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PROMOTING SUSTAINABLE USE OF MEDICINAL AND AROMATIC PLANTS FOR LIVELIHOOD IMPROVEMENT AND BIODIVERSITY CONSERVATION UNDER GLOBAL CLIMATE CHANGE, THROUGH CAPACITY BUILDING IN THE HIMALAYA MOUNTAINS, SWAT DISTRICT, PAKISTAN¹

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ABSTRACT

Rural communities in mountainous areas face distinct challenges in integrating traditional sustenance and emerging market uses of medicinal and aromatic plants (MAPs). In Swat District, Pakistan, communities use MAPs for local medicinal purposes and for domestic food consumption. In addition, MAPs are traded in urban markets to generate income. This paper reports on a project aimed at capacity building through awareness raising, training, exposure, and developing market linkages to promote the sustainable use of MAPs. The project comprised a series of consultation and coordination meetings with the local Forest Department, focus group discussions in each village with MAP traders and collectors, and ethnobotanical field surveys guided by community members. The study reports twenty MAP species that had high market value and were used in indigenous medicine systems by all ethnic groups. These species were traded through formal and informal trade networks, including cross-border smuggling between Pakistan and Afghanistan. Additionally, the project included a range of interventions to foster sustainable use and livelihood improvements, such as local awareness campaigns, capacity-building training, community mobilization for conservation of threatened species, and exposure visits to link local communities to processors and buyers to maximize net income. Capacity building was the main intervention undertaken to achieve the overall objectives of the project. These ongoing interventions are successfully achieving all planned targets, and although it is too early to measure the impact of these activities, it is expected that the project will serve as a strategic investment for income generation through sustainable harvesting and marketing of MAPs for rural communities in remote northern parts of Swat District, Pakistan.

Key words: Capacity building, conservation, local community, medicinal and aromatic plants, Pakistan, subsistence livelihoods.

Traditionally, medicinal and aromatic plants (MAPs) have been used widely in Swat District of Pakistan to supplement food and to cure disease (Saqib et al., 2011; Sher et al., 2014, 2015). Currently, however, their collection is limited to informal trade of a few high-value endangered species in localized areas of Swat District. The benefits of informal trade are disproportionately enjoyed by middlemen, while the collectors, both resident and nomadic, gain very little. As in other areas around the world, Swat indigenous knowledge about MAPs is threatened by the increased use of allopathic medicines, increased interest of younger generations in urban-based employment, and lack of

interest by formal public and development institutions in documenting knowledge of MAPs (Bussmann et al., 2007, 2008; de Boer et al., 2012). This paper reports on a project designed to promote livelihoods in local communities by documenting indigenous knowledge of MAPs, promoting their sustainable harvest and use, and promoting their fair trade. We hypothesized that these goals could be achieved through awareness raising and capacity building. Stakeholders included not only communities but also government departments and NGOs. These initiatives benefit the nomadic and resident populations, particularly the landless, small landholders, and the vulnerable in general, for whom income generation

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from MAPs can be a crucial part of their livelihoods. The aim of the present project, therefore, was to create awareness of these issues and to promote sustainable use of MAPs for improved livelihoods and economic development of the target communities. Preliminary work revealed that species having medicinal and aromatic value are important and relatively abundant in Swat District, but, considering them weeds, farmers remove them from their fields and grazing areas through slash and burn techniques. In addition, it was found that a number of other high value MAP species can be successfully cultivated in these environments (Sher et al., 2014; Sher & Barkworth, 2015).

MATERIALS AND METHODS

STUDY AREA

This study took place in district Swat of Khyber Pakhtunkhwa Province in northwestern Pakistan, which accommodates the mountain ranges of the Hindu Kush Himalaya and Karakoram. Swat District is located approximately 190 km to the northeast of the provincial capital of Peshawar. It is known for its beautiful scenery, encompassing the Swat River, fertile lowlands, and extreme altitude gradients to some of the highest mountains in the world. Swat contains five ecological zones: alpine, subalpine, moist temperate, dry temperate, and subtropical. It is separated from Afghanistan by the Hindu Kush mountain range and harbors the highest peak of the range, Tirich Mir, at 7708 m (Shaw & Shaw, 1993). The cool climate of Swat District and its topography give rise to rich alpine and subalpine ecological zones that are especially important for sourcing MAPs.

ECONOMIC BASE OF DISTRICT SWAT

District Swat has a generally narrow economic base, and the economy is characteristically agro-pastoral. The potential for diversifying the economy is limited by remoteness and inaccessibility, unfavorable weather, lack of managerial and technical skills, lack of financial resources, lack of physical infrastructure, and a high cost of doing business in the area (Tawheed et al., 1999; Sher, 2002; Khan, 2005). Possible areas that have been identified for increased incomes include textile work (Khan, 2005) and ecotourism (Sher, 2013). Here we document and promote the potential of forestry/agriculture, especially through capacity building of MAP collectors/farmers. Capacity-building training can improve skills of MAP collectors and cultivators, which will enable them to receive a better return for better

quality product. This sector, can, therefore, be developed mainly through intensification to meet the domestic demand for product.

PROCEDURE

The project was designed to combine a community-based approach with capacity building and linkage development. This approach was adopted based on the premise that sustainable use, management, and efficient marketing of MAPs will only be possible if communities are involved from the outset and are provided with opportunities to improve their awareness of the issues, to develop the necessary knowledge and skills, and, most importantly, to link directly with national markets. Participatory approaches were adapted for conducting general awareness-raising sessions. Village Development Committees (VDC) were involved in the selection of participants for various trainings and for the implementation of all activities as recommended by Bussmann et al. (2008).

Coordination meetings with District Forest Officers (DFO) of Swat District were conducted before starting fieldwork. During these meetings, the objectives and scope of the study were explained. Support of the DFOs was critical to the project because the Forest Department is responsible for maintaining the forests. Resource persons/experts from government departments, NGOs, and Qarshi Herbal Industries were engaged for participation, including leading training sessions and arranging exposure visits. In addition, the project worked with local electronic media experts to produce educational materials on MAPs.

In order to collect and document the rapidly vanishing indigenous knowledge, the project staff conducted several field visits and held meetings with village elders and hakims. As a result, scientific and local information on 20 MAP species was documented (Table 1).

Focus group discussions (FGD) were conducted in each village of Swat District. The participants in the FGDs were primarily MAP collectors and local traders. The participants were asked about the resource conditions of MAPs in their nearby environments in which they collect. The major objectives of the FGDs were to prioritize the important MAPs and delineate the area in a participatory map showing where prioritized MAPs are found as well as their abundance. During FGD information about the knowledge of local people about MAPs, local names, uses, parts used, marketing, distribution, availability, and abundance were gathered and shared among local inhabitants. A

Table 1. List of target medicinal and aromatic plant species, with local uses and local conservation status and abundance.

Scientific name	Common name	Part used	Price (Rs/kg)	Conservation status, abundance	Local uses
<i>Aconitum heterophyllum</i> Wall. ex Royle	Zaharmora	rhizomes	200	Endangered, rare	It is considered poisonous, but in different local preparation/recipes it is used as a general body tonic.
<i>Bistorta amplexicaulis</i> (D. Don) Green	Anjabar	rhizomes	200	Vulnerable, common	Locally used in various preparations for curing severe arthritis.
<i>Berberis lycium</i> Royle/ <i>B. vulgaris</i> L.	Ziariargai/Kwaray	roots	350	Endangered, occasional	Locally used for the treatment of jaundice, general body fever, and internal wound healing. It is also considered to be a general body tonic.
<i>Paeonia emodi</i> Wall. ex Royle	Manekhh	rhizomes	150	Vulnerable, frequent	Locally used as a general body tonic and also for the treatment of backache and libido pain.
<i>Colchicum luteum</i> Baker	Suranjan-e-talkh	corm	3000	Vulnerable, frequent	Locally used for the curing of “Cutty” and knee swelling.
<i>Sinopodophyllum hexandrum</i> (Royle) T. S. Ying	Bankakrri/Kakorra	rhizomes	300	Endangered, rare	Locally used for the treatment of chest and throat cancer.
<i>Trachyspermum ammi</i> (L.) Sprague	Ajwaine Desi	fruits	400	Vulnerable, rare	It is considered a carminative agent and also used as a stomachic.
<i>Valeriana jatamansi</i> Jones	Mushkaybala	rhizomes	300	Endangered, occasional	It is locally used for the curing of rheumatic pain and fever.
<i>Viola pilosa</i> Blume	Banatsha	leaves/flowers	1000	Vulnerable, common	It is used for the increase of eyesight and also used for the curing of gastrointestinal problems.
<i>Saussurea costus</i> Falc. Lipsch. [= <i>S. lappa</i> (Decne.) Sch. Bip.]	Kuth	rhizomes	1200	Critically endangered, very rare	It is locally considered to be a general body tonic and used to improve memory.
<i>Polygonatum multiflorum</i> (L.) All.	Nooryalam	rhizomes	200	Vulnerable, occasional	It is locally used for increasing breast milk production and also considered an appetizing agent.
<i>Geranium wallichianum</i> D. Don ex Sweet	Srazela	rhizomes	500	Endangered, rare	Locally used for the curing of kidney problems and liver disorders.
<i>Trillium govanianum</i> Wall. ex Royle	Matarjarrai	rhizomes	500	Endangered, rare	Locally used as a remedy for constipation and stomachache during menstruation.
<i>Dioscorea deltoidea</i> Wall. ex Griseb.	Kanis	rhizomes	200	Endangered, rare	Locally used for the treatment of constipation and to improve digestion.
<i>Jurinea himalaica</i> R. R. Stewart	Sharshamai	rhizomes	150	Endangered, rare	Locally used for the removal of kidney stones and for general body weakness.
<i>Morchella esculenta</i> (L.) Pers. ex Fr.	Guchii	fruiting bodies	12,000	Endangered, rare	Locally used as a general body tonic, to improve digestion, and also considered an aphrodisiac agent.
<i>Bunium persicum</i> B. Fedtsch.	Kala Zera	fruits	230	Vulnerable, rare	Locally used as a condiment, considered a carminative agent, and used to treat various stomachic problems.
<i>Bergenia ciliata</i> Sternb.	Makanpath	rhizomes	170	Vulnerable	Locally used to control diabetes and blood pressure and also considered a blood purifying agent.
<i>Acorus calamus</i> L.	Skhawaja	rhizomes	280	Endangered, rare	Locally used for the treatment of various gastrointestinal problems.
<i>Asparagus adscendens</i> Roxb.	Musli Sufaid	roots	350	Vulnerable	Considered a general body tonic and aphrodisiac agent.



Figure 1. Capacity building training: researchers and local stakeholders initiate test plots for medicinal and aromatic plants cultivation.

questionnaire was used to obtain and record information.

RESULTS AND DISCUSSION

PROMOTION OF GENERAL AWARENESS

The project successfully provided general awareness about the importance of sustainable use and management of MAPs in eight villages. A total of 245 individuals participated, mostly between the ages of 50 and 70. Of the 245 participants, 30 were female and 215 were male. Having more male than female participants in this context was not surprising because men are more actively involved in the collection, processing, and marketing of MAPs.

During the meetings, topics discussed were the significance of MAPs for the environment and local economy, their availability in the area, conservation and cultivation techniques, and market demand. The meetings were conducted in houses identified by the respective committees. The participants were keen to learn about medicinal and economic value of MAPs found in their area. After the meetings, the participants were taken to the field around the villages for demonstrations on harvesting techniques and identification of valuable species.

CAPACITY BUILDING ON CULTIVATION, HARVEST, PROCESSING, AND MARKETING

After the completion of the general awareness-raising training, all participants joined formal basic trainings. The project's initial goal was to include 50 participants in formal training, and the number was increased because of community demand. Participants received three-day basic training on cultivation, harvesting, processing, and marketing of a number of selected species that are in high demand in local and national markets (Figs. 1, 2).

From the 245 participants, the 15 most active were selected for further advanced training on sustainable use and marketing of MAPs. This was an additional three-day training focused on marketing and availability of MAPs in Swat organized at the Agriculture Research Station in Swat District. The participants were mostly village activists. They were willing to travel to the MAP markets situated within and outside Swat to create market linkages, collect market information on MAPs, and help village-based collectors with collective marketing. In addition to the community members, staff of local NGOs and government departments (Forest Department, Agriculture Department, Social Welfare Department, and Women Development Department) participated in this training.

The various training sessions organized during the project period provided an excellent opportunity for creating and furthering linkages. Experts from the National Rural Support Program (NRSP), FAO, Qarshi Industries, and government line departments (Forest Department, Agriculture Department, and Social Welfare Department) were engaged for lectures and presentations on various topics. Linkages with these stakeholders, particularly the herbal industry and the Government Forest Department is crucial as the Forest Department is responsible for management of natural forests, including herbs, while the herbal industry is one of the main buyers of MAPs in bulk/raw form.

EXPOSURE VISITS, WORKSHOPS, AND SEMINARS

A workshop was organized during the last three days of each of the 10-day training periods. Resource persons from government and NGOs were invited for presentations and lectures on various topics concerning MAP development in Swat District. As mentioned above, 10 participants from government and NGOs were given the opportunity to attend the training and the three-day workshop. Experts from NGOs and government line agencies also delivered presentations and lectures on (1) the availability of MAPs and



Figure 2. Capacity building training: samples of medicinal and aromatic plants and collection tools displayed during training.

conservation needs in the district; (2) the role of the Government Forest Department of Swat District; (3) MAP processing and quality control; (4) MAP-based enterprise development by the NRSP; (5) the role of community trade associations in MAP development by the Community Services Program Swat District; and (6) cultivation potential in Swat District by the Government Agriculture Department of Swat.

Two exposure visits were organized for 35 of the participants. This included 30 community representatives (25 male and five female) and five representatives from the Forest Department. The first exposure visit was made to Qarshi Industries, Hattar, Haripur, Khyber Pakhtunkhwa. Given the

crucial role of processing and packaging MAPs, it was important that participants saw processing techniques and learned about quality standards required by the herbal industry. The participants were given presentations on processing and quality control by experts of Qarshi Industries. The participants were also shown MAP cultivation fields owned and managed by Qarshi Industries. The second exposure visit was organized after the completion of the 10-day training in May 2016. Participants from key stakeholders including community members and government line departments were taken to the major markets dealing with MAPs in Lahore. The participants received briefings on the

origin of raw material, trade routes, trade links, and prices of various MAP species.

DEVELOPMENT OF EDUCATIONAL MATERIAL ON MAPS

Information materials such as booklets and posters were developed and disseminated. Because the community members were the main target for these resources, the information was mainly printed in Urdu and illustrated with photographs of locally available MAP species. Brief English versions were also printed for circulation to donors and NGOs. The booklets contain information on the general importance of MAPs, their industrial and folk uses, and their collection and processing techniques. A total of 300 booklets (200 Urdu and 100 English) were disseminated to various stakeholders including communities, government line departments, NGOs, and educational institutions. A poster containing awareness messages on causes of degradation of MAPs and the need for their conservation was also produced and disseminated. The main message highlighted in the booklets and the poster is that sustainable management of forest and natural vegetation in general can result in increased income for the local users particularly if coupled with better marketing of MAPs.

PRESERVATION OF GENETIC MATERIAL

Herbarium specimens were made of the 20 focal MAPs documented in the ethnobotanical inventory. The plants were collected from the project area and preserved scientifically and labeled in accordance with ethnobotanical standards for preparing such specimens, including nomenclature, location from where it was collected, and general habitat of each species. Duplicate sheets were given to the village committees to use for guidance in preparing additional specimens from plants they collected locally. The original specimens were deposited in the herbarium of Centre for Plant Sciences and Biodiversity, University of Swat (SWAT). The information contained in the herbarium sheets will be highly useful for the village committees while making it possible to share such information with other stakeholders. For example, villagers will be able to share information on the herbarium sheets (local names, English names, scientific names, and other relevant information) with potential buyers with and outside Swat District. Such information is crucial for promoting MAP trade nationally and internationally.

CONCLUSIONS

It is important to emphasize that the communities have taken an immense interest in sustainable

development of MAPs, especially given the short term and relatively low-budget nature of this pilot project. It will take some time before the true impact of the project can be ascertained, but short-term benefits for the participating communities included the discovery that many of the weeds around their houses and in their agricultural fields are actually economically valuable species. In the past these species were used for fodder or fuelwood (Sher & Al-Yemeni, 2010). Increasing the interest of communities in making income out of these plants using sustainable methods will not endanger them (Myers et al., 2000; Salick et al., 2004; Mati & de Boer, 2011). Furthermore, enhanced capacity through cultivation and cash income through marketing of a greater range of species will decrease pressure on the few high-valued (some endangered) species that have been harvested both by the government and communities for income generation.

The project has achieved almost all objectives: more than 200 people received general awareness training; 245 received basic training on cultivation and processing while 20 people received advanced training on cultivation and harvesting techniques, processing, and marketing. Ten out of the 20 participants who received advance training were representatives of the government and NGOs. In addition, senior officials from the government and experts from NGOs participated in the training and workshops and delivered lectures and presentations. These interactions, particularly those between the community representatives and government officials, resulted in community empowerment. For instance, the community found that there is no ban on collection and marketing of most herbaceous MAPs. Further, they learned that they can cultivate and market a number of high-valued herbaceous MAPs that are currently in demand in the market. Through training, awareness raising activities, field demonstrations, and exposure visits the capacity of people in MAP development has been increased and linkages with government institutions and the market have been developed. Ten activists belonging to different villages of Swat District are now Master Trainers (MT) after receiving training and participating in exposure visits. These MTs are now local resource persons on MAPs and can contribute to development of MAPs and capacity building of other interested communities in Swat District. Awareness raising, better linkages between the government institutions and the communities, and cultivation of alternate species are expected to decrease reliance on harvesting of endangered species for cash income.

Provision of general awareness on MAPs to over 200 individuals has resulted in a spin-off effect in the entire target community, and a greater knowledge on the importance of MAPs. The 10-day training and workshop brought together the key stakeholders from the project area, creating linkages and increased understanding between key stakeholders about the environmental and economic importance of MAPs. The workshop was also helpful for these stakeholders in knowledge sharing and discussing other possible collaborative efforts in relation to MAP development in Swat District. The posters and booklets printed and disseminated toward the end of the project further highlight the importance of conservation and the need for collaborative efforts to ensure the long-term sustainable socioeconomic benefits of MAPs in Swat District.

In addition to the key achievements during the implementation of this project, we believe that the communities need to be further empowered for sustainable utilization of MAPs for income generation. This can be achieved through greater interaction of the government institutions and community and increased awareness and clarity on MAP-related regulations. Moreover, market surveys on demand and supply of the raw material and its availability in Swat District are crucial for quantifying the sustainability of MAP development.

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