamansi and Matricaria chamomilla were selected for large scale cultivation. Selection of the species was based on their better adaptability in the region and high market demands. Regular training was imparted to the interested farmers on cultivation, harvesting and marketing trend of selected species. This has resulted the development of small MAPs nurseries by 50 progressive farmers in all three clusters.

(iii) Registration of farmers

In order to avail benefits of Government schemes and proper regulation of medicinal
plants cultivation, and trade, medicinal plants growers of all three clusters were registered from Herbal Research Development Institute (HRDI), Gopeswar Chamoli, Uttarakhand. A total of 120 farmers (Dharauj -90; Mudiyani-Banlekh – 20; Gumod – 10) are registered for cultivation and marketing of selected medicinal and aromatic plant species.

(iv) Association of farmers

For proper management and execution of MAPs business, the farmers have set up a farmers association which is named as ‘Gramin Kisan Swarojgar Sangathan, Champawat’. The main aim of the association is to promote the farmers for cultivation of MAPs in every household of the district Champawat and develop an appropriate network for collection, harvesting, packing, value addition and marketing of selected MAP species for livelihood enhancement.

(v) Memorandum of Understanding (MoU) with traders

Towards better marketing of selected MAP species, Memorandum of Understanding (MoU) was facilitated between MAPs growers and traders. The same was signed by both the parties.

(vi) Training programme and exposure visits

Through regular meetings, discussions and assurance of technical support, the farmers put their trust for adoption of MAPs cultivation at large scale. Participatory learning and sharing of knowledge was the process adopted during the present field based capacity building programme (Negi et al. 2011a). In this context, 30 village level meetings were organised with farmers, traders, experts, NGOs and government organizations. Over 195 participants with different age groups participated and benefited. Discussion was revolved round on different uses, cultivation technology, market demand, transportation process and their conservation strategies. Selection of progressive farmers was based on their willingness towards MAPs cultivation. Exposure visits of 120 progressive farmers were made to various institution working on medicinal and aromatic plants aspects i.e. Central Institute of Medicinal and Aromatic Plants (CI-MAP), Udham Singh Nagar, Centre for Aromatic Plants (CAP), Dehradun, National Bureau of Plant Genetic Resource (NBPGR), Nainital, The Energy Resource Institute (TERI), Nainital, Krishi Vigyan Kendra (KVK), Champawat, Uttarakhand and some areas of Himachal Pradesh practicing MAPs cultivation.

Results and Discussion

Perception analysis was done for knowing the interest of farmers towards cultivation of MAPs and therefore, more than 40% local farmers and some of the traders of MAPs were consulted. Traders were largely preferred the species which have high market demand and rate. The preferences of the species by traders are: Asparagus racemosus (66%) followed by Rosmarinus officinalis (60%), Ocimum basilicum (51%), Valeriana jatamansi (42%) and Matricaria chamomilla (30%). However, farmers were preferred those species which are easy to cultivate. The preference of the species by farmers are: Rosmarinus officinalis (65%) followed by Ocimum basilicum (60%), Valeriana jatamansi (56%) Asparagus racemosus (53%) and Matricaria chamomilla (48%) (Figure 1). During initial stage of the field survey it was found that there was not a single farmer directly involved in cultivation of these medicinal and aromatic plants. They collect from wild when required for the purposes of home remedies. Initially a large number of MAPs species under cultivation were tried but keeping in view the farmers perception, market demand and high rate, focus was made on 5 high value MAPs species (Table 1). Yield potential of the selected species revealed that the Rosmarinus officinalis showed the highest (25±2.7 kg/Nali) yield followed by Ocimum basilicum (18±2.3 kg/naali) and Valeriana jatamansi (15±2.1 kg/Nali). The cost–benefit analysis of selected species for cultivation/Nali is presented in Table 2. The maximum benefit was recorded from Ocimum basilicum (Rs 1970±32.1/Nali) and least from Matricaria chamomilla (Rs 220±4.1/Nali).
**Figure 1:** Perception of local farmers and traders towards selection of MAPs species for cultivation.

**Table 1:** Adoption of five high prioritized medicinal and aromatic herbs for large scale cultivation.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of species</th>
<th>Local name</th>
<th>Use part (dry)</th>
<th>Harvesting period</th>
<th>Production Kg/Nali</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td><em>Asparagus racemosus</em> Willd.</td>
<td>Satawar</td>
<td>Roots</td>
<td>Oct.-Dec.</td>
<td>10±1.8</td>
</tr>
<tr>
<td>3.</td>
<td><em>Ocimum basilicum</em> L.</td>
<td>Bantulsi</td>
<td>Leaves</td>
<td>Sep.-Oct.</td>
<td>18±2.3</td>
</tr>
<tr>
<td>4.</td>
<td><em>Valeriana jatamansi</em> Jones.</td>
<td>Tagar</td>
<td>Roots</td>
<td>Nov.-Dec.</td>
<td>15±2.1</td>
</tr>
<tr>
<td>5.</td>
<td><em>Matricaria chamomilla</em> Linn.</td>
<td>Chamomile</td>
<td>Flowers</td>
<td>May-June</td>
<td>7±1.1</td>
</tr>
</tbody>
</table>

Note – 1 Hectare = 50 Nali

**Table 2:** Cost-benefit analysis and monetary benefit to local farmers through selected MAPs cultivation/Nali

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of species</th>
<th>Income(Rs)/year</th>
<th>Agricultural cost (Rs)</th>
<th>Net profit(Rs)/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Rosmarinus officinalis</em> Linn.</td>
<td>3375±62.4</td>
<td>1700±32.7</td>
<td>1675±28.3</td>
</tr>
<tr>
<td>2.</td>
<td><em>Asparagus racemosus</em> Willd.</td>
<td>2000±39.1</td>
<td>800±26.5</td>
<td>1200±22.2</td>
</tr>
<tr>
<td>3.</td>
<td><em>Ocimum basilicum</em> L.</td>
<td>2970±53.2</td>
<td>1000±29.4</td>
<td>1970±32.1</td>
</tr>
<tr>
<td>4.</td>
<td><em>Valeriana jatamansi</em> Jones.</td>
<td>1200±30.6</td>
<td>300±9.1</td>
<td>900±23.5</td>
</tr>
<tr>
<td>5.</td>
<td><em>Matricaria chamomilla</em> Linn.</td>
<td>420±10.7</td>
<td>200±6.4</td>
<td>220±4.1</td>
</tr>
</tbody>
</table>

Note – 1 Hectare = 50 Nali

Over the years, a total of 120 farmers in all three village clusters were adopting large scale cultivation of MAPs under 14.0 hectare lands. Initially, 10 farmers were interested to cultivate MAPs (2007-2008) which was subsequently improved over the years i.e. 97 farmers (2008-2009), 109 farmers (2009-10) and 120 farmers (2010-2011). A total of 16.65 quintals raw materials of selected MAPs were harvested by farmers in all three clusters after fourth year of cultivation. This has provided a sum of Rs. 1, 55,750/- net monetary benefit after marketing to the traders in local market (Figure 2). The study initially seeks to determine the importance of the value chain as a production and marketing approach, as well as its significance for improv-
ing the livelihoods of the primary producers. The integrated value chain were developed taking into account the experiences and expertise of different disciplines which might be able to provide the most effective way of understanding the issues and solving the problems related to cultivation and marketing (Figure 3). It was also found that marketing is not possible without having certificate from state government regarding cultivation of MAPs. Herbal Research and Development Institute (HRDI) is a nodal agency of state largely responsible for promotion, conservation and cultivation of medicinal plants. HRDI provides loans and subsidies for cultivation of medicinal plants and also registered farmers for cultivation of medicinal plants so that they can market their crops with the help of the institute without involvement of middlemen (Negi et al. 2010). In this context all the farmers who have adopted MAPs cultivation under our intervention are registered from HRDI, Gopeshwar, Chamoli, Uttarakhand, India.

![Figure 2](http://www.openaccessscience.com)

**Figure 2:** Increase the number of farmers and their income from MAPs cultivation in different clusters.

Resource-poor people in the region collect plants from the wild to complement their meagre income. Besides, illegal collection from wild, there were many other threats, such as land-use disturbances, heavy livestock grazing and changing climate conditions. The interest of MAPs collectors is to increase incomes over a short time and have no concern for plant sustainability (Negi et al. 2010). Similarly, the reduction of grazing rights in forests and meadows may enhance plant diversity and ecosystem functioning if grazing pressure is intense (Rao et al. 2003). If disturbances caused by traditional resource uses are moderate, diversity may decline following abandonment of such uses and recuperation of lost diversity may be a very slow and costly process (Kotiluoto 1998; Stampfli and Zeiter 1999; Samant et al. 1998). A group of collectors from Johar valley in Pithoragarh district of Uttarakhand reported that an amount of 200 g of dry Atis (*Aconitum heterophyllum*) in 1 day could be collected five years ago but now they collect less than 70–100 g day\(^{-1}\) (Belt et al. 2003; Alam and Belt 2004).
Figure 3: Value chain developed for marketing of medicinal and aromatic plants.

As such, medicinal and aromatic plants cultivation has great potential for employment generation and enhancement of livelihood security in Uttarakhand Himalaya considering the favourable climatic and soil conditions. In this context, farmers need to be encouraged to grow species that have economic potential at one hand and ecological significance on the other so as economical as well as ecological sustainability could be maintained (Maikhuri et al. 2003; Kala 2007; Negi et al. 2011b). Besides, to sustain the traditional healthcare system the Medicinal plant cultivation is required (Phondani et al. 2010; Negi et al. 2011b). Various institutions working in the area of medicinal plant cultivation in Uttarakhand such as Herbal Research and Development Institute (HRDI), Gopeshwar, Chamoli, Central Institute of Medicinal and Aromatic Plants (CIMAP), Udham Singh Nagar, G.B. Pant Institute of Himalayan Environment and Development (GBPIHED), Almora, High Altitude Plant Physiology Research Centre (HAPPRC), Srinagar, National Bureau of Plant Genetic Resources (NBPRGR), Nainital, The Energy Resource Institute (TERI), Nainital, Forest Research Institute (FRI), Dehradun, Wildlife Institute of India (WII), Dehradun, and Forest Departments of Uttarakhand. All these organizations directly and indirectly help to the local farmers in the field of MAPs cultivation through various programmes for developing and disseminating cultivation technologies, setting up nurseries to propagate and supply planting material to farmers, training and providing loans and subsidies linked to cultivation of MAPs for sustainable development (Negi et al. 2010). For proper execution of MAPs business, the farmers have set up farmers association ‘Gramin Kisan Swarojgar Sangathan, Champawat (GKSSC) which is under progress for registration. The main aim of setting up an association is to promote the farmers for MAPs cultivation and develop an appropriate network for conservation, harvesting, value addition, packaging and marketing of selected MAPs species for livelihood enhancement. If interested farmers are registered with HRDI, they could be benefited by loans, subsidies, better planting material, better practices for cultivation and harvesting technology of medicinal and aromatic plants.

Conclusions

Finally it is concluded that the livelihood security of the Himalayan people can be improved through cultivation of medicinal and aromatic plants. In this context, participatory approach could be one method where various stakeholders come together and learn about different aspects of medicinal and aromatic plants cultivation, processing, marketing, etc. Particularly farmers get benefited through this approach as they undertake medicinal and aromatic plants cultivation as one of the alternative option for income generation. It is hoped that the scientific information and contribution of these species and their monetary benefit could improve the economic conditions of the local people and simul-
taneously reduce the pressure on natural habitat. The information may be helpful to the policy planners and developmental agencies working in the field of MAPs sector. Besides, raising awareness and capacity building on MAPs cultivation of poor rural communities can be involved to undertake large scale cultivation of MAPs.

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