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Arun Valley Sustainable Resource Use and Management Pilot Demonstration Project



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Newsletter

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Publisher

Rural Reconstruction Nepal

GPO Box 8130

Lazimpat, Kathmandu, Nepal

Tel: 977-1-415418, Fax: 977-1-418296

E-mail: rrn@rrn.org.np

Webpage: <http://www.rrn.org.np>

Date: December 2002

Advisors

Dr. Arjun Karki

Sarba Raj Khadka

Editors

Komal Khatiwada

Prem Kala Nembang

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— EDITORIAL —

Biodiversity in Arun Valley, Nepal

Different kinds of plants (flora) and animals (fauna) are found on the Earth. These various types of flora and fauna found in nature is the biodiversity that we call in general term. Nepal extends from 60 meter above sea level the lowest altitude, to 8848 meter, highest peak of the world. Above 4000 meters, which is a snowline, we do not have any flora and fauna. The diversity of plants and animals exists below the snowline and is related to the climate of particular locality. Even though Nepal is small its geographic diversity holds three percent of world's biodiversity. We are proud to note that Nepal stands at 25th position in biodiversity status in the world.

Arun River Valley, located in the Sankhuwasabha district of eastern Nepal is the deepest river valley in the world. The valley is rich in biodiversity, both in terms of wild as well as domesticated life forms. There are 11 globally endangered mammals, and numerous plant species listed as endangered or threatened elsewhere.

Among the numerous plants and animals found in Arun Valley, the recent study conducted by RRN in the community forests of three Village Development Committees (VDCs) of the valley found the various types of plant species categorized by their local uses, viz: Medicinal (21 species), Essential oil, Essence and perfumes (7 species), Fiber materials for household use (6 species), Poisons (5 species), Bio-fertilizers (2 species), and Erosion and gully control (2 species) and Forest weeds (3 species). These species are used by the local people for different purposes since long time. Similarly, RRN has also conducted other studies related to biodiversity, which included identification of the various agrobiodiversity, and wildlife diversity the summary of which has been presented in this newsletter. The researchers have found out that there has been varieties of disturbances in maintaining the biodiversity of this region due to poverty,

increased population pressure, lack of knowledge for the sustainable use of natural resources, slash-and-burn agricultural practices bush fires, excessive wood extraction, and poaching.

Collection, extraction and sale of these resources had been at the level that is threatening their existence if continued at the present level. The farmers and the people at the adjacent to these forests are unaware of the situation that one day these resources will be unavailable for them from these forests without a proper intervention, demonstration and education on sustainable utilization and management of these resources and controlling of these resources by these people.

Sustainable development of the country is not attainable unless the biodiversity resources management is not practiced appropriately. Therefore, to conserve and manage these resources for present as well as future use is very important for all people.

We are proud to be with the readers for second time with Conservation. There are case studies, summary of studies related to biodiversity, and some of the activities of the RRN under Arun Valley Sustainable Resource Use and Management Pilot Demonstration Project (AVASRUMPDP) in Sankhuwasabha. This project aims to explore the biodiversity status, evolve with the community-based forest management practices, access and equitable sharing of the biodiversity resources and enhance the capacity of local and indigenous people to sustainable use of biodiversity.

Finally, we would like to welcome your suggestions and feedback on this issue of Conservation.

A Field Assessment of Finger Millet (*Kodo*) Diversity in Sankhuwasabha District, Nepal

By Bal K. Joshi¹
Madan R. Joshi²

Background

Finger millet (*Eleusine coracana* Gaertn.) locally known as *Kodo* is the fourth staple food crop in Nepal after rice, maize and wheat. It is grown on an average 25,800 ha of land from the southern plains to 3,150 m above sea level, fetching a national productivity of 1,095 kg/ha. It is developed, probably in the Ethiopian region of Africa, from the *Eleusine coracana* subsp. Nepal is secondary to the *Eleusine* species diversity. About 790 accession of finger millet has been collected from various parts of Nepal. The significance of the crop rises with the increase in altitude because cultivation of rice becomes less productive with increase in altitude. Finger millet is cultivated in *bari* land and is mostly relayed after maize in the hills but as a sequential crop in the lower elevations. The crop is important for its nutritive value as it contains considerable amounts of minerals (Ca, P, Fe), carbohydrates, proteins (Table 1), fats and amino acids required by the human body for normal growth and development. Likewise, the crop is quite hardy in nature and can be cultivated in areas where others cereals fail to perform well. Millet stubble has essential fodder value to farm livestock. Despite these advantages of the crop, it still fails to enjoy the status of rice, and is considered an inferior or poor man's diet in the rural society.

Parameters	Rice	Maize	Wheat	Finger millet
Protein (%)	6.8	11.1	12	7.3
Carbohydrates (%)	78	66	69	72
Lipids (%)	0.5	3.6	1.7	1.3
Minerals (%)	0.6	1.5	2.7	2.7
Energy (kcal/100g)	345	328	341	328

Field assessment and findings

A field visit was made to assess the diversity of Finger Millet in Sankhuwasabha in August 2002. The assessment was made in Num, Hatiya and Pawakhola VDCs of Sankhuwasabha district. Numerous varieties of finger millet were found as the authors made appraisal with the local farmers and observed the farmland in the area.

There are many advantages of finger millet compared to other crops. A majority of people in the area reported that finger millet considerably resists pests and drought as in comparison to other improved crop cultivars of rice, wheat and maize. It possesses biological diversities in terms of morphological aspects as well as ecological aspects. For instance, at a point of time of field visit, some crops were ready to be harvested, some were at middle growth stage and some had been just transplanted. It was also encountered that some crops were grown in the steep slopes while some were in the plains and some were adapted to mixed cropping and some were to single. Such landraces are a gift of nature which would continue to exist and breed without human intervention. Thousands of such crops exist but are in the verge of extinction. These various crops were developed over the years by our ancestors to suit different ecological conditions and uses. Diversity in crops signifies adaptation to different environments and growing conditions. The ability of a certain variety to withstand drought and poor soil, resist insects or pests or give higher protein yield is an inherent nature in itself. It was also found that marigold is used to keep the pests at bay in the millet fields.

A total of 12 landraces were found at Num, Hatiya and Pawakhola sites viz. *Dalle*, *Okhale*, *Paudhure*, *Kamre*, *Chykre*, *Phyangdhokre*, *Kartike*, *Mangsire*, *Bange*, *Nagre*, *Dhante* and *Dalle seto*. Farmers reported that these landraces can be planted with any other crops as in intercropping or mixed cropping. They have diverse landraces that can be harvested in Ashad, Kartik, Mangsir and Paush. Interestingly, *Elusine indica*, a wild relative of finger millet is also commonly found in these 3 VDCs.

1. Nepal Agriculture Research Council (NARC)
2. Rural Reconstruction Nepal-RRN



Figure 1. Closed type of ear head



Figure 2. Open type of ear head

Varieties come with the different colours of the grains and their sizes. A deep brown colour is the predominant colour of most varieties, but, shades of this colour ranging from orange red at one end to very deep brown, almost black at the other are met with, even making allowance for the fact that on account of storage and rain in the stack, the colour tends to deepen and change. A distinctive type is white *kodo* in which the husk is also white. Variations in the size of the grain are very limited. Differences in quality of the grain are also recognized though opinions differ. Some are considered better in taste, others are said to give more or less pudding from the same weight of flour, and still others are said to yield a pudding of poor consistency, pudding which cannot be kept overnight and so on. The protein content in white *kodo* is much higher than in brown *kodo* and likewise, the digestibility coefficient of the former is also much higher.

In regards to maturity period, the varieties may be distinguished as early, medium and late-maturing, the period ranging from 4-5^{1/2} months. Both, short as well as tall varieties are prevalent in the fields. As far as the ear head is concerned, it is broadly classified into two types - (i) the spikes are curved inwards and have a compact appearance (ii) the spikes are straight and the ear heads have an open appearance. There is a special type

too in which the spikes are branched, short and thick; somewhat like a coxcomb. Both, open-ended and close-ended ear heads are either green or deep violet, almost dark, in colour. Purple or violet open, violet closed, green open, green closed, violet coxcomb or green coxcomb ear heads form the latter. The difference in the length of spikes of different varieties is more conspicuous in the open ear heads than in the closed ones. The spikes are well filled or portions of the rachis are blank.

With reference to yield, as a rule, the open types are higher yielding than the corresponding compact types and the long duration varieties are better than the short duration varieties. The open types with the long spikes are, however, liable to shed and to be brittle; the spikes breaking during harvesting, carting and stacking. In spite of their lesser yield, in some localities, the compact types are preferred as they are free from the aforementioned defects as seen in the open types.

The seed *Kodo* is usually liable to be mixed, hence, deteriorate in its quality; therefore, considerable care is necessary in sowing seeds of good quality. Generally, immature, shrunken and small seeds coming from late-formed ear heads and/or as a result of insufficient rains during the later stages are mixed. The *kodo* grain itself is so small that

this mixture is not readily noticed. Risks due to poor seeds are guarded against by sowing an unduly large quantity of seeds, which is an invariable practice. At the winnowing time, however, the heaviest seeds from the best part of the heap are taken. Thorough cleaning is also usual among efficient cultivators. Such seeds are not, however, always available and seed grains are bought or borrowed from lots intended for food. It has been reported that heavy grains selected by the salt-water method yield a better crop than unselected seeds. This procedure is, therefore, recommended. The same object can also be achieved by separating the largest, heaviest grains through a sieve of suitable mesh.

Number of landraces per household indicates one of the aspects of landraces diversity. Finger millet diversity at household level has been most positively influenced by the number of *bari* land parcels.

Unlike rice farmers, finger millet farmers fail to maintain varieties of landraces on the farms. Perhaps, this reflects on the limited use of finger millet in recipes. It is primarily used as flour to make porridge and other items. Thus, it could most likely be promoted as flour. Even the most widely cultivated landraces do not have preferable traits. However, there may be variations in the taste of flour and difference in flour recovery. Further research work is a prerequisite for the promotion and utilization of this crop at the fields. The starting point lies in documenting the indigenous knowledge held by the farmers and the community.

Conclusion and Recommendation

Finger millet bears paramount significance in subsistence farming system as well as in regards to food security. Considering the importance of this crop in relation to food and nutritional security for the poor, there arises a need of more thrust on its research and development. In slash and burn agriculture, it helps to protect the soil too. Participatory characterization and evaluation of traditional cultivators will support protection against piracy. Value of finger millet should also be increased as it plays a vital role in food security for people residing in the hilly regions. Adding value through breeding and non-breeding approaches should be initiated. Introduction of white-coloured finger millet will be beneficial because of its similar appearance to rice after cooking. Thick porridge, bread, popping, fermentation, stem sucking are the common forms of its uses. Additional improvement in food recipe is necessary to increase its uses. Scientific documentation of indigenous knowledge would further reveal the diverse aspects of this crop as well as its proper utilization for poverty alleviation schemes as an alternative to food security management problems.

Some specific qualities of finger millet

- The crop can be grown in marginal lands therefore it has been a popular food of many poor and subsistent farmers in the hills of Nepal
- Uniquely adapted to low input management and diverse environments
- Crop of scarce times
- Responds significantly to low fertilizer levels
- Excellent long-term storage qualities
- Unusually high grain calcium content
- Tolerance to cold temperatures
- High quality fodder

Forest Resources and Consumption Survey, Sankhuwasabha, 2002

[The forest resources consumption survey was carried out in Sankhuwasabha among six forest users' groups in March-May 2002. The summary of the survey is presented below]

The Sankhuwasabha is one of the richest districts of the country in terms of availability of biodiversity resources. Forests are the prime sources for fuel wood, timber, fodder, grasses and leaf litters providing as the basis of rural livelihoods.

The district of Sankhuwasabha lies in the far eastern region of Nepal. It is home to the internationally renowned "Arun Valley" which boasts of its rich biodiversity. Sankhuwasabha is bounded by Taplejung district in the east; Solukhumbu district in the west; Dhankuta, Bhojpur and Tehrathum districts in the south and Tibet (China) in the north. The district ranges in elevation from 457 m, the deepest valley (Arun Valley) in the world to 8,463 m (Makalu Peak), world's fifth highest peak. Sankhuwasabha enjoys wide climatic variations from Tropical, Sub-tropical, Temperate, Cool Temperate to Alpine. A number of ethnic groups such as Bhotes, Rais, Tamangs, Gurungs inhabit the district.

The total area of the district is 3468.37 km² (3,16,937 ha.). The estimated forest area represents 1,26,541 ha, shrub land represents 54,039 ha and grassland represents 39,256 ha. Altogether, forest, shrub land and grassland comprises 63.58 % of the total area of the district. The estimated per capita forest is 0.79 ha.

Community forestry program was initiated since the last few decades in the area. It has been reported that a total of 228 Community Forest User Groups (CFUGs) have been formed in the district up to the fiscal year 057/058. This includes a total of 26506.73 ha. i.e. 12.06 % of the forest area under Community forests including shrub land and grassland area. A total of 21,307 households are involved in the proper management and utilization of these community forests.

Community Forests in the Project sites

The details of CFUGs in the project sites is presented in Table 1. It shows that a total of 1,372 households (HHs) are involved for sustainable management and utilization of the CFUGs in the project sites through 21 CFUGs covering a total area of 7188.96 ha., i.e. 27.12% of the total handed-over area of the CFUGs of the district.

The data from table 1 also indicates that Num VDC has the highest number of 11 CFUGs covering a total area of 3785.87 ha representing 52.66% of the total handed-over area of the project sites. Similarly, 8 CFUGs were formed in Pawakhola VDC comprising 2919.50 ha of forestland. However, only two CFUGs have been handed over so far in Hatiya VDC occupying 6.73 % of the total area. This is because of the Makalu Barun National Park and Conservation Area (MBNP) covering a major portion of the land in the VDC.

Table 1: Details of CFUGs in the project area of Sankhuwasabha district, Nepal, 2002.

SN	VDCs	Total no. of CFUGs		Total Area Covered		Total HHs benefited	
		Number	%	Area (ha.)	%	HHs	%
1	Num	11	52.38	3785.87	52.66	767	55.90
2	Hatiya	2	9.52	483.59	6.73	129	9.40
3	Pawakhola	8	38.10	2919.50	40.61	476	34.70
	Total	21	100.00	7188.96	100.00	1372	100.00

Management of Community forests on a sustainable basis is a current issue among the various development planners and researchers. So, it is the responsibility of the concerned organizations to find out patterns in forest resources, consumption and requirements, consequently serving as guidelines for the planning and development of management strategies in the community forests in the particular area.

Owing to all of the aforementioned facts, RRN conducted an assessment on community forest resources, consumption and requirements, concentrating on six CFUGs of these three remote VDCs of the district. The findings of the study can be useful to formulate appropriate developmental interventions in the community forests for biodiversity conservation and utilization.

Objectives of the Study

The main objective of the study was to analyze the forest resources, consumption and requirement patterns by users of CFUGs in the project sites. The specific objectives of the study were:

1. To analyze the consumption patterns of different forest products such as timber,

fuel wood, fodder, ground grass and leaf litter by the members of CFUGs in the project sites.

2. To find out the dependency patterns of forest resources such as timber, fuel wood, fodder and leaf litter in the community and private forests.
3. To assess the condition and availability of other valuable forest resources such as climbers, mushrooms, wild lives, avi fauna and lichens in the area.
4. To analyze the availability, conditions, distribution patterns, existing cultivation practices, processing and trading system of the locally available NTFPs in the project sites.
5. To explore the ethno-botanical uses of different plant species among the different ethnic groups in the project sites.
6. To describe the changes found in the forest condition after the formation of community forests in the area.

Methodology

Study Area

The study was focused on the consumption and dependency patterns of these resources in the three VDCs of the Sankhuwasabha district *viz.* Num, Hatiya and Pawakhola where RRN is implementing its pilot demonstration project on the sustainable use and management of biodiversity resources. The study focused on six CFUGs of the area as presented in Table 2.

Table 2: Details of CFUGs undertaken for the study, Sankhuwasabha, Nepal, 2002.

SN	Name of CFUG	Total HHs	Total Area (Ha.)	Year of Handover	Forest type
1	Sukepatal	72	103.90	1992	Katus-Chilaune (Schima-Castanopsis)
2	Langling	88	231	2000	Katus-Chilaune (Schima-Castanopsis)
3	Gunyang	121	551.31	1996	Khashru-Guras (Oak-Rhododendron)
4	Gunyang Kalyan	122	602.057	1996	Khashru-Guras (Oak-Rhododendron)
5	Namase Himshikhar	98	480.11	1996	Khashru-Guras (Oak-Rhododendron)
6	Silsile	45	679.06	2001	Khashru-Guras (Oak-Rhododendron)

Source: Constitutions & operation plans of the aforementioned

A social survey, using structured questionnaires, was adopted to reveal the required information. The target population was the users of the six CFUGs of the area. A total of 89 respondents were selected using stratified random sampling method.

Some Major Findings of the Study

- The highest amount of **timber** consumption was found in Gunyang and Guyang Kalyan FUGs, i.e. 15 cft./hh/yr in each and the lowest was in Namase-Himsikhar FUG, i.e. 7cft./hh/yr. The type of houses and furniture used by the people were the main reasons for affecting the amount of timber requirements in the area.
- People were found deriving **timber** from both public forests (PFs) and community forests (CFs). However, the dependency was relatively higher on CFs than that of PFs for timber use. For timber requirements, the highest dependency on CF was found in Namase-Himshikhar, i.e. 92% and the lowest was in Selsele FUG, i.e. 52 %.
- The users of Selsele FUG were found consuming highest quantity of **fuel wood** i.e. 324 Bhari/hh/yr, whereas the users of Gunyang and Gunyang Kalyan FUGs were found consuming lowest amount, i.e. 100 Bhari/hh/yr. The climatic condition of the particular area was found as the major reason for affecting the fuel wood requirements in the study area.
- Relatively higher dependency was found on PFs than CFs in all sites for **fuel wood** requirement except in Selsele site where most of the fuel supply was derived from CFs. The highest dependency on PF was found in Gunyan and Gunyan Kalyan FUGs i.e. 81 % and the lowest in Selsele , i.e. 35 %. The higher dependency on PFs for fuel wood was due to the nearness of these forests from the residential area as well as availability of preferred species in PFs
- The highest amount of **fodder** consumption was found in Selsele FUG , i.e. 267 Bhari/hh/yr, whereas lowest amount of consumption was found in Gunyan and Gunyang Kalyan FUGs, i.e. 99 Bhari/hh/yr. The higher degree of fodder supply was found from PFs as compared to CFs in all sites. The livestock raising practices in the area was found directly related to fodder consumption patterns.
- The users were found dependent more on Public forests (PFs) than CFs for **fodder** requirements in all sites. The highest dependency on PFs for fodder was found in Gunyang and Gunyan Kalyan FUG, i.e. 94 %, and the lowest dependency was in Selsele , i.e. 52 %. The nearness and availability of preferred fodder species in PFs was found one of the main reasons for higher dependency on these forests.
- PFs were found major contributing sources of **ground grass** as compared to CFs. However, in Selsele site, users were not found collecting ground grasses either of the sources at all. The highest amount of ground grass use was found in Sukepatal FUG, i.e. 139 Bhari/hh/yr, and the lowest in Gunyang and Gunyang Kalyan FUGs, i.e. 32 Bhari/hh/yr. the ground grass collection and use patterns was found directly related with the availability of forages in designated pastures and livestock raising practices.
- The dependency for **ground grass** was found more on PFs than those of CFs in all sites. The highest dependency was found in Sukepatal FUG where cent percent of the ground grass was derived from PFS. In other FUGs over 80% of ground grass was collected from PFs.
- The highest amount of **leaf litter** was used by the users of Selsele FUGs, i.e. 82 Doko/hh/yr, whereas lowest use was found among the users of Gunyang and Gunyang Kalyan FUGs, i.e. 1 Doko/hh/yr. The use pattern of leaf litter is associated with the livestock raising practices in the area.
- It was found that the users of all FUGs highly dependent on PFs for their leaf litter requirements except Selsele FUG.
- The most preferred **timber** species among the users of Sukepatal and Langling FUGs was found Katus (*Castonopsis* spp.). However, the users of Gunyan and Gunyang Kalyan FUGs preferred Kaunla (*Machillus duthiei*). Similarly, the users of Namase-Himshikhar and Selsele FUGs ranked Uttis (*Alnus nepalensis*), Salla (*Pinus* spp.) and as the most preferred

- timber species, respectively. The preference ranking of particular timber species was based on the durability, shininess availability and cost effectiveness.
- The users of Sukepatal and Langling ranked Katus as the most preferred **fuel wood** species, whereas the users of Gunyang and Gunyang Kalyan ranked Jhingune (*Eurya accuminata*) as the most preferred fuel wood species. Similarly, Uttis (*Alnus nepalensis*) and Bilaune (*Maesa chisia*) were found as most preferred fuel wood species among the users of Selsele and Namase-Himshikhar, respectively.
 - Gogan (*Saurauisa nepalensis*) was found most preferred **fodder** species among the users of Sukepatal, Gunyang and Gunyang Kalyan and Himshikhar FUGs, whereas the users of Langling FUG considered Khanyu (*Ficus semicordata*) as the most preferred fodder species.
 - More than 39 species of climbers were found in the project site. Out of this nine species of climbers i.e. Majhito (*Rubia manjith*), Gophala Lahara (*Holboellia*), Indreni (*Cytrullus colosynthis*), Jadelo (*Cissus adnata*) Cahva (*Piper chava*), Charchare (*Cissus repens*), Kukur daino (*Smilax* spp.) were considered as locally threatened species by the users of all FUGs in the study area.
 - More than 35 species of mushrooms were recorded from all sites. Altogether 12 varieties of mushrooms were reported as locally threatened species in the study area. There were Kale, Katuse, Bhai, Kane Barje, Khale, Katune, Kanye, Chipile, Chile, Khaio and migre. The richest site for mushroom diversity was found Gunyang and Gunyang Kalyan CF of Num VDC.
 - More than 29 species of wild animals and 50 species of birds were listed from all FUGs in the study area. The users also reported that the number of wild animals and avifauna species were increasing after formation of community forests and restriction of illegal hunting. Some of the new and nearly disappeared birds species such as Danphe, Munal, Kalij, Spiny Babbler etc have been also reported reappearing. Similarly, some of the threatened wild animals like red panda, Himalayan black bear, Kasturi, snow leopard, spotted leopard etc were also reported reappearing in the community forest of the study area.
- Numbers of NTFPs were reported available in the study area. The most of the high value NTFPs included as medicinal and aromatic plants such as Chiraito, Loth salla, Panchaule, Jatamansi, Pakhanbed, Thulo-okhati, etc. It was found that total of 16 types of NTFP species were locally threatened stage in all of FUGs.
 - The trading system of the most of the NTFPs was mostly concentrated in the village level where the collectors sold these products at nominal prices to brokers. It was also found that some of the collectors directly used to sell their collection to Tibetan markets and some instances Tibetan brokers used to come their place to collect these NTFPs.
 - No any NTFPs related processing units were found in the study area. It was reported that people were interested to having Allo processing units, Nepali paper making factory and processing/distillation units of medicinal and aromatics plants.
 - A number of plants with religious and cultural value were found in the project area. Many ethnic communities in the area were found using these plants during their religious and cultural functions and ceremonies. Altogether 17 plant species were found using by Gurung communities, in their culture and religious ceremonies. Similarly, 11 plant species were found using by Sherpa communities, 23 plant species by Rai community and 14 species by Tamang communities in the study area from their generation to generation.
 - There was not much systematic traditional systems of forest management were reported in the study area. However, people in Gunyang and Gunyang Kalyan FUGs of Num reported that they used to conserve Nigalo plant (*Drepanostachyum intermedium*) by forming a responsible committee that prevents to collect premature plants. Similarly, in Namase-Himshikhar FUG of Hatiya i.e. the users have been conserving, managing and utilizing their nearest surrounding forest since many years ago before the formation a community level committee and recruiting a watchman.
 - Among the major problems of forest in the study area was forest fire, illegal collection of forest products, erosion/landslides, grazing etc. problems existed in all FUGs.

Sustainable Livelihood-based Biodiversity Conservation with Focus on NTFPs-based Enterprises Approach in Nepal

Nepal's biodiversity is a gift of nature induced by topographical and climatic variations. However, proper management of the natural resources to uplift the living standards of the marginals inhabiting the remote mountains is still a burning issue. This report is an outcome of the field study carried out on Non Timber Forest Products (NTFPs) based enterprises and biodiversity conservation in the western mountain districts of Nepal. The study also tries to document the experiences on NTFPs-based enterprises, initiated and supported by different organisations. The proposed targeted districts were Humla, Jumla, Dolpa, Baitidi, and Dang. However, during the study period, other districts en route have also been included viz. Mugu, Surkhet, Dandeldhura, and Banke.

Objectives

The overall objective of the study is to document the lessons resulting from the NTFPs-based biodiversity conservation projects and activities in Nepal and to analyze their livelihood implications in the biodiversity conservation initiatives under planning and/or implementations by different agencies.

Study Sites

Remote districts of Western Nepal (Humla, Jumla, Dolpa, Baitidi, and Dang) were the targeted sites of the project. However, four other districts (Mugu, Surkhet, Dandeldhura, and Banke) en route have been covered to come up with a more realistic picture.

Methodology

The study was conducted in the following steps:

- Review and collection of secondary information

- Field visits for general assessment and collection of primary information and report preparation

Findings of Study

The study area mostly comprises of mountainous districts; especially Humla, Mugu, Dolpa and Jumla being very remote. These districts are considered to be remotely accessible, especially during the rainy season. In contrast to the other parts of the country, people residing in the mountain districts of Mid Western Development Region of Nepal have minimal cultivable land and have to depend on other natural resources. Literacy rate and per capita income of the people in the area are comparatively lower to other parts of the country. Agricultural production is low due to the availability of less cultivable land coupled by cold climatic conditions.

The study shows that the area is perpetually afflicted with food deficit. Transportation of commodities is costly because the mode of transport solely constitutes either helicopters or planes. NTFPs are the only exportable items from the area. NTFPs-based enterprises could be one of the alternatives to raise the living standards of the community occupying this region as the area



Non-timber Forest Products: An Alternative Livelihoods Options

is rich in NTFPs, especially high-value MAPs (Medicinal and Aromatic Plants).

High-value medicinal plants can significantly

change the economic status of the marginal community. These plants thrive in the high mountains, thus, still needs to be explored. Topographically, the area is not easily accessible and according to the local collectors, these high-value MAPs are found in precarious locations of the mountain forests. Local collectors are not aware of conservation techniques; hence, they tend to overexploit the available resources. Awareness has to be, therefore, raised among the local collectors to optimize the use of natural resources. Harvesting and collection of NTFPs by the local collectors depend on the market situation. The distillation plants and factories for processing are mostly located in the accessible areas of the lower plains; therefore, the raw materials collected in the mountains have to be transported for processing to the lower parts. This adds to the cost in transportation, which could be reduced if processed locally.

Several organizations are working to support the local communities in raising their economic conditions. Their effective impact on the targeted community would take some time though. The government and other organizations operating in the area need to join hands for the benefit of the rural community and sustainable use of NTFPs. This will certainly aid biodiversity conservation and promote NTFPs-based enterprises at the local level. Following actions are suggested to raise the livelihood of the resource-poor communities residing in the remote mountains;

- (i) Promotion of local enterprises**
Technical and financial support to run the existing NTFPs-based enterprises and establishment of new ones.
- (ii) Conservation of biodiversity**
Management of NTFPs resources by preventing overexploitation and allowing regeneration of the renewable resources.
- (iii) Sustainable use**
NTFPs found in the study area are valuable and need protection for the benefit of the local people through extensive participation in the NTFPs-based enterprises.

Arun Valley Sustainable Resource Use and Management Pilot Demonstration Project

Arun Valley Sustainable Resource Use and Management Pilot Demonstration Project is a GEF/UNEP-funded biodiversity conservation project, being implemented by Rural Reconstruction Nepal (RRN) in the Sankhuwasabha district of Arun Valley since February 2001. The project comprises of three major components viz. forest biodiversity conservation through community forestry, micro-hydro schemes and livelihood and other income generating programmes.

Project Goal

The project aims to mitigate the major threats to natural resources; especially, the forests and the water bodies, from anthropogenic activities and to design and evolve a management system with locally tested and proven solutions for integrating local community participation in the management of natural resources (forest, soil and water), thus, incorporating indigenous knowledge, skills and ecological principles.

Objectives

The primary objective of the project is to organise and analyze the traditional knowledge of local communities and apply it in the conservation and sustainable use of biodiversity in one of the world's unique mountain ecosystems enriched with globally significant biodiversity.

General Objectives

- To conserve the biodiversity and forest ecosystems of selected sites in the eastern watershed area of Arun river outside the MBCP areas.
- To develop community-based sustainable natural resource use, model-based indigenous knowledge system, biological and ecological understanding of the resource

base and action research.

- To develop alternative renewable energy sources through the promotion of locally adaptable fast growing energy plants and micro-hydro schemes which will ultimately contribute to biodiversity conservation.
- To improve the living conditions of the inhabitants of the project sites through various livelihood and income generating schemes that can subsequently contribute to biodiversity conservation.

Specific Objectives

- To generate baseline information on the existing natural resources use pattern, demographic situation, existing development efforts and their impacts on people, resources and biodiversity.
- To provide necessary conducive environment for the promotion of sustainable community-based resource management and livelihood approaches and develop effective sustainable management system for protecting biodiversity in the proposed study sites.
- To analyse how local communities working in consultation with government agencies can agree on possible alternative options for equitable sharing of benefits while ensuring the sustainable use of biodiversity.
- To identify, develop and conserve food and other resources of the communities to ensure sustainable livelihood and food security.
- To promote cleaner alternative energy uses (e.g. micro-hydro system) as these minimises deforestation and loss of biodiversity and also encourage agro-based income generating small-scale industries.

- To identify the economic and policy incentives that would promote traditional knowledge of local communities for the benefit of biodiversity conservation and the use of such incentives at regional and national level.
- To disseminate and extend the findings of the project to local, regional and national levels for effectiveness of biodiversity conservation.

Activities Carried out between

January and June

1. Assessment of Community-based Resource

a. Post support activities to community forest users' groups (CFUGs)

Post support activities to CFUGs have been carried out. The project activities, hence, have been focused on the conservation of biodiversity and its sustainable use in all the community forests through the process of capacity building of the CFUGs, preparation and review of operational plan (OP) and its implementation. The post support activities constitute the fundamental basis for the conservation and sustainable use of forest biodiversity through community forestry.

b. Collection of baseline information

The project office, in active participation with selected CFUGs, also involved itself in the process of collection of baseline information about forest resources, preparing the forest management OPs based on scientific management principles and practices and developing a monitoring and evaluation mechanism. It was carried out from February-April, 2002.

c. Meetings with CFUGs

This is one of the regular activities carried out in the field by the concerned field staffs. The project staffs have participated in several meetings and assemblies of CFUGs in all project sites. The main

objective of these activities is to enable the community people to understand the concerns and problems of the CFUGs in implementing the OP develop close rapport with the CFUGs members and assist in developing technically sound operational and management plan.

d. Review and implementation of OPs

Review and implementation of CFUGs' OPs and joint monitoring activities were carried out along with capacity building and awareness-raising campaigns on biodiversity conservation and sustainable resource use and management strategies. The project staffs have participated in the regular meetings of the executive committee, village council meetings and annual council meetings of the members of the CFUGs to identify the concerns and issues pertaining to biodiversity conservation and effective implementation of OPs. Such interactive meetings were found to be effective in the context of management and the sustainable use of forests and NTFPs in general and the difficulties encountered in the implementation of operational plans in particular.

2. Development of Participatory Resource Management Approaches

a. In situ seed production and cultivation of *Swertia chiraita*

Chiraito (*Swertia chiraita*) is one of the most economically potential and lucrative herbal plants in Arun Valley. In order to start a systematic cultivation of *Swertia chiraita*, it is important and necessary to initiate in situ seed production programs in the natural habitat. As a result, RRN staffs have initiated participatory forest survey to locate and demarcate appropriate forest area for the in situ production of the Chiraito plant. The CFUGs members, along with RRN project staffs, have identified the potential *niche* areas for the conservation and in situ seed production of *Swertia chiraita*.

b. Strengthening multipurpose nurseries

The CFUGs have placed high priority for the establishment of multipurpose nurseries at all

the project sites. These multipurpose nurseries primarily consist of forests, fodder, herbal plants, vegetables, other NTFPs and some economically significant timber species as identified and realized by the local community. The project has recently established 5 such nurseries with the request and the assistance of the CFUGs in different project sites.

c. In situ seed collection

The members of CFUGs and eco-clubs and project staffs were mobilized for in situ seed collection. A total of 25 kgs of seeds from various kinds of plants such as multipurpose tree species, fruits, fodders and herbal plants were collected from their natural habitats for the purpose of nursery raising and direct seeding based on their nature of propagation. The seeds from the following plant species were collected: chiraito (*Swertia chiraita*), uttish (*Alnus nepalensis*), walnut (*Jugulans regia*), lapsi (*Choerespondia axilaris*), allo (*Diospyrus melabrica*) and siris (*Albezzia labec*).

3. Environmental Education Campaigns

Environmental education has been considered as one of the most fundamental program activities of the project so as to raise awareness on environmental conservation. A number of various activities have been carried out in all project sites under the theme of environmental education. These activities include, inter alia, formation of village eco-clubs, adult literacy classes, awareness raising campaigns, forest visits and camping, interaction and quiz contests, sports, games and plantation of trees.

a. Environment Awareness Campaigns through Eco-clubs

There are altogether four eco-clubs comprising of 81 members actively involved in conservation and awareness creating activities in the project sites. All of these clubs were re-organized to further energize them. The project office has been carrying out conservation education activities through local eco-clubs, the members of which are trained by the project staffs. Project staffs

stationed at the respective project sites facilitate the eco-club members to carry out most of the environmental education and awareness raising activities.

b. Environmental Education and Adult Literacy classes (EEAL)

EEAL classes were organised in six project sites. These classes focused on the women members of the CFUGs in the project sites. The purpose of EEAL was two-fold : to make the participants literate so that they are able to read and write and to impart environment management-related information such as community forestry, sustainable use of NTFPs and herbal plants, watershed management and sustainable use and conservation of livelihood resources of the community.

4. Livelihood-based Activities

a. On-the-spot training on vegetable gardening

The underlying purpose behind the concept of “*on-the-spot training*” is to enhance people’s participation as well as to provide handy technical know-how to the community people in a scientific way. It is considered as one of the most innovative approaches in the field of training management. Training is conducted in the fields relatively in short duration of time so that large strata of the people (e.g. women, dalits, the rich and the poor) can be included in the technology transfer and delivery process. RRN conducted on-the-spot vegetable gardening training to the farmers at different sites of the project.

At the end of the training session, almost all of the participating farmers were provided with different varieties of vegetable seeds as per their interest. Farmers were charged a nominal price for the seeds; the collected amount being deposited in the CFUGs’ funds.

b. Training on Bee-keeping and Distribution of Improved Bee-hives

A training program on bee-keeping was organised at Khandbari of Sankhuwasabha district for one

day which fetched 15 participants in all. The major topics included in the training were as follows:- types of bees and their natural behaviour, life cycle of bees, technique of improvement of traditional bee-hives, pest problems on bee-keeping and their remedies, uses and importance of honey, economic analysis of bee-keeping, identification of favourable plant species and vegetation for bees et al. Practical sessions were also



Participants in Bee-keeping Training

conducted to enable the participants to improve their skills on activities like transferring bees from a traditional hive to a modern hive and *vice-versa* plus sustainable honey hunting.

c. Village Animal Health Workers’ Training (VAHW)

Village Animal Health Workers’ Training was organised in Chitwan district for 15 days. 3 people from different project sites participated in that training.

5. Micro-hydropower and Alternative Energy Development

Micro-hydropower and alternative energy development is the major project component as it consumes nearly 50 percent of the total budget and involves considerable infrastructure development activities. The micro-hydropower related activities are summarized below:

a. Finalization of Micro-hydropower Schemes

An independent consultant was hired to review the detailed feasibility study and estimates of the micro-hydropower schemes. After completion of the review of design and estimates and final check in the field, three Micro-hydropower and two Peltric Set Schemes were found technically feasible within the reasonable limits of expenditure.

- (i) Neguwakhola Micro-hydro project in Num VDC ward #s 4, 5, and 6
- (ii) Thulokhola Micro-hydro project in Num VDC ward # 2, Mangsima
- (iii) Bhotekhola Micro-hydro project in Hatiya ward # 2, Hatiya
- (iv) Ghattekhola Peltric Set in Hatiya wards # 9, Namase
- (v) Ghattekhola Peltric Set in Pawakhola wards # 7, Pawakhola

b. Formation of Energy Users' Committee (EUC)

To ensure successful implementation and sustainability of the micro-hydro schemes, the project staffs organized mass meetings of energy users in all sites. The project staffs, local leaders, eco-club members and teachers attended these meetings and shared their views and concerns regarding construction activities and sustainable management aspects. EUC was formed in each site and comprises of 7-11 members.

c. Formation of Micro-hydropower and Peltric Set Construction and Management Committees

Peltric set construction and management committees were formed in Pawakhola-7, Bhotegoun and Hatiya-9, Namase. Similarly, micro-hydropower construction and management committees were formed in Hatiya-4 and Num - 4, 5 and 6.

d. Procurement of Electromechanical Equipment

The estimated equipments for Peltric set have been finalized. The transportation of these

equipments to the project site is ongoing. The energy users' groups are being mobilized for transportation up to the construction sites.

6. Training/Workshops

a. Program Review Workshop

A program review workshop was organized at the district headquarter, Khandbari, from February 16, 2002 to February 19, 2002. The entire project team, the President, the Executive Director and the Finance Director of the organisation attended the workshop.

Problems, issues and concerns related with program implementation were discussed during the workshop. Finally, a revised Detail Implementation Plan (DIP) was prepared for the remaining period so that program activities could be executed smoothly and effectively.

b. Participation in the District Development Council (DDC) Meeting

Project Director attended the DDC meeting held at Khandbari from February 24, 2002-February 28, 2002. He presented the revised DIP with proposed programs and financial statements so as to include it in the district level program planning and share it with the council members.

c. Participation in the Periodic Planning Workshop of DDC

RRN forest officer participated in the periodic planning workshop at Sankhuwasabha district to share RRN's learning and include it in the DDC planning. A number of issues such as inclusion of women in the CFUGs formation, livelihood schemes for the remote VDCs and processing and cultivation of NTFFPs were raised by RRN to be included in the periodic plans of the district.

<p>Rural Reconstruction Nepal AVASRUM Khandbari Bazar Sankhuwasabha, Koshi Zone, Nepal Tel: 977-029-60150</p>
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