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Poverty and Livelihood Impacts of a Medicinal and Aromatic Plants Project in India and Nepal: An Assessment

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A medicinal and aromatic plants (MAPs) project was implemented in Nepal and parts of India from 2005 to 2009 by the International Centre for Integrated Mountain Development to enhance the livelihood options and reduce the poverty of poor

rural households. The present study assesses the impact of the project on poverty and livelihood security using quantitative and qualitative data collected in a household survey, focus group discussions, and interviews with key informants. The project improved the skills and knowledge of producers and collectors MAPs in production, management, processing, and

marketing, as well as their negotiating power with traders. This helped increase household income and alleviate poverty. However, the project's impact varied across project sites. While an impact was quite visible in Nepal and Chhattisgarh, India, it was less visible in Himachal Pradesh, India. Factors responsible for the different levels of impact are analyzed, and lessons are drawn for future programs and projects. The findings suggest that locally available and commercially valuable natural resources, including MAPs, have the potential to improve the livelihoods of rural mountain people.

Keywords: Medicinal and aromatic plants (MAPs); poverty assessment; livelihoods; Hindu Kush–Himalaya; India; Nepal.

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Introduction

Despite attractive economic growth in some countries in South Asia, poverty remains a major development challenge, particularly in the Hindu Kush–Himalaya (HKH) region, for several biophysical and socioeconomic reasons (Hunzai et al 2011). Earning a livelihood in mountain areas is considerably more complex and difficult because of inaccessibility, fragility, and vulnerability arising from topographical complexity, altitudinal gradient, and poor physical and socioeconomic infrastructure (Jodha 2005; Rasul and Kollmair 2010). Rural mountain people in developing countries seem to be prone to poverty (Wymann von Dach et al 2006). Of the 210 million people in the HKH region, 66 million live in poverty and are highly vulnerable to climate and other global changes (Hunzai et al 2011).

An overwhelming majority of the poor in the HKH live in rural areas and depend heavily on nature-based goods and services, including forests and non-timber forest products (NTFPs). In India alone, 270 million people depend directly or indirectly on NTFPs, including medicinal and aromatic plants (MAPs), for their livelihoods (Rasul et al 2008). Thus, the livelihood security of rural mountain people depends greatly on the status

and condition of the natural resources available in the forests and their optimum utilization through enterprise development (Tiwari and Campbell 1997; Saxena 2003; Mahapatra et al 2005).

Realizing the importance of NTFPs for rural livelihoods, the International Centre for Integrated Mountain Development (ICIMOD) has undertaken a number of projects for the sustainable use and management of locally available and commercially valuable natural resources, including NTFPs, to enhance the livelihood options of the rural poor in the HKH region. One of these projects focused on the community-based management and sustainable use of MAPs and was implemented at 3 project sites in Nepal and India by national partners from 2005 to 2009. The objective of this project was to enhance livelihood options and reduce poverty in poor rural communities.

A growing body of literature (Edwards 1996; Olsen 1998; Acharya 2005; Antinori and Bray 2005; Belcher and Ruiz-Perez 2005; Donovan et al 2006; Rasul et al 2008) suggests that MAPs can help sustain and improve rural livelihoods through sustainable harvesting, improved market access, and value chain development. Diverse economic actors are involved in value chain activities such as collecting, domesticating, harvesting, trading, processing, and marketing MAPs. The sustenance and

livelihoods of these actors depend directly and indirectly on MAPs (Acharya 2005; Olsen and Bhattarai 2005). Despite growing interest in the potential role of MAPs in enhancing the livelihoods of poor mountain communities, empirical evidence based on primary data is limited, and most claims are based on anecdotal evidence (Paumgarten 2005).

It is, therefore, important to examine the extent to which ICIMOD's MAPs project has contributed to the alleviation of poverty and to draw lessons from it for the design of future programs and projects for livelihood improvement and poverty alleviation. Accordingly, this study was undertaken to

- Assess the impact of the MAPs project on poverty and the livelihoods of the target beneficiaries and
- Draw lessons and make recommendations for the design of future projects and programs in the sector for NTFPs in the HKH region.

The scope of the MAPs project was much broader than the objectives of the present study, encompassing the in situ and ex situ conservation of MAPs and promotion of the sustainable use of NTFPs. However, the focus of this study is the project's impact on poverty. While poverty has many dimensions—economic, social, political, and environmental—this study focused solely on income poverty. Although the study was conducted in India and Nepal, the lessons learned should be relevant to other mountain regions where rural people depend on nature-based goods and services for their livelihoods.

Project background and implementation mechanisms

Project areas

The project was implemented in Nepal and two states of India, namely, Chhattisgarh and Himachal Pradesh (Figure 1). Poverty is widespread in the project areas, and the rural poor depend heavily on MAPs for their sustenance and livelihoods. Nepal is one of the world's poorest countries; in 2004, it ranked 140 out of 177 countries on the Human Development Index (HDI) (Deshingkar 2006). Although Himachal Pradesh has made some progress, poverty remains pervasive in Chhattisgarh, which has an HDI value of 0.358 compared to the national average of 0.47 (Gandhi et al 2011). These sites were selected in consultation with national partners and government agencies.

In Nepal, the project was implemented in the Darchula and Baitadi districts in the Far Western Development Region. Although least developed economically, the districts of Darchula and Baitadi are rich in MAPs that the local people depend on considerably for their subsistence livelihoods and income (Bhattarai et al 2005).

In Chhattisgarh, the project was implemented in Dhamtari Forest Division, which has large forest areas rich in MAPs. Formed in 2000, Chhattisgarh is a new state, of which more than two-fifths is forestland. About a third of the population consists of tribal people who live in forest areas. The livelihoods and wellbeing of these indigenous people and other vulnerable sections of the rural population are intimately linked to the forests and its products. They earn their livelihoods and fulfill their basic needs by collecting and processing MAPs (Marothia 2009). Dhamtari is also a major *mandi* (a traditional market center in rural India, where traders buy agricultural products from rural people or intermediaries at auctions held on designated days). A large quantity of MAPs are traded from the Dhamtari *mandi* to markets in Delhi, Mumbai, and other large cities in India, from which they are supplied as raw material to pharmaceutical companies or exported.

Like Chhattisgarh, Himachal Pradesh is rich in MAPs, and MAPs have occupied an important position in the sociocultural and spiritual activities of the rural people for centuries (Ranjana et al 2008). ICIMOD's MAPs project was implemented in the Kangra district of Himachal Pradesh, the largest district in the state.

Interventions relating to poverty

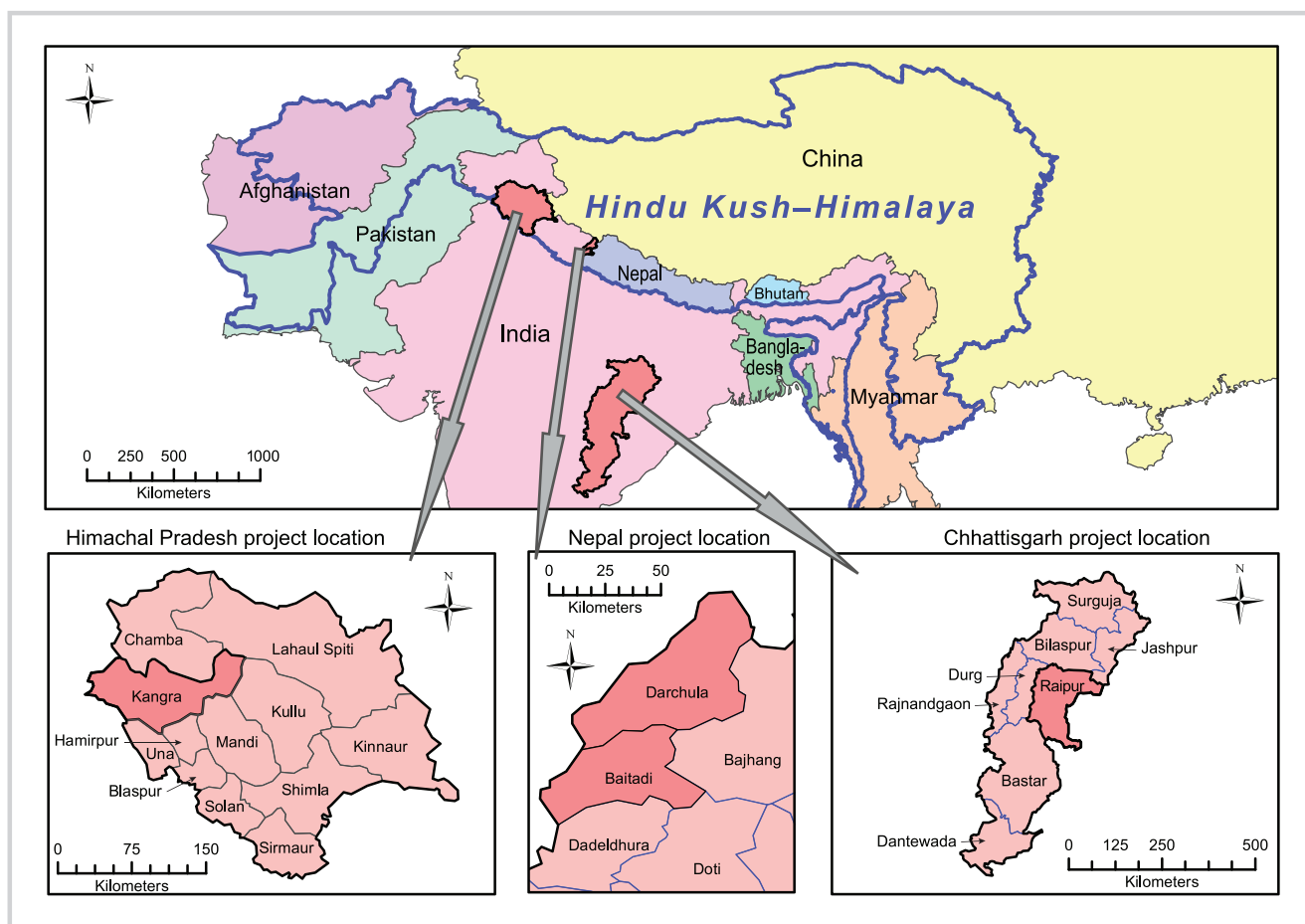
A number of interventions were made under the project to enhance the livelihood options and reduce the poverty of poor rural communities in the project areas. Although the focus of the project and the interventions varied slightly in the 3 project areas, most interventions were common and can be broadly categorized into 4 groups as part of an integrated approach focusing on value chain development (Scherr et al 2003):

1. Providing training to develop the skills and knowledge of producers and collectors of medicinal plants in the production, domestication, sustainable harvesting, processing, packaging, cooperative development, enterprise development, and marketing of MAPs (Figure 2);
2. Supplying quality planting materials, such as high-quality seed, seedlings, and other inputs;
3. Supporting community-based enterprise development and making machinery and other technology available for processing, grading, packaging, and extracting oil and essences from plants and seeds; and
4. Facilitating marketing through the establishment of producers' cooperatives in Nepal and development of local standards and a certification mechanism in India (a certification agency was established by the government of Chhattisgarh to ensure quality and produce a certificate for MAPs).

Implementation mechanisms

The project was implemented by national partners at each project site. ICIMOD was responsible for the overall

FIGURE 1 Map of study area. (Map by ICIMOD)



coordination, supervision, and backstopping of the project, and national partners were responsible for its implementation and management. Project participants were identified by ICIMOD's national partners. In Nepal, the project was implemented by the Canadian Centre for International Studies and Cooperation, a nongovernmental organization (NGO), and the Federation of Community Forestry Users of Nepal, an umbrella organization of community forestry user groups. In Chhattisgarh, the project was implemented by the Chhattisgarh State Minor Forest Produce (Trading and Development) Co-operative Federation (CGMFPF) in the state capital of Raipur, and in Himachal Pradesh, the project was implemented by Chaudhary Sarwan Kumar Himachal Pradesh Agricultural University.

Project outputs

Before the project, MAPs were not cultivated in the project areas. Collectors were unorganized and did not have access to technology, skills, market information, or business platforms. They were vulnerable to the dictates

of the traders and received low prices. Baseline information on prices and production of MAPs was collected for 2005, before the start of project interventions. Data on prices and income were collected for 2009, when the project ended.

The project trained 1070 people, established 15 nurseries in India and Nepal, and distributed 25,000 seedlings among project beneficiaries. Regular supervision ensured that the training and material inputs received by the beneficiaries were used properly. The project aimed to enhance livelihood options and reduce poverty through the sustainable use and management of MAPs. Figure 3 explains the expected impact pathway and process of the project.

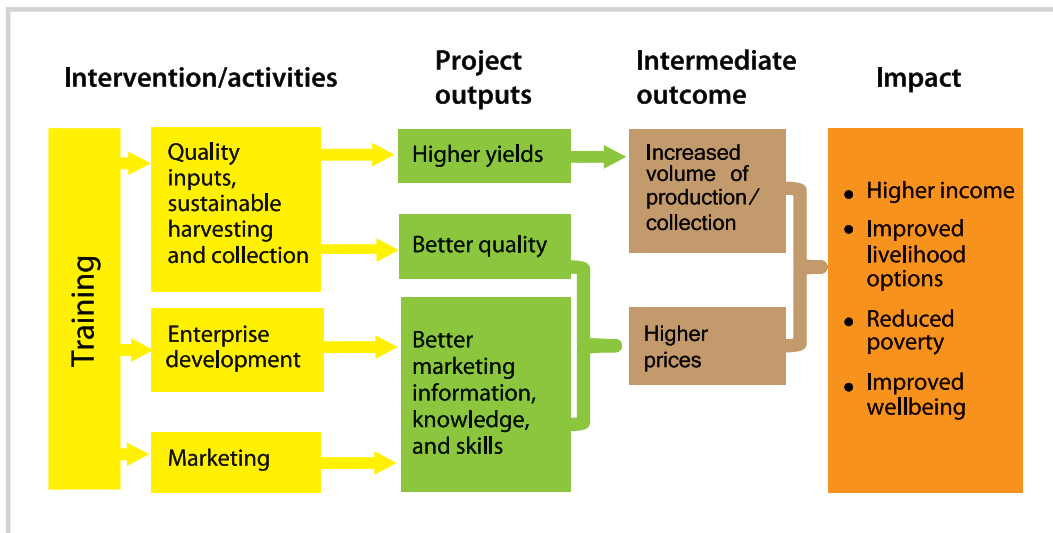
Methodology and data collection

A before-and-after approach was used to assess the impact of the project on poverty. Because of a lack of reference data on household income and other socioeconomic conditions, the "before" data were obtained using the recall method (following Deaton and

FIGURE 2 Training in organic production of MAPs in Nepal. (Photo by Nirmal Bhattarai)



FIGURE 3 Project impact pathway.



Grosh 2002) to analyze household income, expenditure, and poverty at a particular point in the past (Bamberger 2009). While the recall method is widely used when baseline data are not available, errors in recalling postintervention numerical data (price, income, etc) may lead to some bias in the assessment. Following the Asian Development Bank (ADB 2002) and Michalski and Cousins (2000), the study used qualitative information to gain insight and triangulate the survey data to minimize recall error.

Because there has recently been a marked increase in the combined use of qualitative and quantitative data (Garbarino and Holland 2009), quantitative and qualitative information were integrated and sequenced to enhance understanding of the impact of the project on poverty. Qualitative data were collected through focus group discussions and key informant interviews. Key informants were carefully selected and were key stakeholders, such as project participants, traders of NTFPs, forest departments, CGMFPF, NGOs, and community-based organizations working in NTFPs and the rural development sector. Eleven focus group discussions were conducted, one in each village, with project participants. The focus group members were selected to cover women and men, as well as representation from different age groups and ethnic affiliations.

Quantitative data were gathered through a household survey using a structured questionnaire. The household survey was conducted from December 2009–March 2010. The questionnaire was prepared in English and then translated into Hindi and Nepali. Questionnaires were administered through local consultants familiar with the local language and culture.

Data were collected from a total of 177 households in 11 villages (Table 1). Using a sampling frame developed from a list of project participants that was maintained by the implementing NGOs, 10% of participating households were randomly selected from each of the project areas. Multiple sources of information were triangulated to confirm and validate the information gathered from different sources.

Key findings: impact of the project

Changing management practices

The project provided participants with training in nursery techniques, methods of planting and sustainable harvesting, storage, drying, distillation, pressing, maceration, and extraction. Project participants applied their new skills and knowledge to the production, collection, harvesting, processing, and marketing of MAPs. Information collected through focus group discussions and key informant interviews suggests marked improvement in the production, processing, quality, and marketing of MAPs at the 3 pilot sites. As a result,

collection, production, management, and marketing practices changed significantly (Table 2). Training and other awareness-raising efforts helped improve project participants' skills and knowledge related to the production, management, processing, and marketing of MAPs, which has had a positive impact.

Production and productivity of MAPs

Data gathered through the household survey show that the density of medicinal plant species increased in the project areas. In Chhattisgarh, India, the number of plants per hectare in the protected area increased considerably in 2009 from the number in 2005. For example, the density of *aonla* (*Phyllanthus emblica*) increased 74%, *tikhur* (*Curcuma angustifolia*) increased 56%, *baichandi* (*Dioscorea hispida*) increased 56%, *kalmegh* (*Andrographis paniculata*) increased 48%, *harra* (*Terminalia chebula*) increased 43%, *satawar* (*Asparagus recemosus*) increased 31%, *nagarmotha* (*Cyperus scariosus*) increased 13%, and *baibiding* (*Embelia ribes*) increased 7%; *dhawai* (*Woodfordia fruticosa*) density did not increase (Supplemental data, Table S1; <http://dx.doi.org/10.1659/mrd-journal-D-11-00112.S1>). Similarly, the collection of different species of MAPs in Nepal increased considerably in 2009 from that in 2005 (Supplemental data, Table S2; <http://dx.doi.org/10.1659/mrd-journal-D-11-00112.S1>).

The quantity of MAPs collected in Nepal was measured per household, while in Chhattisgarh, it was per hectare. This is because in Chhattisgarh the project was designed for in situ management and harvesting under the People Protected Area Program of the government of Chhattisgarh, while in Nepal MAPs were harvested from community and government forests. Collectors in Nepal were thus asked to recall their individual harvests, while in Chhattisgarh, the quantity was documented from 37 sample plots on the 750-ha in situ conservation area at the start of the project.

Discussions with focus groups suggest that the project interventions—particularly training in planting and domestication of medicinal plants, sustainable harvesting mechanisms, and species ecology; the supply of improved quality seeds and seedlings; and community mobilization and awareness raising—contributed significantly to increasing the production of MAPs per hectare. The project was also able to engage key stakeholders such as government agencies, the private sector, and NGOs. In Chhattisgarh, for instance, the project engaged the Forest Department, which was instrumental in developing improved infrastructure (storage, processing, etc) and links with the private sector. Partnerships with the Forest Department and other stakeholders helped establish group certification in Chhattisgarh and enhanced the negotiating power of producers and collectors, thereby increasing income and reducing poverty. Improved marketing facilities and higher prices for MAPs also

TABLE 1 Distribution of sample respondents.

Respondents	Nepal		Himachal Pradesh, India		Chhattisgarh, India		Total ^{a)}
	No.	%	No.	%	No.	%	
Male	33	62	27	91	78	83	138 (78)
Female	20	38	03	09	16	17	39 (22)
Total sample HHs	53	100	30	100	94	100	177 (100)
Total beneficiary HHs	527		305		938		1770

^{a)}Figure in parentheses is percentage.

Source: Household survey, 2010.

HHs, households.

motivated producers and collectors to take more care of the plants.

Marketing and prices of MAPs

Producers of MAPs and other NTFPs often receive relatively low prices for their products because of low volume, remoteness, poor transportation and marketing, and lack of market information and storage and processing facilities (Bhattarai and Karki 2004; Choudhary et al 2008). Hence, an important component of the project was the provision of support for marketing and enterprise development to target beneficiaries. The results of the household survey show that producers and collectors received significantly higher prices for MAPs after the project. For example, in Chhattisgarh, the

market price for a number of MAPs increased several times: *dhawaiphool* (*W. fruticosa*) saw a 380% increase, *kalmegh* (*A. paniculata*) increased 350%, *nagarmotha* (*C. scariosus*) increased 167%, *tikhur* powder (*C. angustifolia*) increased 100%, *aonla* (*P. emblica*) increased 80%, *baichandi* (*D. hispida*) (chips) increased 67%, and *baibiding* (*E. ribes*) increased 25% (Supplemental data, Table S3; <http://dx.doi.org/10.1659/mrd-journal-D-11-00112.S1>). The greatest increase was for *dhawaiphool*, which increased to about 5 times the price before the project, and the lowest was for *baibiding*, which more than doubled. Similarly, in Nepal, producers and collectors of MAPs now receive a considerably higher prices for *chiraito* (*Swertia chirayita*), 130%; *jhyau* (*Parmelia nepalensis*), 100%; *ritha* (*Sapindus mukurosii*), 86%; *tejpat* (*Cinnamomum tamala*), 66%; *amala*

TABLE 2 Changing management practices after project intervention.

Management practice	Before	After	Impact
Technology	No processing and extraction technology	Processing and extraction technology introduced	Easier and more hygienic grinding and extraction process
Collection and harvesting practices	Reckless collection with disregard for maturity of products or destruction of plants	Selective harvest of mature and good-quality products using nondestructive methods	Less damage to MAPs and other NTFPs, good regeneration
Marketing	Individual	Group marketing through cooperatives and with certification	Increased cooperation, better trust and reliance, increased bargaining power, higher prices
Packaging	No packaging	Packaging used for some products	Better shelf life and higher prices for products using packaging
Processing	No or limited processing	Standard processing used	Processed projects sold in markets for higher price as a result of value addition

Source: Based on focus group discussions and key informant interviews.

(*Parmelia emblica*), 50%; *sugandhwal* (*Valeriana jatamansii*), 50%; *yarshagumba* (*Ophiocordyceps sinensis*), 42%; *dalchini* (*C. tamala*) (bark), 33%; and *timur* (*Zanthoxylum armatum*), 20% (Supplemental data, Table S4; <http://dx.doi.org/10.1659/mrd-journal-D-11-00112.S1>). Prices for all MAPs studied in Nepal doubled.

However, it is difficult to determine which factors contributed to the higher prices received by producers and collectors and the extent to which higher prices are an outcome of the project. A number of factors may have contributed to increased market prices, including inflation, which is around 5 to 6% per annum. However, inflation alone does not explain the increase in prices obtained by project beneficiaries.

An index developed based on the perceived benefits of the project indicates that the project contributed significantly to linking beneficiaries to regional and national markets for MAPs. It also increased the business skills of the beneficiaries and enhanced their knowledge of marketing through training and networks. The project helped increase the quality of the products through training in packaging and processing, introduction of standards and good practices, and the establishment of facilities for the processing and packaging of MAPs as community-based enterprises at different locations accessible to project beneficiaries (Figure 4). The bargaining power of producers and collectors was increased by forming producer groups, establishing cooperatives, and linking traders to producer and collector groups. Information gathered in focus group discussions suggests that all of these interventions helped increase product quality, reduce reliance on middlemen, enhance the bargaining power of producers and collectors, and reduce marketing costs, thereby paving the way for producers and collectors to procure higher prices.

Household income

Although poverty has multiple dimensions, income is an overriding factor, because many other factors that contribute to poverty are directly or indirectly related to low income. The study revealed that the contribution of MAPs to household income was quite substantial in all 3 project areas, although there were considerable differences among them (Table 3). The contribution was greatest in Nepal (21%) and lowest in Himachal Pradesh, India (15%). In Chhattisgarh, India, the contribution of MAPs to household income was 19% on average. These differences in contribution can be attributed to multiple factors, such as the availability of MAPs, alternative livelihood options, and the availability of marketing and other facilities. Besides these differences in the contribution of MAPs to household income (as reflected in the standard deviation), great variations were also observed within each project area. While the average contribution of

MAPs was about 20% of household income, for some households, this contribution was as high as 50%, while for others it was less than 10%.

Given the importance of MAPs to household income, one of the thrusts of the project was to increase household income through the optimal use of locally available MAPs. The survey revealed that income from MAPs (at 2009 prices) increased significantly for participating households over the project period (Table 4). The greatest increase was in Nepal, where household income increased about eightfold, and the lowest was in Himachal Pradesh, India, where it nearly doubled. In Chhattisgarh, India, household income more than doubled over 5 years, from Indian rupees (INR) 2146 in 2005 to INR 6565 in 2009. The mean difference between income in 2005 and 2009 was statistically significant in Nepal and Chhattisgarh. The increase in income in Himachal Pradesh, however, was not statistically significant.

So why was the impact of the project on poverty significant in Nepal and Chhattisgarh but not in Himachal Pradesh? Information gathered through focus group discussions suggests that the reason was the establishment of a link with the People's Protected Area and joint forest management in Chhattisgarh. Similarly, in Nepal, the project was linked to the community forestry program, which created synergies, influenced policy, and helped develop a market network; this led to better prices and enhanced household income. In Himachal Pradesh, no such link was developed, because the focus of the project was on providing training in growing organic products, producing organic compost, and processing of NTFPs—without creating marketing opportunities. While training and demonstration programs have raised awareness and increased organic production and sustainable harvesting, inadequate marketing facilities and, in particular, lack of a premium price for organic MAPs has prevented producers from obtaining a higher price for organic products, which was the immediate need of participants to realize benefits from the project.

Although household income from MAPs is not very high, our discussions with participants suggested that this income increased the household's safety net, reduced economic vulnerability, and enhanced livelihood options. It also created new employment opportunities in the fields of processing, packaging, and marketing. In particular, poor women's employment opportunities increased through participation in income-generating activities. In Chhattisgarh, for instance, 1457 people—both women and men—were involved in collection and domestication of prioritized species of MAPs promoted by the project, and 128 people were involved only in processing (CGMFPed 2008).

Even though household income increased at all 3 pilot sites, it is important to ascertain the extent to which the

FIGURE 4 Improved primary processing of MAPs. (Photo by Golam Rasul)



project actually helped reduce poverty, particularly among the poorest of the poor. To determine this, the respondents were classified into two groups: households with annual income below the national poverty line and households with annual income above the national poverty line. Following the guidelines set by the National Planning Commission of Nepal in 2004 and the United Nations Food and Agriculture Organization in 2007, households with income equal to or less than Nepali

rupees (NPR) 36,000 (per annum) were considered below the poverty line and households above this were taken to be above the poverty line in Nepal. The Census of India for 2001 sets the poverty line in rural India at INR 356 per person per month and the mean household size at 5.3 people (GoI 2004a, 2004b). Accordingly, households in India with incomes less than INR 22,641 (per annum) were considered to be below the poverty line and households above this were considered to be above the poverty line.

TABLE 3 Contribution of MAPs to household income in 2009.

Project area	Total average annual household income (in local currency)	Income from MAPs	
		Local currency ^{a)}	%
Nepal (NPR) ^{b)}	54,230	11,388 (25,650)	21
Himachal Pradesh, India (INR)	36,806	5521 (11,700)	15
Chhattisgarh, India (INR)	34,555	6565 (15,300)	19

^{a)}Figure in parentheses is standard deviation.

^{b)}INR 100 = NPR 160; 1 USD = 45 INR and 73 NPR in 2010.

NPR, Nepali rupees; INR, Indian rupees.

TABLE 4 Increase in annual household income from MAPs during the project period (2005–2009).

Project area	MAP income before project intervention in 2005 ^{a)}	MAP income after project intervention in 2009 ^{a)}	Difference in MAP income	% increase
Nepal (NPR)	1206 (4382)	11,388 (12,217)	10,182**	844
Himachal Pradesh, India (INR)	1922 (1153)	5521 (2658)	3599	187
Chhattisgarh, India (INR)	2146 (1300)	6565 (4859)	4419*	206

^{a)}Figure in parentheses is standard deviation.

* \dagger is significantly different at the 0.10 level.

** \dagger is significantly different at the 0.05 level.

Source: Household survey, 2010.

The study found that the percentage of households below the poverty line dropped from 53% in 2005 before project implementation (Nepal 49%, Himachal Pradesh 47%, and Chhattisgarh 57%) to 41% after the project in 2009 (Table 5). Similarly, the percentage of households above the poverty line increased at all 3 sites, from 45% in 2005 to 62% in 2009. However, the shift of households from below the poverty line to above the poverty line was not uniform at all 3 sites. While 17% of households in Chhattisgarh moved out of poverty, only 7% of the households in Himachal Pradesh and 8% in Nepal moved above the poverty line. The relatively higher percentage of households moving out of poverty in Chhattisgarh can be attributed to other poverty implementation programs, such as the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), which guarantees the rural poor 100 days of employment per year at INR 100 per day. Hence, these figures must be viewed with caution, because it is impossible to discern the exact effect of the different projects and factors affecting poverty, including normal trends in prices and inflation.

Factors contributing to increased household income

To ascertain the role of the MAPs project in mitigating poverty, respondents were asked their impressions of the impact of the project on poverty and livelihoods, particularly the contribution of project interventions to increasing their household income and reducing poverty. The overwhelming majority (73%) of respondents reported that the higher prices obtained for MAPs and their products after project implementation were the main contributor to increase in their household income, followed by increased marketing skills and better bargaining power (68%). Just under 40% of households mentioned that improved market linkages contributed to increased household income. Product development, however, was perceived to have had limited impact, with only about 20% of respondents considering it to have augmented household income (Figure 5).

There is, however, considerable variation among the responses from the different project sites. While 96% of households in Chhattisgarh considered higher prices to be a major contributor, in Himachal Pradesh only 30% of the household surveyed perceived this factor to have contributed to their household income. In Nepal, almost half of the respondents were of the opinion that higher prices contributed to their increased income from MAPs. Similarly, there is a huge variation in perceptions of the contribution of higher productivity to household income. While half of the respondents in Himachal Pradesh identified increased productivity as a contributing factor to household income, just over one-third of the respondents in Chhattisgarh and less than one-third of the households in Nepal thought that greater productivity was responsible for increased household incomes. Likewise, there was considerable variation in the responses from the 3 project sites about the contribution of product development and improved marketing facilities.

Discussion and conclusion

The aim of this study was to assess the impact of the MAPs project on poverty and livelihoods of the target beneficiaries implemented in Nepal and India and draw lessons for future interventions in the MAPs subsector. Using recalling methods, we tried to assess the level of poverty and income change among the participants' households due to project intervention. Although the recalling method is used widely in evaluation studies (Garbarino and Holland 2009), it suffers from the limitation of possible error in recalling preintervention numerical data. To overcome such limitations, we used qualitative information to complement quantitative data. Our analysis based on quantitative and qualitative information suggests that the project helped increase income and reduce poverty among project participants, as well as improve the skills and knowledge of producers and collectors of MAPs in production, management, processing, and marketing. The integrated approach

TABLE 5 Poverty levels before and after the project.

Poverty level		Nepal		Himachal Pradesh, India		Chhattisgarh, India		Total frequency (n = 177) ^{c)}
		Frequency (n = 53)	%	Frequency (n = 30)	%	Frequency (n = 94)	%	
Before project in 2005	Below poverty line ^{a)}	26	49	14	47	54	57	94 (53)
	Above poverty line ^{b)}	26	49	16	53	37	39	79 (45)
After project in 2009	Below poverty line ^{a)}	22	41	12	40	38	40	72 (41)
	Above poverty line ^{b)}	31	58	18	60	57	66	106 (62)

^{a)}Below poverty line: Nepal \leq NPR 36,000 per annum; India \leq INR 22,641 per annum.

^{b)}Above poverty line: Nepal $>$ NPR 36,000 per annum; India $>$ INR 22,641 per annum.

^{c)}Figure in parentheses is percentage.

Source: Household survey, 2010.

taken by the project in skills development in production, processing, marketing, and value chain development generated a number of direct and indirect benefits for the project participants, including higher prices and increased income. It also enhanced their negotiating power with traders. The enhanced capacity among producers and collectors has enabled communities to engage in small-enterprise development in relation to NTFPs and MAPs. The engagement of beneficiaries in project activities exposed them to markets and the benefits of cooperative efforts.

However, the contribution of the project to increasing household income was not equal at all 3 project sites. While it was statistically significant in Nepal and Chhattisgarh, it was statistically insignificant in Himachal Pradesh. Discussions with participants suggested that the relatively low impact on poverty in Himachal Pradesh may be because of the focus on organic production and knowledge generation. While participants' knowledge of planting increased, this did not translate into increased income for producers because of inadequate marketing facilities and the high cost of labor in the organic production of MAPs. In addition to this, MGNREGS was implemented in Himachal Pradesh in 2005, providing people with immediate income and decreasing their interest in growing MAPs, which produce returns only after 2 or 3 years.

While it is clear from both quantitative data and participants' perceptions that the project had positive direct and indirect impacts on their lives, this must be interpreted cautiously, because it is often challenging to isolated project impacts from wider societal changes.

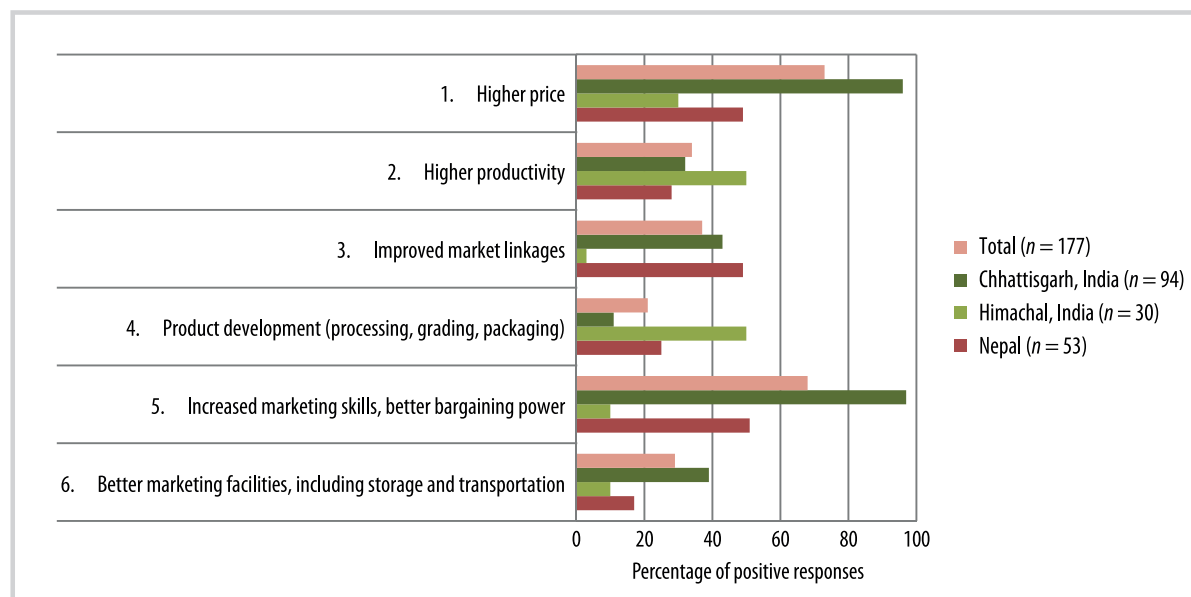
Whatever methods we use—"before" and "after" or "with" or "without"—a certain level of estimation error might remain.

Lessons learned

This study provides important insights for mountain development practitioners and policy-makers in relation to livelihood improvement and poverty reduction in rural mountain communities that depend on available natural resources for livelihoods. An important lesson that emerged from the project is that the success of a development project depends largely on project design and understanding the needs and priorities of project participants, as well as the challenges and opportunities they face in project participation. For a project to have an impact on poverty, it must be well matched to the needs and priorities of beneficiaries. If the project scope does not match the beneficiaries' priorities, the outcome may be affected, as happened in Himachal Pradesh: Despite serious efforts, the impact of the project on poverty in Himachal Pradesh was insignificant because of inadequate attention to the needs and priorities of beneficiaries during the design and implementation of the project, particularly in creating market opportunities for organic MAPs.

Another important lesson that emerged was that a project's success depends on the extent to which it can link with other similar projects to bring about synergies. The success of the project in reducing poverty in Nepal and in Chhattisgarh, India, would have been impossible without the links with People's Protected Areas and joint forest management in India and the community forestry

FIGURE 5 Respondents' perceived reasons for increased household income. (Household survey, 2010)



program in Nepal. Engaging key stakeholders, including the Forest Department and NGOs working in similar projects, contributed significantly to the development of group certification in Chhattisgarh, influenced policy changes in developing improved infrastructure for storage and processing, and helped establish links with the private sector.

The success of a project also depends on how the influence of external factors, such as the introduction of MGNREGS in 2005, is managed. MGNREGS had an unintended influence on the project outcome, both in Himachal Pradesh and in Chhattisgarh, as interest in growing and collecting MAPs decreased because of the availability of alternative employment opportunities created by MGNREGS. However, the development of better marketing facilities, including linking producers and collectors with traders in Chhattisgarh such as

government agencies, helped mitigate the impact of MGNREGS on the MAPs project.

The findings of this study suggest that locally available and commercially valuable natural resources, including MAPs, have the potential to improve the livelihoods of rural mountain people. Our findings are supported by the studies of Roy (2010) and Olsen (2005). However, to tap this opportunity, future projects aimed at the commercialization of MAPs need to take an integrated approach to skill development in production, processing, marketing, and value chain development. Special attention needs to be paid to project design so that project activities match the needs and priorities of both female and male participants. Better coordination among the different stakeholders, including producers, harvesters, processors, traders, NGOs, and government agencies, is required to optimize the benefits of such projects.

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SUPPLEMENTAL DATA

TABLE S1 Changes in density of MAPs in People's Protected Areas in Chhattisgarh, India.

TABLE S2 Average quantity of MAPs collected by households in Nepal in 2005 and 2009.

TABLE S3 Price increases for selected MAPs in Chhattisgarh, India, after project intervention.

TABLE S4 Price increases in selected MAPs at the district level in Nepal after project intervention.

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