

**From Shifting Cultivation to Sustainable Livelihood Creation:  
Strengthening Marginalised Communities through  
Institutional Development and Microfinance for Agroforestry  
and Energy-efficient Technologies**

**– Assessment of an UNDP GEF Small Grant Project  
in Makawanpur District, Nepal –**



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Forest Conservation, Livelihoods and Rights Project  
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**Cover photo:** *Chepang* farmer with her children, Polaghari (Manahari VDC). Photo credit – López-Casero

## Foreword

The Ryutaro Hashimoto Asia Pacific Forum for Environment and Development (APFED) Awards for Good Practices were launched in 2006 to acknowledge the commendable practices of organisations in promoting sustainable development in the Asia-Pacific region, and to disseminate information thereon to a wide range of stakeholders with a view to sharing and replicating those good practices. Six projects were chosen in 2008. Building upon these award winning cases, the APFED members requested the Institute for Global Environmental Strategies (IGES) as APFED Secretariat to facilitate the conduct of case studies to provide a more in-depth study into the progress of the award winning cases and how other projects may learn from them. IGES, wherever possible, is to facilitate this undertaking in collaboration with the member organisations of the Asia-Pacific Regional Network of Research Institutions for Environmental Management and Sustainable Development (NetRes) or alternatively with the local academics who have expertise in the subject matter of the aforementioned case study.

The APFED Gold Award 2008 was bestowed upon the Manahari Development Institute-Nepal (MDI-Nepal) in recognition of its outstanding contribution in promoting environmental management and sustainable development under the project entitled “Mitigation of the Effects of the Carbon dioxide and other Greenhouse Gases by Controlling Slash and Burn Practices.” The project was conducted in the northwest of Makawanpur District in Nepal and funded by United Nations Development Program (UNDP) / Global Environment Facility/Small Grants Program (GEF/SGP). Mr Khop Narayan Shrestha, Coordinator of the MDI-Nepal, received the APFED gold award in the award giving ceremony organised at the 4<sup>th</sup> Plenary Meeting in Davao, the Philippines on 25 July 2008. This Gold Award carries a purse of USD 20,000.

This report presents a case study of the awarded project and is based on a survey conducted from 17 to 21 March 2009 in the project area with full support provided by the project implementer. The survey was led by Federico López-Casero Michaelis (IGES) and the research team included Ukesh Raj Bhujra as a local collaborator. We are grateful to Henry Scheyvens and Enrique Ibarra Gené for their comments and thoughts on a draft of this report.

Special thanks are due to the South Asian Institute of Technology (SAIT), particularly to its Executive Director, Mr Pramod Pradhan, for facilitating the field survey. The research team also appreciates the full organisational assistance provided by the project implementer, MDI-Nepal, and its staff during the survey. The research team owes its gratitude to the communities of Manahari, Handikhola, Kankada, and Raksirang Village Development Committees of Makawanpur District, Nepal, for their wonderful hospitality during the survey.

We are also grateful to Emma Fushimi for proofreading the report. The authors alone are responsible for any errors in fact.

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## Acronyms

<b>AMC</b>	Agroforestry management committee
<b>APFED</b>	Asia Pacific Forum for Environment and Development
<b>CETF</b>	Community Environment Trust Fund
<b>DANIDA</b>	Danish International Development Agency
<b>FAO</b>	Food and Agriculture Organisation of the United Nations
<b>GEF/SGP</b>	UNDP Global Environment Facility/Small Grants Program
<b>GTZ</b>	Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)
<b>ICS</b>	Improved cooking stoves
<b>IGES</b>	Institute for Global Environmental Strategies
<b>MDI-Nepal</b>	Manahari Development Institute-Nepal (Project implementer)
<b>NPR</b>	Nepalese Rupee (Average exchange rate for the period 1 August 2005 – 30 November 2006: 1 USD = 74.9 NPR)
<b>NTPF</b>	Non-timber forest product
<b>PAF</b>	Poverty Alleviation Fund
<b>SAIT</b>	South Asian Institute of Technology
<b>SALT</b>	Sloping Agricultural Land Technology
<b>SCG</b>	Saving and credit group
<b>UNDP</b>	United Nations Development Program
<b>USD</b>	United States Dollars
<b>VDC</b>	Village Development Committee (smallest local administrative unit in Nepal)
<b>WFP</b>	World Food Programme



# 1. Assessment design

## 1.1. Research objectives and components

The main objective of the APFED Award case studies is to conduct an in-depth analysis of the good practice in the award winning cases through: a) examining the key features/components of the project; b) identifying and analysing how the good practice was realised or facilitated, (clearly identifying conditions/interventions both intentional and circumstantial); and, c) drawing lessons from the experience by being able to recommend replicable components or instruments which were key to realising the good practice.

The case study of “Mitigation of the Effects of the Carbon dioxide and other Greenhouse Gases by Controlling Slash and Burn Practices” (hereafter: “GEF/SGP project”) is structured as follows:

- Assessment design
- Key project features
- Field observations and project activity assessment
- Conclusions
- Recommendations.

## 1.2. Assessment Framework

Based on information initially provided by the implementer, a critical assessment framework was developed for assessing the project against its overall and its specific objectives, considering the outputs under each of the project activities. The framework included the following broad approaches:

- **Input monitoring:** Were project resources (money, technical support, equipment, credit, etc.) utilised on time and for the required purposes?
- **Process monitoring:** Was the project implemented in an efficient and participatory way, and is the project accessible to all sectors of the target population – including women?
- **Output monitoring:** Did the project produce the required outputs (improved agroforestry, energy saving technologies, institutional development, provision of credit, etc.)?
- **Impact evaluation:** Is the project producing the intended impacts on the target population and environment (increased income, improved health, increased women’s participation in community management, increased biodiversity etc.)?
- **Sustainability assessment:** Are the facilities and services introduced by the project sustainable financially, institutionally and environmentally (agroforestry schemes, land use and energy saving technologies, credit repayment, maintenance and application of agroforestry methods)?
- **Replicability assessment:** Can the project be replicated? Further questions include: Are there certain pre-existing conditions necessary for its success? What components are essential?

### **1.3. Methodology**

The assessment was conducted in the following seven steps:

#### **Step 1: Site Selection**

The GEF/SGP project involved four Village Development Committees (VDCs) – the smallest local administrative units – (Manahari, Handikhola, Raksirang and Kankada) in north-western Makawanpur District. A number of households and community organisations in several settlements within three of the four VDCs were selected through consultation with the project implementer (see Appendix). The assessment team interviewed project participants of the Chepang, Tamang and Dalit communities. Due to its rather remote location, Kankada VDC was only visited for a meeting with the members of an agriculture cooperative.<sup>1</sup>

The primary selection criterion was the prospect of obtaining information on all the activities of the project in the most representative way possible given the short duration of the stay. While some activities like banana planting were conducted in all the visited sites, others – such as biogas and vermicomposting – were limited to a few settlements. Therefore, the selection strategy was twofold: to include the most representative sites for the common activities as well as sites where the less common activities could be observed.

#### **Step 2: Composition of the research team**

Because the assessment covers economic, social and environmental issues, the research team included two experts in the fields of environmental conservation, community development, participatory rural appraisal, and gender analysis. It consisted of a researcher of the IGES Forest Conservation, Livelihoods and Rights Project and the local collaborator, Conservation Director of Nepal Nature Dot Com, Mr. Ukesh Raj Bhujju.

#### **Step 3: Collection of secondary data**

With the assistance of the project implementer, the materials collected and analysed included the project implementer's application form for the APFED award and the data sheet, reports, development plans and awareness materials (including audio-visual material).

#### **Step 4: Decision on entry strategies**

The decision on entry strategies was primarily made by identifying the key stakeholders. The itinerary and field plans were prepared upon consultation with the implementer, and the main stakeholders were informed at least two days before the scheduled meetings.

#### **Step 5: Fieldwork**

The fieldwork was arranged on the basis of discussions between the team members and SAIT, IGES and MDI-Nepal. During fieldwork, three major activities were conducted, namely site observations,

---

<sup>1</sup> However, near Manahari Bazar, the team also coincidentally met and interviewed one representative from Shikhardanda in Kankada VDC.

interactions with the communities and implementer through focus group discussions, and interactive meetings and interviews using checklists. The checklists were primarily based on the progress report prepared by the project implementer.

#### Step 6: Information analysis

The team members discussed the findings both on the spot in the presence of the target groups and the project implementer and also separately, to analyse the findings and draw recommendations. The methodology for analysis consisted of an assessment against the target indicators and objectives of the project employing the above framework. The conclusions draw primarily from the observations made and information obtained during the 4-day field survey (see the Appendix for details), a review of various project-related documents provided by the implementer, and a consultative meeting with line agency and NGO representatives to obtain their feedback on the project findings.

#### Step 7: Report preparation

The report was drafted in two stages. The first and second drafts were prepared by the team members and were shared with the project implementer for feedback, before the draft report was finalised.

## 2. Key project features

This section briefly introduces the project implementing organisation, the project area and its environmental and social challenges, and the project activities and indicators.

### 2.1. Implementing organisation: MDI-Nepal

The Manahari Development Institute – Nepal (MDI-Nepal) was founded on 19 September 2001 by professionals affiliated with various developmental non-government organisations. It has 25 staff members, some of whom are based at the project sites.

Registered in the District Administration Office of Makawanpur (Regd. No. 744/057/58) and affiliated with the Social Welfare Council of Nepal (SWC affiliation number 13918), MDI-Nepal is a non-governmental organisation that primarily has strengths in agriculture and related subjects such as small irrigation, rural roads and drinking water. During its short history of eight years, it has implemented a series of projects on agricultural development, poverty reduction and basic infrastructure development. MDI-Nepal has implemented several projects to improve the livelihoods of the rural poor primarily through interventions in agricultural, environment and water sectors. MDI-Nepal's main priority has been to ensure food and income security to the vulnerable and disadvantaged people of the rural society. During the field survey, the personal motivation and drive of the staff was observed to be very high.

MDI-Nepal has acquired substantial experience in improving crop productivity of rainfed farm lands through providing technical support for farming practice and the development of small-scale irrigation systems. MDI-Nepal has introduced innovative water acquisition and application technologies such as water harvesting tanks, infiltration galleries, drip irrigation and sprinklers. It is a leading institution in the management of sloping uplands (shifting cultivation or slash and burn farming areas) through terracing and cultivation of high value crops along with the use of water harvesting technologies. The district government has recognised MDI-Nepal's efforts in assisting nearly 5,000 rural farmers escape from poverty and food insecurity by proper utilisation of land and water resources. It has also facilitated the process of establishing community-based institutions.

The main activities of MDI-Nepal are:

1. Social mobilisation
  - a. Building community organisations
  - b. Capacity development of local cadres
2. Rural infrastructure development
  - a. Small/micro irrigation
  - b. Drinking water supply
  - c. Rural roads
  - d. Marketing centres

3. Livelihood promotion
  - a. Appropriate agricultural technologies
  - b. Cash crop (vegetables, non-timber forest products, fruits) and livestock production, marketing
4. Environmental sustenance
  - a. Land degradation: Focus on Sloping Agricultural Land Technology (SALT) in marginal lands
  - b. Climate change mitigation

Apart from the GEF/SGP project, MDI-Nepal has conducted projects funded by the World Food Programme, the Poverty Alleviation Fund, GTZ and other donor institutions. MDI-Nepal has built a rural road under a food-for-work programme and established a lift irrigation scheme in Rajaiya and several fish ponds in the Churia settlements, Handikhola VDC.

## **2.2. Geographic and socio-economic conditions and challenges of the project area**

### **2.2.1. Project area and participants**

The project was conducted in an area managed by the Manahari, Handikhola, Kankada and Raksirang VDCs of north-western Makawanpur district, in the mid-hills of Nepal. The project site targeted 429 ha of slope land under serious threat of degradation. The project has involved a total of 1,524 tribal households of Chepang and Tamang communities in different project interventions.

Makawanpur, a typical mid-hill district of Nepal, has a total land area of 242,600 ha, but less than 7% is classified as cultivable land. The remaining 93% of the land is under serious threat of soil erosion and landslides, due to deforestation, slash and burn agriculture, and other unsustainable land uses. These threats to the environment are also threats to the livelihoods of local people.

### **2.2.2. Environmental challenges: Shifting cultivation in the project area**

Slash and burn, or shifting cultivation, is an age-old rotational agroforestry practice adopted mostly by indigenous people in many parts of the world. In Nepal, this practice is known as *khoriya* and is a dominant farming practice in many districts of the country. Under shifting cultivation both gentle and steep slopes are cultivated and then left fallow for several years to regain soil productivity/health. The practice generally includes the slashing of bushes, the burning of dried branches and the sowing of crops.

In north-western Makawanpur, shifting cultivation is observed mostly in rugged terrain on steep slopes and stony red soils in the sloping uplands. The system functioned well while the population pressure on the land was low and the livelihoods of the shifting cultivators were based on subsistence. However, due to an increase in population pressure and the number of farming communities, this sloping land use system is no longer sustainable. The cycle of shifting cultivation has declined from 15-20 years to just three to four years and, most recently, even one year. In the project area the practice of *khoriya* is observed mostly on slopes greater than 30 degrees, with 57%

of the land in the range of 31 to 40 degrees, where it causes serious problems of soil erosion and landslides. Recently, shifting cultivation has also become a major concern because it is associated with deforestation, loss of biodiversity, threat of forest fire, emissions of CO<sub>2</sub> and other greenhouse gases, and soil erosion. The use of kerosene for lighting and of fuelwood for cooking also raises environmental concerns. The causes and effects of environmental problems in the project area are illustrated in Figure 1.

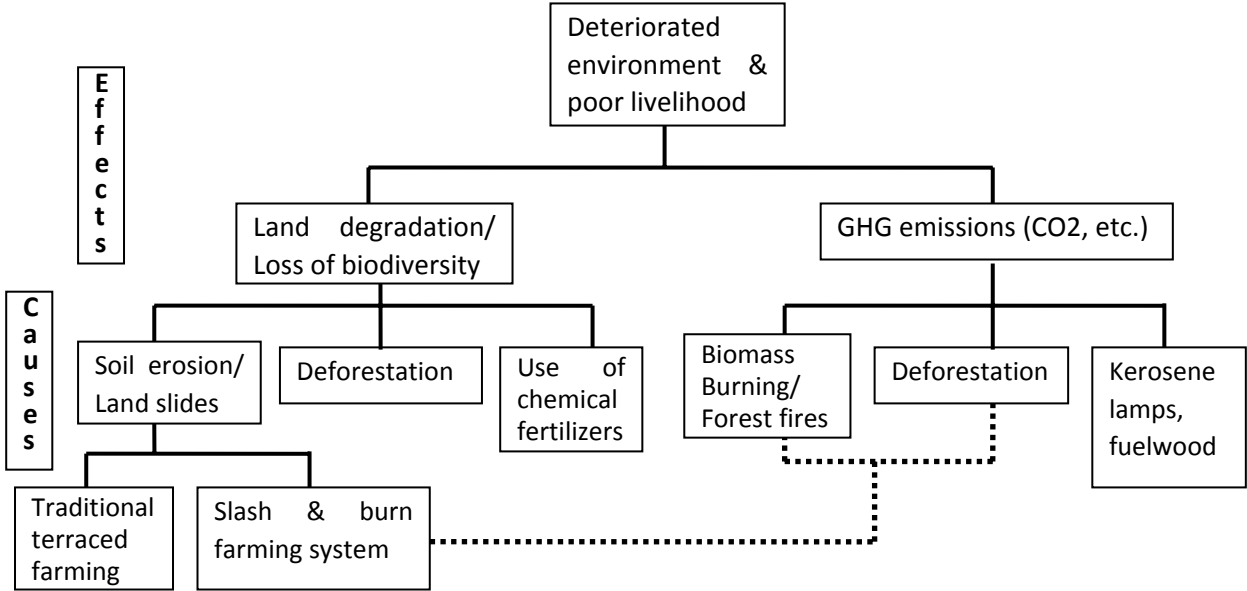


Figure 1: Environmental problem tree (Source: modified from UNDP GEF SGP 2008)

**2.2.3. Socio-economic challenges: Marginalised communities and food security**

In Makawanpur, shifting cultivation is widely practiced by members of the Tamang and Chepang communities. A few Dalit communities are also involved. The three communities belong to the 59 groups of indigenous people of Nepal and have practiced *khoriya* for centuries. The Chepang people, also called Praja, are regarded as the most marginalised and resource-poor group in Nepal. Out of a total population of more than 52,000 people, most of them live in Makawanpur (Project Completion Report, 2). In the project area, the total number of Chepang households is 1,436. The total number of Tamang and Dalit households is 3626 and 463, respectively (Table 1).

Subedi (1995) found that shifting cultivation was practiced on only 0.3% of the total land area of Makawanpur by 2,014 households, which is equivalent to 3.8% of the district population. Usually, all the members of Chepang and Tamang families are involved in shifting cultivation. Men undertake ploughing, hunting and tree felling, while women are mostly responsible for cooking, firewood collection, slashing, planting and harvesting. Children are often involved in the activities conducted by the female community members.

Table 1: Ethnicity composition in Project Area

VDC	Total HHs*	Brahmin	Tamang	Newar	Gurung Magar	Dalits	Chepangs	Others
Manahari	2620	690	1009	127	126	192	209	267
Raksirang	983	35	553	1	2	37	348	7
Handikhola	3155	943	1547	7	72	191	261	134
Kankada	1183	0	517	0	2	43	618	3
<b>Total</b>	<b>7941</b>	<b>1668</b>	<b>3626</b>	<b>135</b>	<b>202</b>	<b>463</b>	<b>1436</b>	<b>411</b>
<b>Percent</b>		<b>21</b>	<b>46</b>	<b>2</b>	<b>3</b>	<b>6</b>	<b>18</b>	<b>5</b>

\*HHs = households

The productivity of land under shifting cultivation is continuously declining due to soil erosion. Prior to project implementation, in 2004, MDI-Nepal conducted a field survey which found that the value of *khoriya* land is extremely low at Nepalese Rupee (NPR) 1,500 to 2,000 per *bhitta* (0.6 ha). The main crops grown under shifting cultivation in the project area are maize, millet, black gram, rice bean (*masyang*), cow pea and horse gram, produced mainly to meet household needs. The income from selling part of these products is barely sufficient to meet household requirements for buying additional food, equivalent to NPR 4,000-5,000 per hectare and year. Prior to project implementation more than two thirds of the families in the area were found to be suffering from varying degrees of food insecurity and deficit from three to nine months a year. Conventionally, there has been not much diversity in the area in terms of fruit trees and vegetables. Banana has not been produced for commercial purpose but for subsistence and as a “cultural crop”, needed when visiting *Sasurali*, i.e. the father-in-law’s house.

Other socio-economic problems are related to a lack of know-how and low use of agricultural inputs. The literacy rate is very low among the Chepang and Tamang communities. Many farmers have not received formal schooling. Input costs for irrigation and improved seeds are usually too high for the shifting cultivators to afford. The causes and effects of food insecurity are shown in Figure 2.

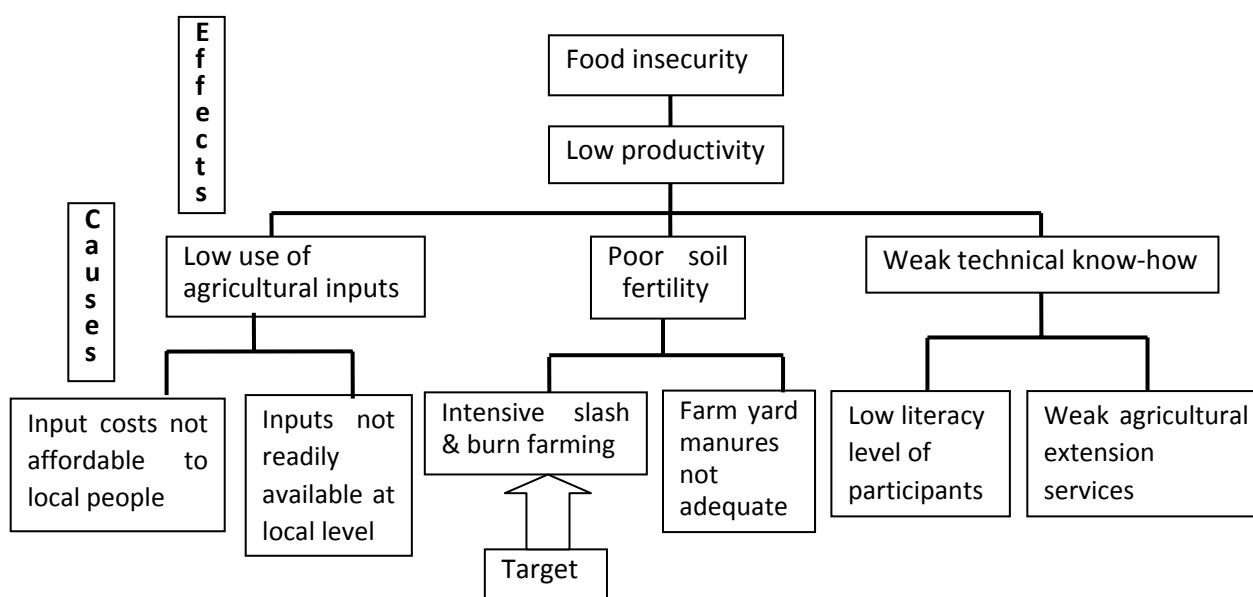


Figure 2: Socio-economic problem tree (Source: modified from UNDP GEF SGP 2008)

As in other slash and burn areas of Nepal, land tenure is a critical issue in north-western Makawanpur. A large section of the farming population lacks basic tenancy rights, and government policies do not adequately address this issue. Many Chepang families have tilled the land for many generations, but still around 40% of Chepang families in Nepal do not have a land registration certificate. Tenancy right is based on customary law, which means that the person having the first claim to the piece of land and who cultivates it is the owner. The insecure tenure rights of the Chepang community have been a serious obstacle to development programmes targeting them.

### 2.3. Project overview

To address these problems MDI-Nepal proposed a pilot project to introduce and expand improved slope land farming techniques to the Global Environment Facility/Small Grant Program of UNDP. In addition to the SGP fund of USD 49,000, the project obtained additional support amounting to NPR 8,095,284 (equivalent to USD 117,382) from different co-funding partners (Table 2). The local bodies and communities contributed matching funds required for the implementation of different activities under the GEF/SGP project.

This project was implemented during a 30-month period from June 2004 through November 2006. The project targeted 2,000 households in an area of 500 ha of slope land under serious degradation.

*Table 2: Budget contribution by co-funding partners to MDI-Nepal projects in the area*

Fund sources	Sector	Total amount (NPR)	Equivalent (USD)
<b>UNDP/GEF/SGP</b>		-	<b>49,000</b>
<b>Co-funding partners</b>			
Local Forestry Users' Committees	Solar, ICS, toilet construction, irrigation, fodder/nurseries	665,499	9650
Local Agricultural Cooperatives/ AMCs	Solar, water turbine, toilet construction, goat raising, biogas, marketing, seed inputs, nurseries	603,202	8746
DDC Makawanpur	Agroforestry	200,000	2900
DANIDA	Personal costs for project staff & infrastructure (rural road, drinking water, irrigation)	1,175,931	17,051
GTZ	Personal costs and micro-projects (rural road)	998,937	14,484
PAF	Irrigation and drinking water	824,253	11,952
Government subsidy	Solar, biogas, water mill	1,596,500	23,149
FAO	Goat raising	1,172,400	17,000
WFP	Micro-projects (rural road)	475,562	6,896
Cash by farmers	Solar, ICS, biogas, toilet construction, seed inputs	383,000	5,554
<b>Total (co-funding)</b>		<b>8,095,284</b>	<b>117,382</b>



### **2.3.1. Objectives**

According to the original proposal submitted to the GEF/SGP, the main objective of the project was “to reduce the level of GHGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and others) in the atmosphere that are added through slash and burn and other wrongly managed agricultural practices.” The specific objectives were to:

- Improve slash and burn practices towards sustainable livelihood of the shifting cultivators and to ensure sustained productivity level
- Promote energy saving technologies
- Disseminate information among stakeholders on biodiversity protection and conservation.

However, in the Project Completion Report submitted to the SGP, the overall objective was reworded as “to achieve improved and sustainable people’s livelihood through the management of sustainable land management practices that contribute to combat land degradation and mitigate greenhouse gas fluxes that are released through biomass burning” (Project Completion Report, 5). In the completion report the specific objectives were restated as:

- The development of appropriate land use practices for sustainable production as an alternative to the shifting cultivation system, to be used for demonstration. Improved conservation and agronomic practices were to be emphasised. This was to include in situ improvement of shifting cultivation practices and the agroforestry system, integrated livestock farming, horticulture development and small-scale income generation schemes.
- The introduction of several incentive schemes to motivate the farmers to adopt energy saving technologies such as a solar home system, improved cooking stoves (ICS), biogas, bio-briquette etc.
- The development of community-based organisations that ultimately take initiative in implementation of project activities.
- The development of skilled human resources to enable them to carry out and prepare a land use map.

The assessment team agreed to assess the project against the objectives as stated in the completion report, since these capture the essence of the original objective formulation while more accurately emphasising the actual priorities of the project.

### **2.3.2. Key target indicators and project activities**

The key target indicators of the project were:

- 2,000 households (shifting cultivators) participated in the programme by the end of the project period
- 500 ha sloping land (slash and burn area) brought under appropriate agroforestry models that avert slash and burn practices
- 1,000 families successfully adopted energy saving technologies (ICS, hydro-energy, biogas, etc.)
- 20 forest user committees/ agro-forestry committees successfully applying forestry/agroforestry regulatory byelaws to improve forest productivity and minimize forest fires
- At least 50 water harvesting tanks established for irrigation purposes

The project activities are grouped into five main components which comprise specific activities (Table 3):

- (1) Institutional development
- (2) Agroforestry in slash and burn area
- (3) Energy efficient technologies
- (4) Livelihood promotion
- (5) Capacity development

*Table 3: Project components and activities*

<b>Main component</b>	<b>Specific activities</b>
Institutional development	Promotion of saving and credit groups; Agricultural cooperatives
Agroforestry in slash & burn area	Application of sloping agricultural land technology (SALT) system with banana, pineapples and fodder grasses, hedgerows in contour slopes, and bio-pesticides
Energy efficient technologies	Solar home system, improved cooking stoves, biogas system, bio-briquette
Livelihood promotion	Fresh vegetable farming, cash crop farming, goat keeping, water harvesting irrigation ponds, and vermicomposting
Capacity development	Training and exposure

### **3. Field observations and project activity assessment**

The structure of the subsequent project assessment follows the project components. The report first presents both input and processes of the various project activities under each component and then analyses the outputs and impacts of each project component. The focus of the analysis is on both the quantitative and qualitative extent of the outputs delivered by the project and the social and environmental impacts of the project.

#### **3.1. Institutional development**

Before examining input, processes, output and impacts of the project, it is important to understand what type of local people's groups and networks already existed in the area before the project was implemented and which have been created as a direct or indirect contribution of the project.

A number of local user groups already existed in the area under government programmes. They include:

- Forest User Groups
- Buffer Zone User Groups
- Drinking Water User Groups
- Irrigation User Groups.

The creation of the latter two types of groups is legally required for public construction works in Nepal. After the construction is completed, all participating households become members. Tasks of the user groups involve book-keeping supervision, voluntary level contribution and the mobilisation of local material. They collect a monthly or yearly contribution from their members for operation and maintenance.

##### **3.1.1. Project input and process**

Both under and outside the UNDP GEF/SGP project, MDI-Nepal has assisted several existing local groups, mainly with mobilising non-local material. The main input of the project, however, was to promote the creation of a number of new local institutions that can be categorised under three types:

- Saving and credit groups (SCGs)
- Agroforestry management committees (AMCs) and
- Cooperatives.

##### ***Saving and credit groups***

Saving and credit groups are basic organisational platforms for local people, which they initially create regardless of political ideologies, caste, religion or gender. They collect monthly savings out of their members' earning and use the funds for their socio-economic needs, i.e. for consumptive or productive uses. In the project area the typical savings contribution ranges from five to 20 NPR per

month and member. The groups meet once a month to discuss activities and problems they face in the development process. They are governed by the principles of regular savings, accounting and transparency. The main purpose of the SCGs is to:

- Improve access to rural credit to their members at minimum service charges where formal credit services are limited
- Promote economic activities and create self-employment opportunities at village level
- Buy food provisions for consumptive purposes
- Provide an organisational platform on which poor people can participate fully in decision-making processes and enhance economic, social and political strength through mutual support and cooperation

The role of the project was to facilitate the creation of saving and credit groups by promoting the idea among the community members, with the MDI-NEPAL senior field supervisor informing farmers of their opportunities and organising meetings.

### ***Agroforestry management committee***

The project also facilitated the creation of agroforestry management committees at the local level. Their main purpose is to promote agroforestry in sloping uplands and the installation of energy saving technology. AMCs tend to originate at the settlement level. Once fully established AMCs can proceed to become legally registered as cooperatives. AMCs do not collect contributions from saving, but receive revolving funds from their members, who pay for the seeds, saplings, biogas and other items received under the project. Thus households have to return the investments to their community organisations, AMCs or cooperatives although the items were originally supported by the project through the Community Environment Trust Fund (CETF) and seed grant funds.

The main role of the project has been to provide direct support to individual AMC members through a revolving fund mechanism. To receive this support, individuals must be a member of an AMC, and membership is conditional on the individual having an agroforestry farm in sloping uplands. The project initially paid 100% of the cost of any input items (seeds, saplings, biogas, solar home systems, etc.). All member farmers received this support through the AMCs. Once members are able to pay back the cost of the items, they pay to the AMCs – not the project – in accordance with the norms established by the AMCs. These norms vary depending on the different items (see Table 4).

*Table 4: Revolving fund mechanism (MDI Project Completion Report)*

<b>Types of inputs</b>	<b>Project supported rate (NPR/unit)*</b>	<b>Revolving fund to be collected from member farmers (NPR/unit)</b>	<b>Remarks</b>
Banana saplings	2 / sapling	1	50% of the total cost
Pineapple saplings	2 / sapling	1	50% of the total cost
Solar home	5,000-8,000/set	5,000-8,000 (400/month)	100% (instalment basis)
Biogas	3,500-5,000/plant	2,500-5000 (300-400/month)	100% (instalment basis)

\* Average exchange rate for the period 1 August 2005 – 30 November 2006: 1 USD = 74.9 NPR

AMCs opened bank accounts, either at the Small Farmer Cooperative Limited (SFCL) located in Manahari Bazar or at the Agricultural Development Bank in Hetauda, to deposit the money collected through the revolving funds.

### ***Cooperatives***

Most of the co-operatives in Nepal are related to agriculture, farming and farm products. They represent the last step in the formalisation process of local farmers' organisations. In the project area, the only cooperative which was already in the process of being registered before the project started was the Janachetana Agricultural Cooperative in Kankada VDC, established in 2004.

The ultimate purpose of social mobilisation under the project was to have local organisations of farmers take over the role of providing financial support for the various activities introduced by the product. As such a role is easier for legally registered organisations, the project aimed at promoting and guiding the legal registration of informal local communities of farmers as agricultural and savings and credit cooperatives.

### **3.1.2. Project output and impact**

By its completion date in November 2006, the project had supported the creation of a total of 41 institutions, i.e. 30 saving and credit groups, six AMCs, and five cooperatives.

### ***Saving and credit groups***

The 30 SCGs had 819 members with women constituting 42% of the total members. The size of the SCGs varies depending on the type of social cluster, the local geography, the number of like-minded people in the community and their eagerness to participate in the group. The groups have typically 20-30 members, with a minimum membership of 16 and a maximum of 40. The groups were able to accumulate a total of NPR 1.3 million as monthly saving and disbursed NPR 6.6 million in total.

#### *Box 1: Saving and credit group - example*

##### **Manjushree**

The Dandibari and Dumsigadh settlements of the Handikhola VDC are organised under the Manjushree Savings & Credit Group. The Group has 45 members, mostly women (39). The vice chair and treasurer are women. They started the group by saving NPR 5 per member per month in 1998. In 2009, the members increased savings to NPR 30 per month. The other income included cash collected from the solar lamps (NPR 46,000). According to the arrangements made by MDI-Nepal, the members can take loans and have to return them to the group's revolving fund. The total saving is NPR 400,000, most of which is being invested by members in their businesses. The activities include ginger cultivation, buffalo and goat raising, shops, and also for the preparation of overseas employment. The members are affiliated with the buffer zone management committees of Chitwan National Park and are also involved in protecting the Panchakanya community forests. The community forest management focuses on the control of forest fires and slash and burn practices. Some women have shown interest in handicrafts, such as bamboo craft.

## AMCs

In the four VDCs of the project area, there are now six AMCs with 819 members in total. The six AMCs were able to raise their funds to a total of over NPR 880,000. In a sense, the project funds were gradually transferred from the project's account to the AMCs' accounts, while benefitting the AMCs' individual members. After the project's end the AMCs have turned out to be financially sustainable by collecting saving contributions from their members.

### Box 2: Agroforestry management committees - examples

**Churiyamai Community Organisation** of Polaghari settlement, Manahari VDC is a spinoff from the Rupachuri Agricultural Cooperative in 2008. It has more female than male members. The organisation used to collect NPR 10 per month person, and recently the savings have been raised to NPR 20 per person per month. They have 20 households as members. Three members have not yet been able to deposit the required savings. The total deposit is NPR 25,000.



Photo: Churiyamai Community Organisation (MDI-Nepal)

**Shanti Navasirjana Community Organisation** in Chuwarpakha settlement, Handikhola VDC has 39 household members (37 Tamangs, and 6 each of Chepang and Viswokarma). The organisation has seven different organisations at the settlement levels. Their plan is to install 20 improved cooking stoves, 22 toilets, 22 biogas plants and 10 solar lamps. Forest protection has been a major exercise of the community. In several gullies, springs flow throughout the year, mainly due to upstream vegetation. Locals have realised that there is a direct link between water sources and the forest.

## Cooperatives

There are five local community organisations registered as *cooperatives* as a result of the project. Four of the cooperatives are agricultural cooperatives involved in promoting agroforestry activities in each of the four VDCs (Raksirang, Kakada, Hadikhola, Manahari) while one cooperative in Raksirang VDC undertakes saving and credit operations. By the end of the project, the five cooperatives had altogether 512 members and had generated a total sum of approximately NPR 1,800,000 (Table 5).

The major source of funds was the revolving funds during the project implementation, but now, as with the AMCs, it is monthly savings. The cooperatives also provide loans at an annual interest rate not higher than the inflation rate, currently about 12%.

The APFED Team visited three of the agriculture cooperatives (Niguretar, Janachetana and Churiya Agriculture Cooperatives) and most members attended the meetings and participated actively in the discussions. Their achievements are summarised in Box 3.

*Box 3: Agriculture Cooperatives*

The **Niguretar Agriculture Cooperative** in Raksirang VDC (10 men and 10 women committee members) is registered with the Division Cooperative Office. Its chair has been actively involved in expanding its membership and savings. Initiated in 2008 with MDI-Nepal facilitation, the number of cooperative members and shareholders has grown to 103 in 2009. The monthly membership deposit is NPR 20 per member, and the total capital in March 2009 was NPR 259,614. Their main activities included planting bananas, pineapples and broom grass. They plan to expand the activities among the members, with the following targets:

- Banana: 500 plants each for 77 households
- Pineapple: 500 plants each for 51 households
- Broom grass: 10,000 plants each for 103 households
- Goat farming: 15 households

The cooperative provides loans to members for banana plantations and other entrepreneurship, and also provides support in cases of emergencies and rescues.

The **Janachetana Agricultural Cooperative** in Lothar Bazaar was formed in 1998, and is well-established. The cooperative is managed by the dwellers of Kankada VDC. The twelve board members come from Chepang tribes. At the meeting with the APFED team, female members of the cooperative were not present. The cooperative made initial monthly savings of NPR 10 per person, and in 2009, the monthly savings range from NPR 25 to NPR 150 per person. The Cooperative has operating capital of NPR 900,000. Over 50% of their investments are in goat and cattle farming. Several members stated that they are pleased that none of them has to approach the local money lenders. Apart from undertaking activities under the project it has engaged in honey production. It earned a profit of NPR 75,000 from honey collection. It runs a grocery store along with a collection centre for natural honey. In 2008, 4,000 kg of honey was collected. A Kathmandu based company collects all the honey from their depot in Lothar. They have two paid staff for the business. The cooperative also collected 218,000 bananas in February - March 2009. Over 75% members have banana plots. Some households have not been able to grow banana for want of saplings. The cooperative members believe that banana cultivation can be further expanded on a larger and commercial scale.

The **Churiya Agriculture Cooperative** of Handikhola VDC (registered in 2005) has 172 members including 62 women, as well as 204 share-members. One woman holds the position of a joint secretary. The cooperative has installed 40 sets of solar panels, 240 sets of improved cooking stoves and 50 units of biogas plants (20 under construction). Four members are involved in vermicompost. The cooperative has share capital of NPR 20,400 with an additional fund of NPR 2,832, a miscellaneous fund of NPR 8,434 and grants of NPR 45,827. It has also generated interest of NPR 44,255. The cooperative is in the process of creating a demonstration village by establishing a total of 60 biogas plant units; it also seeks to have 80 toilets, 15 solar lamps, and a bio-diesel plant installed. Apart from banana and fish, they have also promoted growing ginger as a cash crop.

Table 5: Registered cooperatives at project completion (MDI-NEPAL Project Completion Report)

Indicators	Janutthan Saving & Credit Cooperative	Janachetana Agriculture Cooperative	Churiya Agriculture Cooperative	Rupachuri Agriculture Cooperative	Niguretar Agriculture Cooperative	Total
VDC	Raksirang	Kankada	Hadikhola	Manahari	Raksirang	
Total No. of HHs* covered	41	50	151	165	105	512
Total members (No.)	41	50	151	165	105	512
Executive	9	9	11	11	11	51
Female	6	6	40	35	36	123
Monthly saving (NPR)	35,540	77,974	61,148		8,730	183,392
Share amount (NPR)	4,100	5,000	15,100	3,200	3,200	30,600
Membership fee (NPR)	820	65	50	1,210	1,920	4,065
Revolving fund (NPR)	400	220		62,107	181,142	243,869
CETF (NPR)		198,900	302,001	471,100	85,800	1,057,801
Community Forestry Committees (NPR)		-	23,200		10,000	33,200
Donations (NPR)	65,000	15,236	18,400	15,000	15,000	128,636
Interest (NPR)	8,250	8,193	16,129	33,192	8,353	74,117
Other fund (NPR)	10,100	37,012				47,112
<b>Total fund (NPR)</b>	<b>124,210</b>	<b>342,600</b>	<b>436,028</b>	<b>585,809</b>	<b>314,145</b>	<b>1,802,792</b>
Disbursement	81,000	197,353	417,037	666,707	314,245	1,676,342
Collection	30,000	22,600	49,000	159,058	57,720	318,378
<b>Loan Portfolios</b>	<b>81,000</b>	<b>197,353</b>	<b>417,037</b>	<b>666,707</b>	<b>314,245</b>	<b>1,676,342</b>
Livestock	31,000	26,422	70,000	57,500	80,851	265,773
Solar		154,248	120,000	471,100	85,800	831,148
Vegetable Farming		4,083	85,000	28,542	33,095	150,720
Banana, pineapple			7,600	33,565	84,499	125,664
Trade	15,000	12,600	40,200	65,000	25,000	157,800
Household expenses	10,000		55,900		5,000	70,900
Other	25,000	-	38,337	11,000		74,337
No. of credit takers	15	20	65	82	83	265
Expenditures	-	163,647	50,500	34,985	4,505	253,637
Purchase of land		117,000	7,000			124,000
Office equipment		46,647	43,500			90,147
Cash bank	68,210	-	15,820			84,030
Bank balance	5,000	4,200	1,671	39,975	53,215	104,061



### 3.2. Agroforestry in slash and burn area

Realising the disastrous effects of slash and burn farming described above, MDI-Nepal attempted to support farmers in rehabilitating the degraded area applying both an appropriate form of sloping agricultural land technology (SALT) and a suitable combination of fruits and fodder species to achieve environmental conservation and local livelihood promotion. The saplings were distributed under the revolving fund scheme.

#### 3.2.1. Project process and input

##### ***Application of sloping agricultural land technology***

Originally developed in the Philippines in the late 1970s, SALT is an agroforestry technology for sustaining agricultural production on sloping lands and minimising soil erosion. It is a relatively simple, practical, low-cost and appropriate method of diversified farming. The GEF/SGP project integrated various SALT models, namely food crop production (SALT-1), livestock (SALT-2) and fruit production (SALT-4). Broom grass (*Thysanolaena maxima*; local name *amriso*) was planted widely as hedgerows, following SALT-1 principles. Based on SALT-2 and SALT-4, horticultural crops – especially fruits like banana and pineapples, and nitrogen fixing fodder trees were planted and combined with livestock raising, particularly goats. Various rhizomatous crops like ginger and turmeric, and food legume crops such as black gram, horse gram and rice bean (*masyang*) were also planted in between the rows.

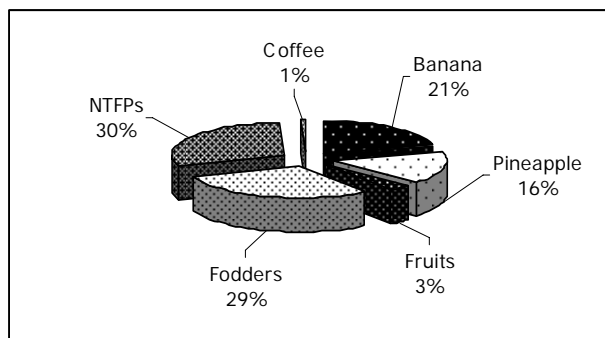


Figure 3: Planted species by percentage (MDI-Nepal Completion Report)



Photo: Row of banana trees planted under SALT (López-Casero)

##### ***Crop species***

In discussion with the communities, the following crop species were identified as appropriate for planting *khoriya* land:

- Banana for sale and consumption

- Pineapple for local sale and consumption
- Other fruit trees (lemon, mango, litchi, guava, etc.)
- Trees to provide fodder for livestock, particularly *ipil-ipil* (*Leucaena ssp.*) and *bakaino* (*Melia azedarach*)
- Non-timber forest products (*kurilo*)
- Coffee

Members of 1,524 households in all four Village Development Communities within the project area planted over 900,000 of plants during the project implementation period (Table 6 and Figure 3).

*Table 6: Plantation records of agroforestry crop species (MDI Project Completion Report)*

<b>Crops</b>	<b>Plantation Total (No.)</b>
Banana	193,335
Pineapple	148,363
Fruits	31,371
Fodder trees	265,925
NTFPs	278,139
Coffee	7,241
<b>Total</b>	<b>924,374</b>

#### *Banana (Musa paradisiaca)*

MDI-Nepal has supported banana planting on the slopes on a large scale, supplying nearly 200,000 banana saplings during the project period. Among the popular varieties of banana, 'Hazipure', a local variety with a life span of seven years, has been widely cultivated, as it resists dry spells well. The improved varieties 'Chiniya champa' (life span: three years) and 'Jhapali Malbhog' (life span: two to three years) were also tested by the project, but were found not suitable to the slash and burn slopes. While banana is normally produced throughout the year, in the project area the production is higher from March to May (spring), with 35% of the annual production, and in September/October (autumn) with 31%. The lowest production rate is during November/December, representing 4% of the annual yield.

#### *Pineapple (Ananus comosus)*

In total, nearly 150,000 pineapple suckers were supplied by MDI-Nepal. Pineapple harvest is usually from July to September, occasionally running into December. The varieties of pineapples planted in the project area were both local ones and others brought from Chitwan, including 'Queen'.

#### *Other fruits and coffee*

Slightly more than 30,000 other fruit trees were planted with financial support from the project including orange, lemon, lime, mango, litchi and guava. The climate of the mid-hills of Nepal is also suitable for coffee production. Coffee needs shade for good growth and production, making it an appropriate crop to be planted under trees in an agroforestry scheme. While the possible introduction of coffee in the area was mentioned in the project proposal, the implementer began

with the actual promotion of coffee planting after the official end of the project. In September 2007 MDI-Nepal organised a one day discussion on coffee in Manahari, in which 40 local farmers and a coffee specialist participated, but efforts to reach an agreement failed. MDI-Nepal is currently attempting to establish market links, which it has generally considered a prerequisite for all market oriented project activities, and if this is successful the implementer plans to support the extension of coffee plantations from later in 2009.

#### *Fodder trees*

Under the project, a total of 265,925 trees were planted to provide fodder for livestock, including *ipil-ipil* (*Leucaena ssp.*) and *bakaino* (*Melia azederach*). *Ipil-ipil* is a thornless shrub or tree which may grow to heights of 7-20 m. *Leucaena* has had wide success as a long-lived and highly nutritious forage, and has a great variety of other uses. Recently it has been recommended for contour planting in small scale tropical farming systems as a means of soil conservation and fertility maintenance. *Bakaino* is also a fast growing tree and excellent fodder for livestock animals, particularly goats.

#### *Grasses*

The project has also promoted broom grass as fodder for livestock animals, as hedgerow to prevent soil erosion and as farm fencing. Another potential use is the extraction of *kucho* (broom) from its inflorescences for sale on the market.

#### *Green manure crops*

Green manure crops include stylo (*Stylosanthes spp.*), velvet bean (*Mucuna pruriens*) and sunhemp (*Crotalaria juncea*). Stylo is a tropical legume, which is hardy and drought tolerant, and contains rhizobium. In good growing conditions it can produce over 3 tonnes of dry matter per hectare during summer. Velvet bean is an annual plant that grows well on dry, sandy and somewhat infertile soils. It adds a substantial amount of nitrogen to the soil. Sunhemp is a tall shrubby annual plant that is best turned under as a green manure or mowed about 70 days after planting.

#### *Wild asparagus*

As a non-timber forest product (NTFP), wild asparagus (*Asparagus racemosus*; local name: *kurilo*) has been promoted in the project area as it was strongly requested by the participants given its medicinal values.

### **3.2.2. Project output and impact**

As a direct impact of the project, fruit and fodder tree plantations were established on 438 ha of *khoriya* land and since the end of the project farmers have continued the activities with support from their community organisations and more land has been included in the agroforestry scheme.

#### ***Socio-economic impacts***

The assessment focuses on socio-economic impacts of this project component, but also considers effects on the natural environment.

### *Banana farming*

A survey conducted by the implementer found that at least 538 households had produced bananas during the 30-month project period, amounting to a total quantity of 2,904,502 pieces and generating a total income of more than NPR 2.6 million (see table 7 and box 4).

As a result of the project, banana farming has become a popular enterprise among Chepang and Tamang communities in a number of production pockets of *khoriya* land in the project area. Local farmers, especially women, have established banana farming as a major income source. Almost five new saplings of banana have been extracted from the mother plants on average, and have been planted in the surrounding areas. It is estimated that nearly one million banana plants have been planted out in the project sites. The fact that 80% of these bananas have been planted since the end of the project is a strong indicator for the sustainability of this activity.

*Table 7: Production and income from the agroforestry crops (MDI Project Completion Report)*

<b>Agroforestry crops</b>	<b>No. of participating households</b>	<b>Unit</b>	<b>Production (units)</b>	<b>Average rate (NPR/unit)</b>	<b>Total income (NPR)</b>
Banana	538	Piece	2,904,502	0.90	2,616,328
Pineapple	54	Fruit	8,040	12.63	101,525
Banana sucker	113	Sucker	25,132	2.59	65,314
Pineapple sucker	36	Sucker	12,854	2	25,708
Orange	71	Kg.	4,800	20	96,000
Lime	34	Fruit	18,260	3.45	63,000
Broom grass	64	<i>Mutha</i>	9,216	11.04	101,760
Asparagus	4	Kg.	310	170	52,700
Total	914				3,122,335

As a further achievement of the project, bananas started entering the local markets in 2005. Now, there are a number of production pockets in the villages, such as:

- Niguretar and Churidanda of Raksirang VDC
- Rupachuri, Balbhajyang, Anptal, Musle and Faribang of Manahari VDC
- Silinge, Einatar, Kharkantar, Devitar, Sikhadanda and Panthali of Kankada VDC and
- Runchedanda, Hattibaune, Chapal, Chuhwarpakha, Dillipur and Basantpur of Handikhola VDC.

*Box 4: Farmers who introduced banana farming under the project*

Polaghari (Manahari VDC) is a settlement of around 20 *Chepang* families and considered one of the most deprived ones in the VDC prior to project implementation. It is reached in a one-hour walk from Manahari Bazaar. Encouraged by the project, residents Mrs Ram Maya Praja and her elder brother Mr Ram Bahadur have invested in banana cultivation on the slopes. They started the cultivation in 2004 by planting 1,500 banana saplings. Mrs Ram Maya's family moved to the area in their father's time. The land belongs to the government. Ms Ram Maya is the vice chair for the proposed Polaghari Community Forest User Group which still needs to be registered at the District Forest Office. With

the proposition of the community forests, the Polaghari dwellers have protected the forest from fire and grazing. Mrs Ram Maya has 2,000 plants and plans to increase the number by another 200 plants in 2009. During the high season (September through November), she earns NPR 2,000/month from her sales. She explained that her family members do not have to enter the national park to gather yams and wild fruits for a living.

In the same settlement, Mrs Buddhi Maya Praja has recently completed pitting one *khoriya* to expand her banana cultivation which she began in 2004 with 300 plants. She plants every year and now has more than 2,000 banana plants on her land. She has built a house with the income from the banana sales. Mrs Gori Maya started banana cultivation with 100 plants. She earns NPR 500 monthly from banana sales. She also grows tomatoes, which earned her NPR 900 in 2008. She said that the first thing that the farmers use to buy from their income from banana is rice. She is pleased with her income from the banana sales, and compares this with the days when she was paid merely NPR 30 a day for carrying manure loads.

Mr Lalit Bahadur Biswakarma from Shikhardanda at Kankada VDC, a member of the Dalit caste, has successfully planted out several hundred banana saplings.

The Chisapani area in Handikhola VDC was unfamiliar with banana cultivation until 1994 when the first lot of Hazipure and Chiniya champa varieties was introduced by Mr Kali Bahadur from Chitwan. Now the entire area is known for the quality of its banana.

Mr Chularam Thing, who has planted 500 banana plants of large size, is convinced that the bananas were more beneficial than the traditional corn or millet crops on *khoriya* land. Traders use to come to the field, pay cash directly to the farmers, and collect bananas themselves.

In Rupachuri settlement, Mrs Kanchhi Maya has established banana farms in two sites (700 plants in Polaghari, and 1,200 plants in Serange of Raksirang VDC).



Photos: Banana trees under *Shorea robusta* trees as an outcome of the project's agroforestry scheme, Polaghari (Manahari VDC). (López-Casero)

Some farmers are experimenting with or considering innovative ideas for further use of bananas. In Niguretar, the banana growers have started considering production of banana chips. Nearly 40 packages (at 100 grams) are prepared from 150 pieces of banana. One farmer has started packaging

banana chips. In Dandibari and Dumsigadh settlements of the Handikhola VDC, the local banana growers are organised under the Manjushree Savings and Credit Group and are planning to make use of the banana plants' fibres. They have already started saving for a fibre-extracting machine which would cost NPR 50,000.

*Market links in the banana business*

There is a well established marketing chain from the farms through the wholesalers to the markets. Local traders, currently about 18 youths, collect bananas from the uphill farms and supply them to the wholesalers in Manahari and Lothar. The markets include the local markets in Manahari and Lothar, and the nearest urban markets. The wholesalers either operate banana collection centres at Lothar and Manahari Bazaars or directly collect the bananas at the farms and supply markets. The main urban markets are Pokhara, Baglung, Shyanja and Gorkha (Figure 4). Most recently, the local traders are trying to penetrate the foreign market, especially India.

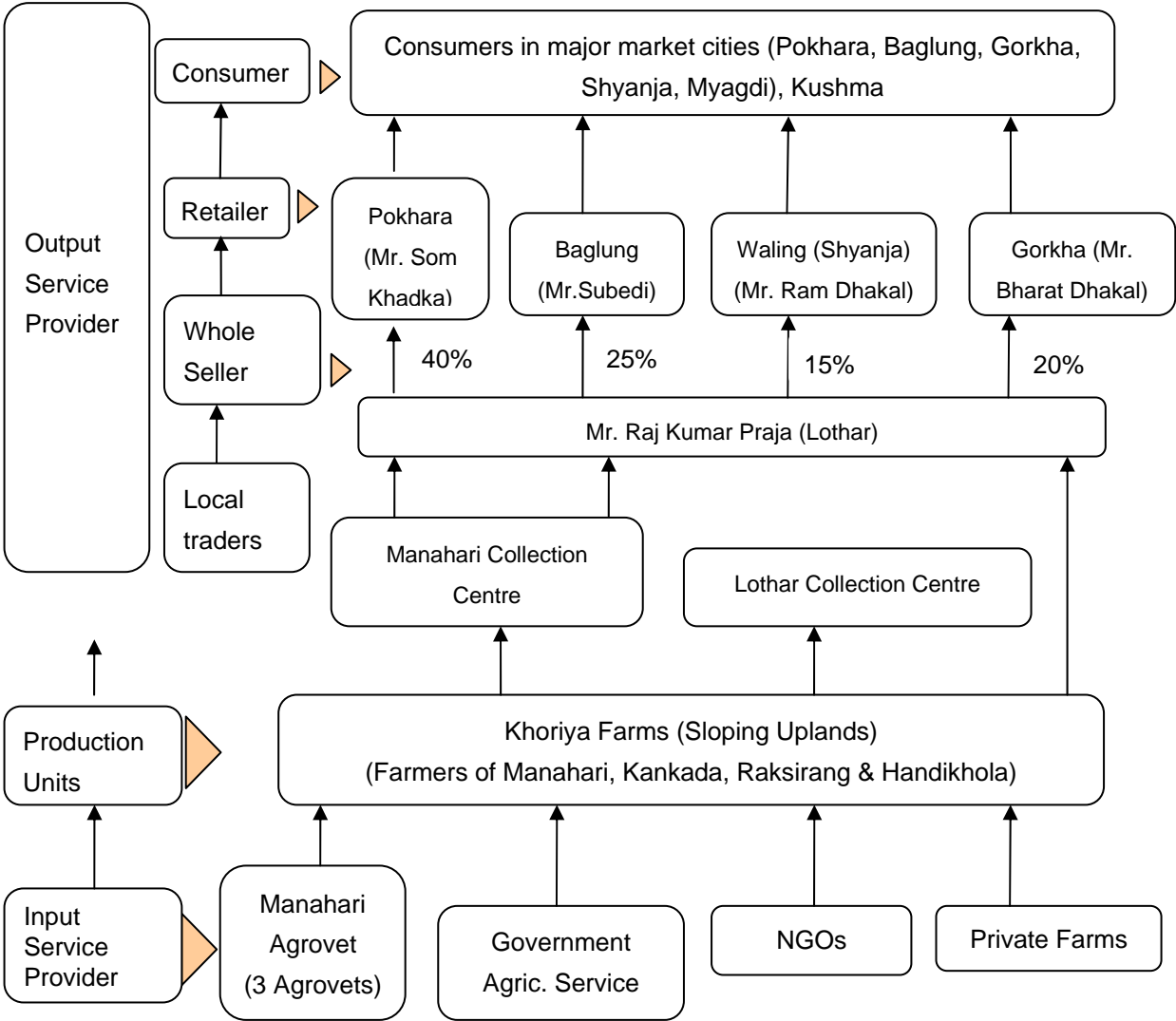


Figure 4: Market Linkage: The existing market networks for banana (Sub-sector market map)



#### *Box 5: Wholesalers*

Wholesaler Mr Raj Kumar Praja operates a banana collection centre at Lothar Bazaar. Sacks of banana are deposited at his depot from where he transfers them to Pokhara. One sack contains approximately 1,400 bananas. He informed that he pays NPR 80 per 100 for common bananas, and as much as NPR 120 for the best variety. In Lothar Bazaar the APFED Team also met a trader who said he is offered only a maximum of NPR 60 for 100 pieces.

Ms Sanumaya Chepang has started a banana wholesale business. She collects bananas from the local farmers, and sells them to the traders in Pokhara. During peak season (September - October), she handles about three to four tractor loads. One tractor trip carries as much as 18,000 bananas. The wholesale price for banana is NPR 40 per 100 pieces, and may reach as much as NPR 100 for the hybrid variety. She has experienced no problems dealing with urban traders. However, men from the same areas reported that they had lost thousands of Rupees to a Pokhara based trader who never returned to make payment after collecting 24,000 bananas.

Based on the sales record of the wholesaler in Lothar Bazaar, MDI has estimate that during a period of four years (2005-2008), altogether 6.6 million pieces (*kosas*) of banana were produced in the project area and sold, with a total value of NPR 3.8 million. The price of bananas is valued on a 100 piece basis. During the project period, farmers could receive an average of NPR 55 (approx. USD 0.70) for 100 pieces; now the price is said to range between NPR 60 and 80 (see Box 5).

#### *Pineapples, other fruits, fodders and green manure crops*

At least 54 households produced pineapples for sale during the project period, amounting to a total quantity of 8,040 fruits and generating a total income of NPR 101,525 (Table 7). A considerable share of the pineapples is consumed at the local level by villagers themselves, with an estimated 70% of the total production being supplied to the local traders of Manahari and Lothar. The average price per piece is NPR 13.

The main impacts of the planting of other fruit trees have been both to provide additional food and income sources to the farmer households in the project area. Boxes 6 and 7 provide a few examples of farmers who have planted large numbers of other fruit trees and fodders in addition to bananas.

#### *Box 6: A progressive farmer*

Mr Ramesh Praja is a progressive farmer living in Niguretar, Raksirang VDC. Although not officially registered, he owns approximately 1 ha of steep land next to his house. He used to grow crops like maize and millet before the project began. Following the advice given by the MDI-Nepal technical personnel as part of the project, he has successfully experimented with pineapple and broom grass. With support from the project, Mr Praja has planted approximately 50,000 pineapples on his land. He annually earns NPR 50,000 to 60,000 from the sales of pineapples. Mr Praja's farm has become a model for others in the area who want to establish pineapple farming. Although not hopeful in the beginning, Mr Praja also planted 1,000 sets of broom grass. However, when he harvested 500 sets of broom (*kucho*) after one year of plantation and sold it for NPR 13,500 in Manahari Bazaar, he and his neighbours were very surprised. In 2008, he earned NPR 13,000 from broom grass. Meanwhile many farmers are involved in planting broom grass in Raksirang and Kankada VDCs.

Mr Praja has also planted out about 1,500 banana plants on approximately two hectares of slope land beside the Jhirkekhola. He now supplies banana saplings to his neighbours at NPR 3 per plant. During the field visit, several women were found carrying loads of banana suckers from Mr Praja's farm for planting on nearby slopes. With this income Mr. Praja is now fully able to support his 7-member family.



Photos: Pineapple field (left) and broom grass, Niguretar, Raksirang VDC (MDI-Nepal/ López-Casero)

#### Box 7: Combination of different fruit horticulture

In the Raksirang area, the APFED team learned from Mr Maniklal Praja that he successfully introduced orange and lemon at an early stage of project implementation. Others like Mr Ram Bahadur Moktan from Handikhola VDC, who established a horticulture farm of 125 lemon trees, 200 banana plants, 50 mango trees and other trees in 2004, learned about the project from friends and neighbours.

In Rupachuri settlement, Mr Tirtha Lal Tamanag and his son have not only planted 500 banana plants, but also 15 mango trees, 25 orange trees and other fruit trees. Prior to fruit horticulture, they used to gather non-timber forest products (gittha and bhyakur).

In the Chisapani area of Handikhola VDC, Mr Ram Kumar Chepang has 900 banana plants, along with fruit trees (35 lemon and 20 mango trees), and 300 bamboo plants.

Mrs Sukumaya Praja of Polaghari, Manahari VDC, has planted out fodder grasses such as *ipil-ipil* (*Leucaena species*), *tanki* (*Bauhinia species*), *bakaino* (*Melia azedarach*), and *nimaro* (*Ficus nemoralis*) to feed her goats, without having them graze freely.

#### Environmental impacts

One of the principal achievements of the project was the almost complete halt of slash and burn cultivation on 438 ha of marginal sloping land. As a result, soil erosion on the steep slopes of the project area has been significantly reduced, preserving land productivity and reducing the contamination of aquatic habitats. No direct measurements on soil erosion were made in the project



area, but using figures on reduced soil erosion from a study on SALT experiences in the Philippines, the implementer has calculated that the adoption of agroforestry in the project area has reduced soil erosion by 1,386 tonnes per year. Even though the application of figures from the Philippines is questionable due to different soil types, slope gradients, climate and ground cover, there is general consensus that well-managed agroforestry systems have lower erosion rates than slash and burn row crop cultivation.

The combination of various rhizomatous crops like ginger and turmeric, and food legume crops such as black gram, horse gram and rice bean (*masyang*), has proved particularly effective in controlling slash and burn farming, generating income and controlling soil erosion.

The contribution of the agroforestry component to climate change mitigation by planting banana plants and other fruit trees is less significant, particularly when considering the far greater carbon sequestration in the original natural forests of the project area. In terms of adaptation to climate change, the banana and pineapple varieties promoted by the project appear to be well chosen in view of already observed changing precipitation patterns, with winter rainfall becoming scarcer and periods of drought becoming longer (Practical Action 2007). At the time of the field survey most of Nepal, including the project area, was suffering one of the longest droughts on record with no significant rainfall for about six months. Almost all the banana plantations visited were not visibly impacted by the drought.

The agroforestry schemes of the project have satisfied a significant portion of fuelwood needs, thus reducing the demand for such resources from the surrounding forests, which in turn has had a positive impact on wildlife habitat conservation.

The extent to which natural vegetation cover remains on the slopes under agroforestry varies considerably among the project sites. This is mainly to do with how slash and burn was conducted prior to the project. In most sites many large trees, predominantly *sal* (*Shorea robusta*), of the original forest had been left standing, providing the necessary shadow for banana trees (particularly in south facing slopes), but few natural understorey plants remained. Even where both considerable tree canopy and understorey natural vegetation were found, banana plantations thrived. This led the APFED team to the conclusion, that with an eye on preserving biodiversity, most agroforestry activities of the project could be conducted while keeping natural vegetation where it does not interfere or even fulfils the positive functions of providing shadow and preventing soil erosion. In the few project sites that were found almost completely free of natural vegetation, the introduction of agricultural practices (partly as a result of the project) might have had an unnecessary negative impact on biodiversity.

There is also a high risk for outbreak of insect pests and plant diseases in the fruit plantations. Particularly, there is an often a critical incidence of borers during July-August. Chemical control has been discouraged by the project; it is not affordable and has adverse effects on the local environment. However, the implementer has admitted that the application of bio-pesticides,

promoted by the project has demonstrated limitations. The APFED team visited a banana plot where burning the soil around the banana stems has proved an effective measure against the borer.

### **3.3. Livelihood promotion**

Improving the livelihoods of local farmers with banana, pineapple, other fruits and fodders was a major purpose of the project component on agroforestry. Possibly because the project proposal originally placed agroforestry under the objective of mitigation of the effects of greenhouse gases, livelihood promotion was included as a separate component of the project.

#### **3.3.1. Project input and process**

This component included the following activities: Goat-keeping, small irrigation, vegetable and cash crop farming, and toilet construction.

##### ***Goat-keeping***

Goat is a major meat animal in Nepal. Although most rural households raise one or two pairs of goats, there is still an acute shortage of goat supply in the country, so goats are imported from India to meet the growing demand for goat meat. Goat-raising is a cash generating activity generally undertaken by marginal farmers, and mostly by women.

When the project was designed, participating villagers chose goat as one of the preferred options for income generation. In the beginning, the project utilised GEF/SGP funds to support goat farming by 11 poor families, providing each family with four goats. The main purpose was to improve livelihoods of farmers. Later, the implementer linked this component with a FAO telefood project<sup>2</sup>, in which altogether 211 households were provided 645 goats. In addition, funds from the Danish International Development Agency (DANIDA) were also used to provide 216 goats to 125 households.

Where it existed prior to project implementation, goat meat production in the area was found low due to poor husbandry practices, inappropriate pens and shortage of feed and fodder. Therefore, the project also aimed at improving goat management by improving pens, animal health and fodder availability. It promoted stall feeding and plantation of fodder trees and grasses.

##### ***Water harvesting tanks and small irrigation***

The completion report acknowledges that the project placed little emphasis on the development of water infrastructure works, mainly due to budget limitations. However, a few low cost water-harvesting ponds were built to support vegetable farming in suitable areas. Water harvesting is the collection, storage and utilisation of water run-off for the production area. The project used low cost

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<sup>2</sup> The FAO TeleFood programme is based on donation campaigns with media assistance and pays for small, sustainable projects that help small-scale farmers produce more food for their families and communities.

multi-layered, cross laminated UV stabilised Silpaulin plastic sheets. Altogether, the SGP/GEF project supported 28 water harvesting tanks and two irrigation canals with co-funding from the Danish International Development Agency (DANIDA) and the Poverty Alleviation Fund (PAF) providing benefits to 134 households and covering an irrigated area of 869 ropani (1 ropani = 508.72 m<sup>2</sup>) or 44.2 hectare in total (Table 8).

*Table 8: Water harvesting tanks and surface irrigation project (MDI Project Completion Report)*

Type of scheme	Schemes	Command area		Participating households	Total cost (NPR)
		Ropani	Hectares		
Water harvesting tank	28	739	37.6	114	590,065
Surface irrigation	2	130	6.6	20	71,277
Total	30	869	44.2	134	661,342

### **Vegetables and cash crops**

The project supported the growing and commercialisation of fresh vegetable production in the project area, particularly where this could be combined with irrigation and social mobilisation and where road access existed. The major vegetables promoted were tomato, cucumber, beans, radish, cauliflower, cabbage, peas, onion and potato.

The most suitable cash crops promoted by the project have been ginger, turmeric, garlic and black grams. Ginger and turmeric are shade-loving crops which were found ideal for growing within the banana farms. Ginger in the Shikharbas area is a very popular crop. One farmer annually earns as much as NPR 120,000 from ginger crop sales. Black gram is a traditional cash crop grown widely in slash and burn areas. Garlic was identified at a later stage as an appropriate crop in irrigated areas after the development of water harvesting tanks.

### **Vermicomposting and pit composting**

After participating in four days training in Kavre facilitated by GEF/SGP, two project staff provided training to a total of 30 farmers during the project period. In addition, 1,000 earthworms were provided to each farmer starting in 2004.

Altogether 230 compost pits were constructed in the agroforestry farm area. The purpose of the compost pits is to produce adequate quantities of compost manures to supply the agroforestry farms. Field debris and grasses are collected and piled in the pits. Each pit can produce 2,000 kg of compost manure every three months.

### **Toilet construction**

Although not part of the original project proposal, the construction of toilets has also been promoted to improve sanitation. Where biogas plants existed, toilets were connected. As with most other project inputs, a revolving fund was provided. Altogether 103 toilets were constructed with a total investment of 185,369 NPR. The field survey did not include a review of the construction of toilets.

### 3.3.2. Project output and impact

#### *Socio-economic impacts*

The APFED team found that a considerable share of the visited households had adopted goat keeping as a result of the project. According to a survey conducted by the implementer, 102 families had benefited from this project activity and recorded receiving an average additional income of NPR 4,387 per household per year from goat farming. Table 9 shows the total income received by the participating households for each VDC.

*Table 9: Income received through goat farming (MDI Project Completion Report)*

VDCs	Participating Households	Production (kg)	Amount (NPR)
Manahari	61	229	343,252
Handikhola	12	19	26,000
Kankada	18	27	41,258
Raksirang	11	27	37,000
Total	102	302	447,510

The project promoted goat keeping mainly for subsistence, but in the completion report the implementer recognises a potential for increasing production and ensuring greater profits for the farmers by supplying local markets through an efficient marketing system.

#### *Box 8: Experiences of farmers from goat farming*

Mrs Gori Maya of Polaghari settlement, Manahari VDC, has five goats, and had earned NPR 4,000 from goat keeping by 2008.

Mrs Bhim Maya Praja has raised six goats. With the income from goat meat she has no problem of food supply to her family. Prior to project implementation, her family members used to illegally enter the national park to gather roots and other non-timber forest products. These days, they do not practice such activities anymore.

Mrs Sukumaya Praja has now better income from banana harvest and goats farming. She sold 3 goat kids for NPR 1,000 each. Prior to the project intervention, she used to carry loads of manure for the rich farmers uphill for a meagre payment of two kilograms of corn flour, worth about NPR 30. She used to earn an additional NPR 100 to 120 per day from selling her labour for other work. She can now cover her family's rice needs (as much as 20 kg per month) as well education for her four children, and essential spices for her kitchen, with the income from her banana sales. Her banana production was 200 pieces in the first year (2006), and by 2009 it was 500 pieces. Also, she earned NPR 3,000 annually from goats. She is careful about her banana and other crops, and does not let her goats graze freely. She has planted out fodder trees such as *ipil-ipil* (*Leucaena leucocephala*), *tanki* (*Bauhinia* species), *bakaino* (*Melia azedarach*), and *nimaro* (*Ficus nemoralis*).

Although the project succeeded in the construction of 28 water harvesting ponds, there has been a problem with the low cost Silpaulin plastic sheets initially used. At many places the plastic sheets were found to be abandoned. They were damaged by ants, rats, plants and other animals. The

project implementer has reacted by promoting the construction of cement tanks, despite the higher costs.



Photos: Irrigated vegetable plot (left) and cement water tank (López-Casero)

During the project period, 187 households engaged in fresh vegetable production and sales. As a result they received an additional income of NPR 807,417 by selling 67,295 kg of fresh vegetables (Table 10). Farmers made especially good income by sales of off-season tomato during the festivities of Dashain and Deepawali.

Table 10: Production and sales of fresh vegetables (MDI Project Completion Report)

Name of vegetables	Participating households	Total production (kg)	Average rate (NPR)	Total income (NPR)
Radish	25	7498	6	45,363
Bean	12	2368	11	25,196
Tomato	25	8740	11	95,616
Potato	57	45643	10	456,430
Bitter gourd	8	1924	15	28,360
Onion	23	2362	14	32,194
Leafy vegetables	37	15432	8	124,228
Total	187	83967		807,387

Some 270 farmers participated in growing and selling cash crops in the project areas, generating a total of NPR 1,103,825 in sales. Ginger was sold at NPR 25 per kg, and black gram at NPR 40 per kg (Table 11).

Table 11: Production and sales of cash crops (MDI Project Completion Report)

Crops	Participating households	Production (kg)	Average rate (NPR/kg)	Total income (NPR)
Ginger	31	7,657	25	191,425
Turmeric	48	8,016	15	120,240
Blackgram	192	19,804	40	792,160
Total	271			1,103,825

*Box 9: Vegetable farmer*

Apart from banana trees provided by the project, Mrs Buddhi Maya from Polaghari (Manahari VDC) also cultivates vegetables including cauliflower, onions, tomatoes and others. She earned NPR 3,000 from 700 cauliflowers, and NPR 2,500 from onions. Like her neighbours, her family members also now do not have to go to the national parks, where they would be threatened by the park guards (army and civil), to gather edible wild fruits for their survival.

Vermiculture farming quickly gained popularity among farmers. By the project end, a total of 20 farmers in different locations had altogether 56,000 earthworms. These worms produced 1,460 kg of vermicompost, which is mostly used for nursery crops. Vermiculture has also become an income generating activity through vermicompost trading in the villages. Almost half of the produced vermicompost, 570 kg, had been sold by the project end at NPR 20-25/kg, generating a total of NPR 11,400. The market networks are increasing, as people are realising the benefits of vermicompost use, and some users in the area are reported to have stopped using chemical fertilisers such as urea. Vermiculture was a particularly successful activity under the project.

*Box 10: Vermiculture experience*

Beginning in 2005, with 1,000 earthworms in a basket (1 m x 500cm X 1 m) Mr Lal Bahadur Thing has been able to produce three quintal (= 300 kg) of compost per year. Earthworms are kept in a moist, mixed bed of dung, paper and banana stem. They eat the dung and release excreta as good quality manure. This is collected and used for vegetable farming.

In conclusion, the project largely succeeded in promoting and improving both goat-keeping and vegetable farming based on small irrigation technologies. Both activities have led to substantial income generation of participating households. There is room for further expansion of both activities amongst farmers in the area provided that the original project implementer and/or local community organisations provide initial input in the form of livestock or loans for the irrigation scheme. Vermicomposting is still rather small-scale, but its success so far demonstrates potential for its adoption by other farmers, provided that efforts are made to facilitate the expansion of knowledge amongst farmers in the area.

***Environmental impacts***

The project has had a positive environmental impact by training the farmers in improved management of goats and other livestock. During the field visit, no free grazing was found in the project sites. The goats were found in the enclosures and the cattle in the sheds. Whenever the families have to graze their livestock, an adult member shepherds their stocks. The project has also contributed to improving environmental conditions by decreasing dependency on forest for grazing. Vermicomposting has also had a positive impact on the environment by providing a source of natural fertilizer.

### 3.4. Energy Saving Technologies

The project introduced an incentive scheme to motivate farmers to adopt energy saving technologies. The scheme was financed both from the GEF/SGP fund and contributions from other donor organisations.

#### 3.4.1. Project input and process

The energy saving technologies promoted by the GEF/SGP project include:

- Solar home system to reduce the use of combustible oil (e.g. kerosene)
- Improved cooking stoves to reduce the use of firewood at household level
- Biogas plants for the same purpose
- Vermicomposting.

Funds other than from GEF/SGP, namely the Community Environment Trust Fund, the Seed Grant and public subsidies were also utilised to acquire the different technologies. Organisations of local farmers, such as Agroforestry Management Committees, Community Forest User Groups and cooperatives also contributed. These local institutions were involved in organising the distribution of technologies among their members.

#### **Solar lighting**

As a direct input of the project, altogether 230 households installed solar home systems. A photovoltaic solar system with a capacity of 10-20 Watt was used in the project. The system consists of a solar panel, a solar deep cycle battery, charge/load controller and solar lamps. The solar photovoltaic panel is rectangular and made of silicon, which serves as a semiconductor. It is a simple device to generate electric power from sunrays. The lifespan of these panels is declared to be 40-50 years, but they are guaranteed for 25-30 years. The solar deep-cycle battery is 80% dischargeable and has a life of four to six years. The batteries are rechargeable and can be charged automatically by a controller. The capacity of the controller depends upon the capacity of the battery used. The controllers are warranted for two to three years.

The lamps used were generally efficient and good power savers. The solar lamps were procured from and installed by RESS (Rural Energy Solar Support). The details of the solar home system are provided in Table 12.

*Table 12: Details of solar home system (MDI Project Completion Report)*

Technology	HH. = No. of items (total in project area)	Amount contributed by different sector (NPR)					Total amount (NPR)
		Govt. Subsidy	AMCs	CFUGs	Farmers	GEF/SGP CET Fund	
Solar home system	216	1,325,000	60,700	570,000	393,000	1,134,200	3,482,900

### **Improved cooking stoves (ICS)**

The ICS used were mud stoves having two pot holes with plain galvanised iron (GI) sheet chimney outlets. Altogether 749 households constructed ICS during the project period, with the largest contribution made by farmers (Table 13).

Table 13: Details of ICS (MDI Project Completion Report)

Technology	HH. = No. of items (total in project area)	Amount contributed by different sector (NPR)				Total amount (NPR)
		CFUGs	Seed grant	Farmers	GEF/SGP CET Fund	
Improved cooking stove	749	54,550	82,116	126,613	2,900	266,179

### **Biogas plant and toilet construction**

Biogas plants established in the project area are of 4 m<sup>3</sup> to 6 m<sup>3</sup> in size and metal biogas stoves are used. A total of 28 households – almost exclusively in Handikhola VDC – installed plants. The total investment was NPR 457,000, with funds received mainly from the Biogas Support Programme (see Table 14). Private biogas companies were contracted for the construction of biogas plants.

Table 14: Details of biogas plants (MDI Project Completion Report)

Technology	HH. = No. of items (total in project area)	Amount contributed by different sector (NPR)				Total amount (NPR)
		Biogas Support Programme	Co- operative	Farmers	GEF/SGP CET Fund	
Biogas plants	28	252,000	43,000	84,000	78,000	457,000

The APFED Team was shown biogas plants established by the Churia Agriculture Cooperative of Handikhola with support from the project. The biogas plants are attached to toilets, therefore both cattle dung and human excreta are used for generating biogas. The gas is formed inside a dome with the action of anaerobic bacteria. The gas is then piped up to the stove in the kitchen and used for cooking. The size of the biogas plants varies depending on the availability of dung. In the project area generally farmers have built 4 to 6 m<sup>3</sup> sized biogas plants which are sufficient for a family size of four to five persons with two to three cattle or buffaloes.

### **Improved water mills (ghatta)**

Prior to project implementation, people in the area had no access to modern mills to grind food grains. They depended on local *ghattas*, which have a very low efficiency, causing people, mostly women, to spend long hours, sometimes the whole day, in front of a *ghatta*.

The project provided support to five local water mills with an improved *madani*, which is the turbine wheel located in the lower part of the *ghatta* house. The new wheels lead to a substantial increase in efficiency. Under the project, a total of NPR 83,785 was invested in the establishment of the improved water mills (Table 15).



Table 15: Improved water mills

Name of improved water mill	VDC and district	HHs.	Cost contribution				Total cost (NPR)
			AEPC* (NPR)	Cooperative / AMC (NPR)	Farmers (NPR)	CET Fund (NPR)	
Anaptal	Manahari-2	51	5,780	1,500	5,500	6,000	18,780
Musedhap	Handikhola-7	45	5,780	3,000	3,500	6,000	18,280
Botbari	Raksirang-8	55	5,780	1,500	4,000	3,085	14,365
Nedurang	Raksirang-8	65	5,780	1,500	4,000	3,800	15,080
Shikhardada (Lekhman)	Kakada-4	70	5,780	1,500	10,000	0	17,280
Total		286	28,900	9,000	27,000	18,885	83,785
Contribution %			34	11	32	23	

\*AEPC = Alternative Energy Promotion Centre

### **Bio-briquette**

Bio-briquette is an artificial solid fuel, developed to control pollutant emissions from the combustion of domestic stoves. It is manufactured from a mixture of coal, biomass (grass) and desulfurizer under high compression.

The project started at a very late stage to develop bio-briquettes. Two people, one project staff and a local farmer, who were provided training by the Rural Infrastructure Development Project in Kathmandu, engaged in the production of bio-briquettes using *banmara* grass (*Eupatorium adenophorum*). For this purpose, the project purchased one compression machine and a few sets of tools. Seven farmers were trained in this technology. Given the time constraints during the field survey, the APFED team did not view the compression machine.

### **3.4.2. Project output and impact**

According to the completion report, 1,104 technological facilities were installed, comprising 216 solar home systems, 28 biogas plants, 749 ICS, five improved turbine wheels for *ghatta*, 105 toilets and one bio-briquette compressor.

The solar home system was well implemented with a number of panels installed on house roofs or on poles. One important use of the lamps has been for studying. Other use of the electricity generated included television and radio. People who received lamps were generally content with the solar systems. However, maintenance is a problem. Several farmers interviewed in the settlement of Polaghari reported that once the lamps broke they could not be fixed in the nearby bazaar town of Manahari. According to MDI-Nepal representatives, the organisation which procured and installed the solar lamps does not operate its office anymore in the project area. This constitutes a challenge for the sustainability of this activity.



*Photos: Improved cooking stove (left) and improved water mill (López-Casero)*

With the installation of ICS, the project reduced household fuel consumption by 10% on average. During the field visit in Churidanda, Manahari VDC, the APFED team noticed that in one house the traditional cooking stove was the one generally used, while the improved cooking stove appeared almost unused. The implementer explained that not all households accepted the ICS for two main reasons. First, the size of the stove does not fully match the larger size of the pans traditionally used in the households. Second, locals believe that allowing the smoke to impregnate the wood will make the roof waterproof, which is why many prefer the smoke to be released within the dwelling and to filter through the roof, despite the noxious effects this might have on health. The implementer assured that they are working on redesigning the ICS to make them match with the usual size of local pans. More difficult will be to dissuade people from continuing to use the smoke for roof impregnation.

The biogas plants were generally accepted by local people. Where they were installed, fuel consumption dropped an additional 80% for most of the year, except for the winter season (60%), when energy demand is higher. People understandably still require wood for animal feeding and for various religious purposes. The fact that the Churiya Agriculture Cooperative of Handikhola continues to install biogas plants – with 20 under construction – demonstrates the appropriateness of this activity.

A total of 286 households benefitted from the five improved turbine wheels. The mill installed by the Niguretar Agricultural Cooperative at Raksirang serves nearly 100 households. The female operator keeps two *mana* out of four *pathis* (1 *pathi* = 8 *manas*) of flour.

With the compression machine purchased under the project around 1,000 bio-briquettes had been produced by the end of the project. A test conducted in the local market revealed limited interest

and the production has thus been discontinued. MDI-Nepal has a declared policy of ensuring market access before promoting continuous production.

### 3.5. Capacity building activities

In the original proposal capacity building activities were described as “awareness raising activities” and included:

- Celebration of the environment day
- Policy dialogue involving various stakeholders
- Awareness raising pamphlets/brochures etc.
- Training and exposure visits
- Advocacy and lobbying to protect environment against hazards/disasters.

#### 3.5.1. Project input: Training and exposures

Out of the five types of activities above, the emphasis of this component was on training and exposures, to build the capacities of both individual participants and groups with respect to the various project activities. The project conducted a number of training workshops and linkage exposure visits, and provided technical assistance.

*Table 16: Capacity building (Training and exposures) (MDI Project Completion Report)*

Type of training	Total participants (No.)		
	Female	Male	Total
Nursery training	6	29	35
ICS promoter training	0	22	22
Compost making	17	32	49
Vermicompost training	5	25	30
Biopesticide making	26	41	67
ICS orientation training	440	171	611
Introductory workshop in the field	96	243	339
Eco club formation	14	17	31
Farmers school	5	18	23
Internal exposure visit	77	167	244
External exposure visit	2	3	5
Vegetable farming	11	31	42
CBO strengthening	0	2	2
Goat raising	19	11	30
Fund management	0	1	1
Bio-briquette training	0	7	7
ICS installation training	17	33	50
AMC progress & planning (Field level training)	94	163	257
Review learning workshop	21	78	99
<b>Total</b>	<b>850</b>	<b>1094</b>	<b>1944</b>
<b>Percentage (%)</b>	<b>43.7</b>	<b>56.3</b>	<b>100</b>

Altogether 1,944 farmers, 850 of them women, participated in this training. The participation of women was encouraged by adopting field based practical training methodologies (Table 16). The training organised for capacity development of the participants included:

- Agroforestry in marginal lands (including SALT methods)
- Nursery growing
- Management of cooperatives
- Off-season vegetable farming technologies
- Integrated soil and pest management
- Training on improved cooking stoves
- Training on micro-irrigation development
- Marketing management
- Vermicomposting
- Biopesticides

Policy dialogue has also been an important activity. For instance, MDI-Nepal presented the GEF/SGP project and its results at a workshop on "Khoriya Management Coordination Meeting", organised by the District Forest Office of Makawanpur on 22 June 2009. This meeting was attended by a number of stakeholders and the first formal event on options to control shifting cultivation at the district level.

### **3.5.2. Project impact**

The field visit by the APFED Team was too limited to be able to thoroughly assess the direct impacts of capacity building, but the general impression from both the meetings and the field observations was that most farmers had received at least sufficient training to implement the key activities of the project in a successful manner. Interviewed farmers were satisfied with the training they had received by the project. All the interviewed farmers, who experimented with new species and/or applied new techniques or technologies, had participated in a number of the training modules offered by MDI.

As a result of the project's training, farmers who previously depended on slash and burn farming are now able to apply the most important SALT methods. They are able to layout their sloping land using contour planning with the help of locally made A-frames and plant species. They are familiar with the proper selection of banana species, the planting and tending methods. Many farmers have also learned how to grow pineapples or other fruit crops. As a further outcome of the project, most farmers have understood how to increase the value of "marginal" lands by growing suitable fruit crops and different species of fodders.

Most farmers are now able to use quality compost manures prepared in their own compost pits. There is an impressive replication of vermicomposting methods among villagers after the orientation training. Farmers have learned to make low-cost water harvesting tanks for irrigation and shared experience on off-season vegetable farming.

## 4. Conclusions

The conclusions of the APFED Team on the project focus on the achievements of its objectives and target indicators, and on cross-cutting issues, namely a) gender and caste, b) appropriateness and sustainability and c) replicability of the project. Table 17 provides an overview of the achievements of the project in quantitative terms as presented by the implementer in the conclusion report. The following discussion will make reference to these figures.

*Table 17: Summary of achievements (MDI Project Completion Report)*

Descriptions	Target indicators	Achievement	Remarks
Households benefited (No.)	2,000	1,524	
Agroforestry	-	1,089	Tamang: 525; Chepang: 467; Dalits: 27; others: 70
Area under improved agroforestry system	500	438 ha	Total plants: 924,374 (Banana: 193,335; Pineapples: 148,363)
SCGs/cooperatives	-	1,064	Collection of savings: NPR 1,265,028
No. of institutions developed	20	41	Saving & credit: 30: AMCs: 6; Cooperatives: 5
Household with energy saving technologies (No.)	1,000	1,104	Solar: 216; ICS: 749; Biogas: 28; Water mill: 5; Bio-briquette: 1
No. of water harvesting tanks constructed	50	28	
Human resource development (internal cadres)	50	61	Social mobiliser: 4; ICS promoter: 22; Agroforestry nursery foremen: 35;

### 4.1. Achievement of project objectives

The overall objective of the project as stated in the Completion Report was “to achieve improved and sustainable people’s livelihood through the management of sustainable land management practices that contribute to combat land degradation and mitigate greenhouse gas fluxes that are released through biomass burning.” The field survey found clear evidence from a variety of sources that the project succeeded in significantly improving the livelihoods of local farmers of previously marginalised ethnic communities. Moreover, both land degradation and greenhouse gas emission from slash and burn practices have been significantly reduced on 438 ha of marginal sloping land. However, as the project did not include monitoring of erosion and emission reductions, there are no data available that could serve to quantitatively assess the achievement of the latter two objectives.

The performance of the project in achieving its specific objectives is discussed first, before returning to achievement of the overall project goal.

#### **4.1.1. Development of appropriate land use practices for sustainable production**

In terms of contributing to the overall objective, to develop and promote appropriate land use practices for sustainable production as an alternative to the shifting cultivation system was probably the most important specific objective of the project. The project successfully introduced an agroforestry system which integrated horticulture development, livestock farming, and small-scale income generation schemes. Rather than the objective stated in the project proposal – the mitigation of the effects of greenhouse gases – the more important purpose of the agroforestry component was to improve the livelihoods of local farmers by offering them a number of income opportunities.

During the field survey, the plant species chosen for the project intervention in the slash and burn slopes were found to be ecologically appropriate and economically viable. Banana planting has been successful in both forest areas and denuded land, as well as on stream banks and in gullies. In all the visited sites, banana plants were healthy and fruiting. Where the sites were too dry and sunny for bananas, pineapples proved a suitable alternative. When planted and sold in sufficient numbers, pineapples also provide a good income source. The project also provide additional income opportunities from other horticultural crops, cinnamon, asparagus and broom grass. Other activities that contributed considerably to livelihood improvement were goat keeping based on proper management techniques, vegetable farming in combination with irrigated vegetable growing, the experimenting with and expansion of vermicomposting techniques, and toilet construction.

Although the project proposal did not set a target number of households, the total number of 1,089 households which participated in agroforestry during the project period is impressive. The total area covered under agroforestry by the end of the project, 438 ha, is close to the original target of 500 ha (Table 17). Moreover, given that agroforestry activities promoted by the project have been sustainable and replicated since, the current area under agroforestry can be expected to notably exceed 500 ha.

As a further result of the project, there has been a remarkable drop in the incidents of forest fire. Local people have taken initiative to protect and conserve forests, and have controlled fire hazards. In some areas such as Polaghari, the local people have also applied to register the surrounding forests under the community forests system. The decline in the incidences of forest fire will contribute to conserving biodiversity.

#### **4.1.2. Development of community based organisations**

The development of community organisations with the intention that they would take initiative in implementing the project activities was another important specific project objective. In facilitating the creation of 41 institutions by November 2006, the project exceeded its key target indicator of 20 institutions, i.e. 30 saving and credit groups, six Agroforestry Management Committees, and five agricultural cooperatives (Table 17). The formal agricultural cooperatives can be viewed as the ultimate step of successful local institution building. As a result of the project, the majority of the households participating in the project became members in at least one of the community based

organisations – either the SCGs (819 members), the AMCs (819), and/or the cooperatives (512) by the end of the project.

In its assessment of the project, the APFED team employed additional indicators for successful social mobilisation under the project, namely activities, achievements and decision-making processes of the various institutions.

By the end of the project, the SGCs had accumulated a total of NPR 1.3 million (approx. USD 20,400) as monthly savings and disbursed NPR 6.6 million (approx. USD 105,000). The AMCs were able to raise their funds to a total of over NPR 880,000 (approx. USD 13,800), and the cooperatives generated a total sum of approx. NPR 1,800,000 (approx. USD 28,300). In Chuarpakha area, seven savings & credit groups have jointly formed the Churia Agricultural Cooperative to which the households and the groups are members. Local community members no longer use money lenders, as they have substantial deposits earned from their membership monthly savings. The monthly savings were initially NPR 10, but the members have raised these to NPR 25 to NPR 150, according to their earning and savings.

Each of the meetings with the APFED team was attended by large numbers of members including the poorest members of the community. Members appeared to speak frankly about both the progress made and existing challenges. The organisations have established internal rules for regular meetings, participatory decision-making and electing their leaders. In conclusion, the project was successful in facilitating the creation of a large number of institutions that appear to meet important performance quality indicators.

Moreover, the development of community-based organisations was crucial to the success of agroforestry and other activities aimed to improve livelihoods. Through the revolving fund scheme under the project, the project funds were gradually transferred from the project's account to the AMCs account. After the project's end, the AMCs have proved financially sustainable by collecting saving contributions from their members. Informal and formal local community organisations created with the support of the project have ultimately taken the initiative in continuing to implement activities after the project's completion.

#### **4.1.3. Incentive scheme for the adoption of energy saving technologies**

The third specific objective of the project was to introduce an incentive scheme to motivate farmers to adopt energy saving technologies, such as solar home systems, improved cooking stoves (ICS), biogas and bio-briquettes. The key indicator for this objective stated in the project proposal was that by the end of the implementation 1,000 households would have “well adopted” at least one of the energy saving technologies.

It is not fully clear if and to what extent the project surpassed the expected output. The completion report mentions the number of technological facilities installed as 1,104 in total. However, some households have had two or more different technologies installed, so the total number of

households could be expected to be lower than 1,104, but higher than 749, which is the number of the most extensively distributed technology, the ICS (one per household). On the other hand, a large number of households (286) benefited from the five improved turbine wheels. Therefore, the total number of households that benefited from at least one technology can be expected to exceed 1,000. In conclusion, the project has achieved the quantitative target set under this component.

Overall, the APFED team found all technologies in the project area well implemented.

The provisions of solar panels and lamps had a very positive impact in providing lighting to the local communities, which in turn provided additional opportunities for studying and other activities in the evening. With the installation of improved cooking stoves, the households reduced fuel consumption by 10% on average. Where biogas plants were installed, fuel consumption dropped an additional 80% for most of the year, except for the winter season (60%), when energy demand is higher.

The biogas plants were particularly successful with a high acceptance by local people. One cooperative continues to install biogas plants – with 20 under construction –, demonstrating the sustainability of this activity. Moreover, the increasing number of biogas plants and resultant decrease in fuelwood usage will have a positive effect on forests and biodiversity in the area.

The two major problems encountered with respect to energy-saving technologies were a) the unsustainable use of lamps, as the support organisation discontinued their maintenance and supply; b) the limited acceptance of improved cooking stoves, which can only partly be solved by redesigning the ICS given the traditional usage of the smoke for roof impregnation. The implementer has assured that these two issues are being addressed. The discontinuation of bio-briquette production appears justified given the limited interest in the local market.

#### **4.1.4. Development of skilled human resources**

The completion report mentions as the fourth specific objective of the project “the development of skilled human resources to enable them to carry out and prepare a land use map.” The APFED team did not find any evidence of the preparation of a land use map, but capacity building covered a host of different training and exposure measures necessary for the involvement of participants in the implementation of the project activities.

The training activities related to agroforestry practices undoubtedly paved the way for the project to succeed in curbing shifting cultivation in the project area by offering farmers alternative income opportunities. Training on AMC progress and planning were also fundamental for the successful establishment and development of the local community organisations.

#### **4.1.5. Livelihood improvement**

In conclusion, the largely successful achievement of the specific project objectives significantly contributed to realising the overall goal of the project, to improve the livelihoods of hundreds of



poor households, which subsisted on the limited harvest of crops like maize and millet. As a result of the project, the communities have been able to achieve an increase in food security and ultimately an improvement in living standards. As of April 2007, the total income of the participating households from the sale of bananas, pineapples, vegetables and cereals planted after the initiation of the project amounted to more than USD 56,000.

Households, who used to depend on producing maize and millet for subsistence, carrying loads of manure to the uphill communities for a meagre daily wage or poaching in the national park, have seen their lifestyles change after the project intervention. They now carry their own products of banana to the local markets and earn on average NPR 3,000 per month. Similarly, once they started benefitting from the project activities, local people stopped entering the Chitwan National Park and the Parsa Wildlife Reserve to illegally gather wild fruits, roots and non-timber forest products. Thus, the project intervention has indirectly contributed to biodiversity conservation in the protected areas.

Visible impacts of the project in terms of livelihood improvement have been found in all the visited project sites. Sanitation in and around the houses is satisfactory. Personal hygiene was good. Children, women and men are well dressed.

## **4.2. Cross cutting issues**

Apart from the project's own objectives there are crucial cross-cutting issues that were included in the assessment of the project:

- Gender and caste
- Appropriateness and sustainability
- Replicability

### **4.2.1. Gender and caste/ethnicity**

Organising women and members of disadvantaged segments of society is a difficult task in the socio-cultural background of Nepal. This is particularly true for the context of north-western Makawanpur, where most of the poorest Chepang and Tamang communities live. During the field observation, many women were found to be actively involved in the earning activities under the project. Women are working as banana farmers and wholesalers, watermill caretakers, fish farmers, etc. and are the leaders of some informal community groups. In the meetings with the informal community organisations women spoke on their own initiative, constituted the majority of informants and hold either the position of secretary or vice-secretary. There appears to be less opportunity for women in the cooperatives. In the meetings with the agricultural cooperatives, few women spoke without prompting. In the meeting with one cooperative, no female members were present.

Figures on women's involvement in the project are limited to their participation in capacity building (Table 16) and institutional development (Table 18). It can be assumed that the percentage of women who participated in the training for each project activity is similar to the percentage that participated in the actual activities. According to the figures from the completion report, 43% of the

participants of capacity building measures, i.e. training and exposure, were women. This share is impressive given traditional gender roles in the Chepang and Tamang communities.

*Table 18: Gender and ethnicity involved in the project (MDI Project Completion Report)*

Project components	Ethnicity				
	Tamang	Chepang	Dalit	Others	Total
<b>Institutional development (individuals)</b>	<b>1,141</b>	<b>786</b>	<b>160</b>	<b>206</b>	<b>2,293</b>
<b>Percentage (%)</b>	<b>49.8</b>	<b>34.3</b>	<b>7.0</b>	<b>9.0</b>	<b>100</b>
<b>Women</b>	<b>367</b>	<b>261</b>	<b>56</b>	<b>69</b>	<b>753</b>
<b>Percent of women (%)</b>	<b>32.2</b>	<b>33.4</b>	<b>35.0</b>	<b>33.5</b>	<b>32.8</b>
<b>Income generation (households)</b>					
Agroforestry	440	461	20	17	938
Cash crops	170	186	10	19	385
Fresh vegetables	148	103	10	5	266
Livestock (goat)	55	100	9	4	168
Vermicomposting	10	7	1	1	19
Trading (banana)	6	4	0	0	10
Sub-total	839	861	50	46	1,796
<b>Percentage (%)</b>	<b>46.7</b>	<b>47.9</b>	<b>2.8</b>	<b>2.6</b>	<b>100</b>
<b>Technology adopters (households)</b>					
Solar home system	181	35	4	10	230
Biogas	17	4	0	7	28
Improved ghatta	3	2	0	0	5
Toilet	39	7	2	5	53
Improved cooking stove	298	376	10	15	699
Water harvesting tanks	76	0	0	7	83
<b>Sub-total</b>	<b>613</b>	<b>425</b>	<b>16</b>	<b>44</b>	<b>1,098</b>
<b>Percentage (%)</b>	<b>55.8</b>	<b>38.7</b>	<b>1.5</b>	<b>4.0</b>	<b>100</b>
<b>Training (individuals)</b>	<b>839</b>	<b>660</b>	<b>29</b>	<b>82</b>	<b>1610</b>
<b>Percentage (%)</b>	<b>52.1</b>	<b>41.0</b>	<b>1.8</b>	<b>5.1</b>	<b>100</b>

Compared with capacity building, the role the project could play in promoting gender equity in the local community organisations established with the support of the project was more limited. The 32.8% share of women in the local community organisations is satisfactory, but there is potential for the implementer to commit the community based institutions to increasing the participation of women. MDI-Nepal is respected by the local organisations and could thus encourage them to either introduce quota in their statutes for female participation or resort to persuasive strategies and incentives for women's participation. This is especially true for the high-level positions within formal organisations. While two of the vice secretary positions in the informal community groups were held by women, the role of women in the cooperatives registered under law was less evident. This is an issue that deserves further study.

In terms of ethnicity and caste, a particular strength of the project was its focus on the poorest and generally most marginalised communities in the area, namely the Chepang, Tamang and Dalit communities. The project has successfully met its overall target of improving the livelihoods of these communities in the project area. In interviews, members of all three communities stressed the very positive impact of the project in terms of additional income generation. Still, there appears to be potential for a stronger inclusion of the Dalit community members in quantitative terms. The proportion of their involvement in institutional development among the ethnic groups is satisfactory at 7% (see Table 18), as this slightly exceeds the 6% share of Dalit among the total population in the project area. However, judging from the numbers provided by the implementer, the proportion of Dalit community involvement in income generation from agroforestry (2.8%), technology adoption (1.5%) and training (1.8%) could probably have been higher. MDI-Nepal should study the reasons for the low participation of Dalits and consider ways to raise this.

#### **4.2.2. Appropriateness and sustainability**

The impacts of the project have turned out to be largely sustainable. More than two years after its completion, the main outputs are still visible, and in use or effect. The effective social mobilisation under the project has ensured that various informal and formal local institutions keep providing the necessary revolving funds for farmers to be able to conduct most of the activities introduced by the project, particularly those related to agroforestry and livelihood promotion.

The socio-economic advantages of commercial farming of banana and other fruits and crops and from additional income and food sources such as goat keeping and vegetable growing, as well as the benefits from stabilising the slopes through the various SALT methods including fodder tree planting, are now well understood by the local Tamang and Chepang communities. Local farmers are now fully aware of the additional income opportunities and many are open to experiment with new types of fruits and crops. The banana saplings provided under the project are now mature banana plants which, considering seasonal variations, render production throughout the year. The banana plants also provide new saplings for the farmers, contributing to the sustainability of banana farming. To ensure sustainable agroforestry practices over the long-term it will be crucial to continuously apply SALT methods, including keeping and planting an appropriate share of forest trees that mitigate erosion and provide the necessary shadow for certain crops, as well as applying natural fertilisers to guarantee soil fertility. A major challenge to the future of the agroforestry component of the project is that ownership of *khoriya* lands is yet to be resolved. The farmers have planted out thousands of banana and other cash crops in the lands which legally belong to the Department of Forests.

With respect to the component of energy saving technologies, the question of sustainability is more difficult to assess. One of the technologies, the solar home system, has faced a challenge with the repair of broken lamps, as the supplier is no longer providing support services. This problem will have to be addressed either by the project implementer under a different project or by the community organisations, if individuals cannot afford to purchase new lamps. Improved cooking stoves faced a problem of low acceptability among some locals as they were not appropriate. To ensure a

sustainable use of the stoves, they need to be redesigned to match with the usual size of local pans, as discussed above. The use of biogas plants, on the other hand, proved particularly appropriate and sustainable in the settlements where they were installed under the project; the local cooperative has continued the activity of installing biogas plants here. Vermicomposting has also turned out sustainable where introduced by the project and replicated by interested farmers in the neighbourhood, but there is a potential for further expanding this technique throughout the project area. Bio-briquette production is the only activity under the project that has been discontinued, but the implementer provided a good reason for this.

Since the completion of the GEF/SGP project, MDI-Nepal has promoted additional plantation in some 530 hectares of sloping land. Altogether, 1.1 million plants (40% banana and 60% broom grass) have been planted so far, according to information provided by MDI-Nepal. The area covers the sloping uplands of a total 1,606 households, mainly in Raksirang VDC but also in three other VDCs.

#### **4.2.3. Replicability and ongoing replication**

The successful implementation of agroforestry practices and other project activities in the hills of Makawanpur by the project represents a good case for replication for other hilly areas of Nepal and abroad with similar geographical and socio-economic conditions. After the official project termination, various successful project interventions have been replicated by other hill farmers in and outside the project area on a large scale. The most widely replicated activities have been banana plantations and biogas installations.

The APFED team also visited an area in neighbouring Chitwan District where the agroforestry component of the project is being replicated. The area is Kuyalghari in Dahakhani VDC. It comprises steep slopes in the narrow corridor formed by the Narayani River between Mugling and Narayangarh on the Chitwan-Kathmandu highway.

##### *Box 14: Replication of project's agroforestry component in Dahakhani VDC, Chitwan District*

Mr Raju Chepang began planting bananas on his sloping land in 2008. He has approximately 700 plants, and has prepared pits for another 300 plants. He sells the bananas in Mugling, a nearby market about 9 km to the north. He earns NPR 7,000 to 13,000 per year from his sales. He is also supplying banana saplings to 17 households who have prepared planting pits and his farm has become the main source of banana saplings in the new project area. He informed that nearly 100 households were ready to plant bananas.

MDI has produced a booklet titled the "Renaissance of Slash and Burn Farming (Khoriya Farming). Experience from Makawanpur", that can serve as a manual for areas interested in replicating activities promoted by the project. In recognition of MDI's achievements in bringing positive changes among the poor people in Makawanpur, the MDI-Nepal Chair has been invited to the Asia regional meeting of the Civil Society Organisation in Bangkok on 9 April 2009 to present on the implementation and results of the project.

The APFED team and MDI-Nepal held a consultative meeting with local government officials. Officials of seven different local government line agencies participated in the consultative meetings. They represented local development, forestry, soil conservation, nature conservation, agriculture, water management and cooperative organisations. The NGO federation, which has become member of the cooperative, was also represented. The overall comments and feedbacks of the participants referred to options for best utilisation of the *khoriya* lands. The Local Development Officer stated that his office would consider the project's activities for replication in the district.

Of particular relevance for the future replication of the project is the above-mentioned workshop on "Khoriya Management Coordination Meeting", organised by the District Forest Office of Makawanpur on 22 June 2009. This meeting, where MDI-Nepal presented the GEF/SGP project and its results, was reported to have had a considerable impact at the district level. At the meeting the District Forest Officer pointed out the achievements made by the GEF/SGP project and called upon all stakeholders to develop integrated programmes for fighting slash and burn problems in the district.

## 5. Recommendations

Overall, the project was implemented efficiently and successfully, its main objectives were achieved, and most of its activities are sustainable and replicable. On the basis of the above conclusions and the consultations made with participants, project implementers and line agencies, we propose the following recommendations for further strengthening the approach advocated by the project.

- **Project formulation**

Reformulation of project objectives after implementation has begun should be avoided as it is confusing to third parties and makes assessment difficult. If the original formulation is found wanting, which seems to have been the case with the original overall objective of this project (“climate change mitigation”), then revision of project objectives cannot be avoided. In such cases, the implementer should record, justify, and announce the change in project objectives.

- **Social Mobilisation**

Social mobilisation, including the creation of both informal and formal local community organisations, is one of the most successful and sustainable components of the project. Recommendations to further strengthen this component are:

- (1) Link the agricultural cooperatives and the savings and credit groups with the existing community based organisations especially community forests user groups and the buffer zone user committees.
- (2) To address the unresolved tenure rights in *khoriya* land:
  - a) Reach out to local and national authorities, including the Department of Forests, highlighting the achievements of the project and seeking collaboration and support for further activities;
  - b) Initiate a multi-stakeholder dialogue at the local level to identify options for solving the issue of land tenure and use rights;
  - c) Follow the existing laws and policies when implementing project interventions on government lands.

- **Agroforestry**

Agroforestry was another successful and sustainable component of the project. The only concerns here were (1) how to optimise the planting of various crops and (2) how to further reduce the impact on biodiversity and soil erosion:

- (1) Consider other alternative crops such as cinnamon and lemon, along with banana, broom grass (*amriso*) and pineapple;
- (2) Retain existing natural vegetation including trees and shrubs to the extent possible; (Banana plantations, especially on south facing slopes prefer a certain degree of shadow; in addition, this will contribute to maintain soil and biodiversity on the slopes.)
- (3) Consider conducting monitoring of emission reductions focusing on representative test plots.

- **Livelihood promotion**

The various activities under the component livelihood were generally successful, but there is potential to increase the number of participating households:

- Emphasise extension of the successful activities, particularly small-scale irrigation for vegetable farming and vermiculture.

- **Energy-Saving Technologies**

Most of the energy-saving technologies brought a considerable improvement of the participants' livelihoods, but there have been some problems related to acceptance and sustainability.

- Use technologies that do not depend on a single provider;
- Assist community organisations in finding lamps that can replace the broken ones;
- Redesign the improved cooking stoves to match the usual pan size, in order to increase their acceptance.

- **Gender and caste**

Members of all marginalised ethnicities and castes participated under the project, but representation from the Dalit community in livelihood activities was smaller than their share of total population in the project area. Women and men participated in most of the project's activities in similar numbers, but there is potential for more female involvement in formal local community organisations.

- Ensure that all poor ethnic groups which practiced or still practice slash and burn are involved in future projects in a proportion that corresponds with their share of the total population of shifting cultivators;
- Encourage and promote a more active role of women in the formal community organisations, especially the agriculture cooperatives.

## References

MDI-Nepal (Manahari Development Institute) 2003. A proposal on mitigation of the effect of greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O & other) through controlling slash and burn practices among shifting cultivators in north-western Makawanpur. Submitted to United Nations Development Programme and Global Environment Facility Small Grant Programme.

MDI-Nepal. 2007. Mitigation of the effects of CO<sub>2</sub> and other greenhouse gases by controlling slash and burn practices. (Project Number: Nep/03/11). Project completion report. (June 2004 - February 2007).

UNDP GEF SGP (United Nations Development Programme Global Environmental Facility Small Grant Programme). 2008. Renaissance of Slash and Burn Farming (Khoriya Farming). Experience from Makawanpur. Written and compiled by Mr. Narayan Shrestha.



## **Appendix: Schedule of the field survey**

### **Tuesday, 17 March 2009**

4:00-6:00 PM Discussion at MDI office, Hetauda

### **Wednesday, 18 March 2009**

7:00 AM Departure to field, Niguretar (Raksirang VDC)  
8:30 AM Arrival at Niguretar  
8:30-11:00 AM Field observations  
11:30-12:30 PM Discussion with beneficiary members in Niguretar Agricultural Cooperative Ltd.  
13:00 PM Arrival at Manahari  
13:00-14:00 PM Lunch in Manahari Bazar  
14:00-16:00 PM Field visits in Shikharbas community (Handikhola VDC)  
Return to Hetaunda

### **Thursday, 19 March 2009**

6:00 AM Departure to Manahari  
6:30-7:00 AM Breakfast (Manahari)  
7:00 AM Departure to field, Polaghari (Manahari VDC)  
8:00 AM Arrival at Polaghari  
8:00-11:30 AM Field observations  
11:30 AM-12:30 PM Discussion with beneficiary members of Churiyamai Community Organization  
  
13:30 PM Arrival at Manahari Bazar  
13:30-14:30 PM Lunch in Manahari  
14:30-16:30 PM Field visit in Lothar  
Discussion with Janchetana Cooperative members (Kankada VDC) in Lothar  
Return to Hetaunda

### **Friday, 20 March 2009**

7:00 AM Departure to field, Chuwarpakha (Handikhola VDC)  
8:00 AM-11:00 AM Field observations around Chuwarpakha  
11:00 AM-13:00 PM Discussion with members of Churiya Agricultural Cooperative Ltd.  
13:00 PM - 14:00 Lunch in Chuwarpakha  
15:00 PM Arrival in Hetaunda  
15:30-17:30 PM Consultative Meeting with MDI, LDO+DFO

### **Saturday, 21 March 2009**

7:00 AM Departure to field, Churidanda (Manahari VDC)  
8:30 AM Arrival at Churidanda

8:30-10:30 AM	Field observation of Kanchhi Maya farm and discussion
12:00 Noon	Arrival at Manahari Bazar
12:00-13:00 PM	Lunch in Manahari
13:00 PM	Departure to Dahakhani VDC (Chitwan - new area under expansion) - on the way to Kathmandu, in between Mugling - Narayagarh corridor, attached with highway)
15:30 -16:00 PM	Field observation in Kuyalghari, Dahakhani
16:00 PM	Departure to Kathmandu