RURAL DEVELOPMENT TOOLKIT SERIES

TOOLKIT 5

Participatory Biodiversity Monitoring

IN COMMUNITY MANAGED FORESTS

ANSAB
Rich Biodiversity and Prosperous Communities

ASIA NETWORK FOR SUSTAINABLE AGRICULTURE AND BIORESOURCES (ANSAB)

OTHER ANSAB RURAL DEVELOPMENT TOOLKITS IN THIS SERIES (2010)

BUSINESS PLANNING FOR COMMUNITY BASED NATURAL PRODUCT ENTERPRISES

This Toolkit offers skills, methods and tools with which the field facilitators can support rural people to prepare and implement the business plan for their enterprises. The purpose is to build the capacity of facilitators and enterprise leaders on how they can support a rigorous process of planning and successful operation of sustainable community-based natural product enterprises.

ENTREPRENEURSHIP DEVELOPMENT OF NATURAL RESOURCES DEPENDENT COMMUNITIES

This Toolkit focuses on developing entrepreneurial skills and capacities of local communities, especially the poorest among them, to promote the development of sustainable community based natural product enterprises. The purpose is to provide guidance in developing and implementing programs on developing entrepreneurship skills and culture at the community level.

DEVELOPMENT AND MOBILIZATION OF LOCAL RESOURCE PERSONS

This Toolkit focuses on the process and methods of recruiting, training and mobilizing local resource persons (LRPs) so that development services could be more effectively delivered in rural settings through locally available human resource even beyond the termination of a development project.

MARKETING INFORMATION SYSTEM FOR NATURAL PRODUCTS

This Toolkit focuses on the process of setting up a marketing information system (MIS) program and the methods of collection, processing and dissemination of information on markets and marketing of natural products. The objective is to provide guidance in developing and implementing the MIS for natural products in order to enhance market transparency and good value chain governance.

CERTIFICATION OF COMMUNITY MANAGED FORESTS

This Toolkit focuses on group forest management certification. The major objective of the toolkit is to provide important methods and tools for developing and implementing the Forest Stewardship Council's (FSC) group forest management certification so that the communities achieve a position of getting recognition and rewards for their good practices, while conserving the forest and biodiversity.

PARTICIPATORY INVENTORY OF NON-TIMBER FOREST PRODUCTS

This Toolkit provides practical methods and tools to determine total stock and harvestable amount of the selected NTFPs and derive specific recommendations for forest management interventions. The objective is to provide participatory inventory method that provides a basis for sustainable forest management.

CHAIN OF CUSTODY CERTIFICATION FOR COMMUNITY FOREST ENTERPRISES

This Toolkit provides field practitioners and program managers with up to date methods, tools and techniques for obtaining and implementing the Forest Stewardship Council's (FSC) Group Chain of Custody certification. The purpose is to enable small companies and cooperatives promote their certified products in national and international markets and get rewarded.

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Participatory Biodiversity Monitoring

IN COMMUNITY MANAGED FORESTS

ASIA NETWORK FOR SUSTAINABLE AGRICULTURE AND BIORESOURCES (ANSAB)
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Preface

Rural development presents an immense challenge both to theorists and practitioners in the field. Many rural development and conservation projects end up in utter frustration because they are not equipped with effective methods and tools. ANSAB itself has tried various approaches since its establishment in 1992. We have developed a practical combination of environmental, social and economic interventions that conserve biodiversity, create jobs and provide income for the rural poor in remote but resource-rich areas of Nepal. The encouraging outcomes of these interventions have led us to pursue the successful approaches over the past several years.

By 2009, we were able to organize and develop 393 enterprise-oriented community forest user groups and 1,166 economic entities, which generated US $6.82 million in annual total monetary benefits to 78,828 individuals and, at the same time, brought over 100,000 hectares of forests and meadows in Nepal Himalaya under improved community management. When applied properly under an enabling policy environment, this approach can transform rural poor women and men into well governed, organized entrepreneurs that are capable of accessing the market as well as essential business development services. By creating economic incentives to local stewards, the approach helps to reverse deforestation and enhance the stock of natural wealth for improved and sustained flow of ecosystem services and for climate change mitigation and adaptation.

Building on these insights, we have been producing a number of manuals, toolkits, and guidelines. This Rural Development Toolkit Series represents the continuation of our attempt to present our learning to a wide range of development practitioners. This Series consists of eight separate but interrelated toolkits. These toolkits offer practical guidance on the key methods and tools that were developed, tested and refined over the years by working with local communities, development partners and government agencies. These capture the experiential knowledge of dozens of people working for ANSAB and are published after a thorough field testing and peer review. These toolkits are primarily designed for field facilitators and managers of development and conservation programs who have some basic facilitation skills and experience of working with rural people. We are hopeful that the toolkits will prove useful to other rural development and conservation programs, and consequently, to a wider application of our fruitful approach. It is expected that users will adapt the methods and tools presented here to work in different social contexts.

This Toolkit “Participatory Biodiversity Monitoring in Community Managed Forests” provides methods and tools needed to generate useful data to periodically assess the biodiversity status and to track the impact of community based forest management on biodiversity. The purpose is to derive important lessons for improving management that promotes the conservation of biodiversity while

maximizing the value of forest products and services. This toolkit is divided into six stages. A number of steps are suggested for each stage and a number of activities are recommended for each step. Practical tools and considerations are provided along with activities when required.

We are thankful to the blue moon fund (bmf) for providing the grant that allowed us to develop the Series and for encouraging us to translate ANSAB expertise into simple-to-use toolkits. The main contributors of the toolkit are Bhishma P. Subedi, Shiva Shanker Pandey, Shambhu Charmakar, Sushil Gyawali and Nabaraj Panta. Prof. S.P. Singh, Surya Binayee, Ann Koontz and Hemant Ojha through their work in ANSAB program contributed to the evolution and development of the methodology. A number of ANSAB staff (especially Indu Bikal Sapkota, Netra Bhandari, Chandika Amagain, Gopal Sharma, Bishnu Luintel, Durga Regmi, Sony Baral, Baburam Rijal, Ram Acharya, Bhuwan Dhakal and Sanjeeb Bhattarai), donors (USAID), partners (EWV) and local communities contributed to this methodology through their involvement in ANSAB programs. Hari Dhungana, an experienced ANSAB technical expert, edited the Series.

We welcome suggestions and feedback from readers and users as we are very much keen on periodically updating the toolkits to make it more productive and useful.

Bhishma P. Subedi, PhD
Executive Director, ANSAB

Acronym

AAH	Annual allowable harvest
ANSAB	Asia Network for Sustainable Agriculture and Bioresources
Approx.	Approximate
C & I	Criteria and Indicators
Cft	Cubic feet
CFUG	Community forest user group
CWD	Coarse woody debris
DBH	Diameter at breast height
FMU	Forest management unit
GPS	Global positioning system
Ha	Hectare
m	meter
NTFP	Non-timber forest product
USAID	United States Agency for International Development
VDC	Village Development Committee
Vol.	Volume

Glossary

Biodiversity monitoring: A process of assessment of existing status and change in the condition of biodiversity, as measured against a setof criteria and indicators

Biodiversity: Variability of life at genetic, species and ecosystem levels;this toolkit focuses on the species and ecosystem levels

Community biodiversity register: Adocumentation used as a biodiversity monitoring tool that maintains updated information of biodiversity resources in an FMU and is maintained by the community

Community based forest enterprise: An organized economic activity usually undertaken near the resource base as source of raw materials and planned and operated by members of local community

Community managed forests: Forest in which local people have a primary role in the management and utilization of the resources; in Nepal, itincludes community forest, leasehold forest, buffer zone community forest, and collaborative forest

Criteria: A category of conditions or processes by which forest management can be assessed: a criterion is characterized by a set of related indicators which are monitored periodically.

Facilitator: A person who supports the local community and other groups to conduct a specific activity or a range of activities primarily in reference to the objectives of a development program

Focus group discussion: A method involving interactions among an identified group of respondents who have similar background and experience in specific issues

Forest inventory: A method of assessing the stock of forest products in an area

Forest management unit: A defined forest area with mapped boundaries, managed by a single body with a set of explicit objectives expressed in a self-contained multi-year management plan.

Forest management: Forestry operations carried out in a specific area of forest in order to achieve the objectives set by its owner(s)

Frequency: Number of occurrence of a plant species in a particular area

FSC certified material: FSC Pure, FSC Mixed or FSC Recycled material that is supplied with an FSC claim by an organization which has been assessed by an FSC-accredited certification body for conformity with FSC Forest Management and/or CoC requirements

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About this Toolkit

This toolkit is prepared with the objective of enabling field level facilitators and others to conduct a participatory monitoring of biodiversity. Monitoring of biodiversity, or the variability of life at species, ecosystem and genetic levels, provides an important tool for resource-dependent communities and other stakeholders to develop appropriate responses to the ongoing loss of the important resources. Monitoring of biodiversity also provides important informational input to the local communities who seek to generate income and employment through the proper use and management of biodiversity resources in the area. This toolkit provides a range of methods, tools and techniques that will be useful to field staff as well as technical teams involved in supporting the conservation and management of biodiversity. This toolkit addresses the need for a simple yet robust method of monitoring of biodiversity, which is often portrayed as a highly complicated work. The intent is to equip mid-level field staffs, forest technicians and other development facilitators—with simple step-by-step guide for conducting the biodiversity monitoring.

A further distinctive feature of this toolkit is its approach on how to make biodiversity monitoring a participatory exercise. Participation of local people in monitoring is important because current shifts towards participatory conservation demand that the local people, decision-makers and/or managers, need evidence to guide their actions and because they should "own" the process with which such evidence was gathered. It is also essential that the monitoring results are robust, so that the monitoring data and results are acceptable to a range of stakeholder groups. The methods, tools, and activities outlined in this toolkit therefore outline how technical staff and local people work together in the monitoring process. The data generated in this way can provide a baseline for multiple actors, conservation organizations, government agencies and local people; and can be used to devise management strategies and ways of halting the loss of biodiversity. In addition, it provides guidelines how to create economic benefits from resource management.

This toolkit has been developed primarily based on the experience of Asia Network for Sustainable Agriculture and Bioresources (ANSAB). It has been conducting biodiversity monitoring in several of its programs since 1996. Thus, this toolkit is particularly useful to those involved in participatory conservation and management of biodiversity beyond protected areas.

Objective of the Toolkit

The main objective of this toolkit is to promote sustainable biodiversity management by providing tools needed to generate useful monitoring data, to track the impacts of forest management activities on biodiversity and the health of ecosystem. It also supports the development of baseline measurement of biodiversity from which changes to the resource base can be monitored.

The specific objectives are to:

- provide methods, tools and techniques for participatory biodiversity monitoring;
- provide guidance for assessing and monitoring biodiversity, the condition

of the resource base and threats to biodiversity;
- provide a framework for and procedures necessary to develop a local level biodiversity monitoring system that will be useful to multiple stakeholders; and
- provide methods and tools to integrate monitoring information into sustainable biodiversity management and use.

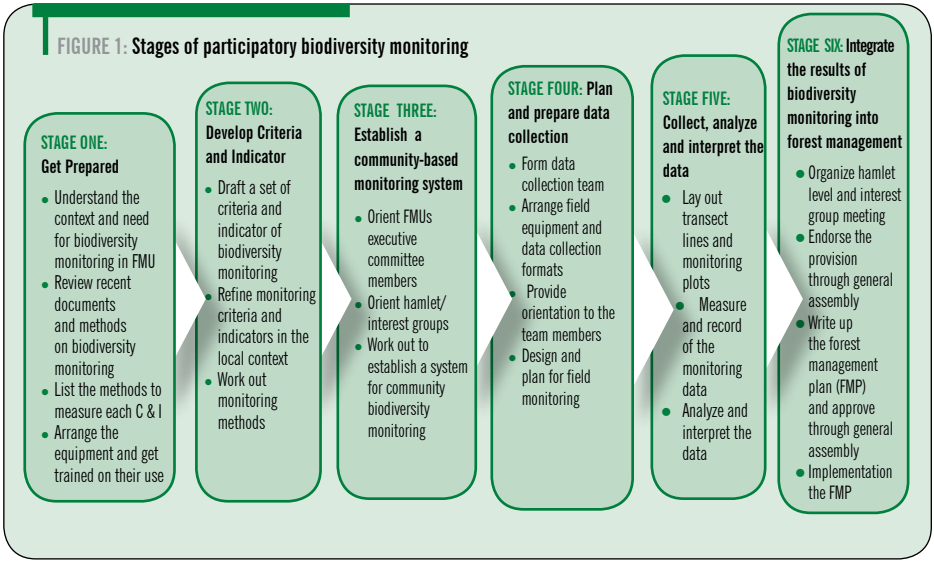
Who is this toolkit for?

This toolkit will be of special interest to people who seek to contribute to sustainable biodiversity management and use, especially through enterprise oriented management approaches. It is prepared for forest managers, forest technicians, researchers, local resource persons, community leaders and conservation organizations.

What does this toolkit contain?

This toolkit is presented in six stages (see Figure 1). Stage one explains what the facilitator needs to do before going to the forest management units (FMUs) to undertake biodiversity monitoring program. Stage two shows steps and activities to develop criteria and indicators (C & I) for biodiversity monitoring and to verify their applicability in the local context. Stage three presents a process of setting up a monitoring system at the FMU level. Then stage four describes how the facilitators and community members should prepare themselves to collect monitoring data. Stage five deals with the methods and techniques for collecting and analyzing monitoring of data. The final stage explains how the monitoring data and analysis process can be utilized into decision making for developing

FIGURE 1: **Stages of participatory biodiversity monitoring**



forest management plan. Each of these stages has been described with the practical steps, tools, procedures and examples from ANSAB's work.

This toolkit is primarily applicable to those FMUs where natural forest exists; forest resources are being used for subsistence and commercial purposes; and the community shows interest in biodiversity conservation. It will be also useful in FMUs having high anthropogenic pressure or an area under biodiversity hotspot. It is advised that the facilitator (s) and local people first discuss on why biodiversity monitoring is important and how it contributes to sustainable management planning. We advise the facilitators to consult two other toolkits developed by ANSAB:

- "Participatory inventory of non-timber forest products"to take stock of NTFPs in the FMUs; and
- "Certification of community managed forests"to have more detailed knowledge of certification requirements and procedures

We advise that biodiversity monitoring be planned together with forest inventory. It is anticipated that forest technicians, suitably trained to work with local communities as facilitators will be able to carry out the activities mentioned in this toolkit.

Stage One Get Prepared

The stage one of this toolkit presents steps and activities for the facilitator (forest technician and local resource person) to get prepared for biodiversity monitoring program. It has four steps (see Figure 2). These steps are mainly desk reviews with which the facilitators form greater awareness of the overall process of biodiversity monitoring; receive updates about criteria and indicators being used in monitoring by other organizations; achieve greater awareness of the criteria and indicators on biodiversity; and arrange equipment for field visit and monitoring work. By the end of this stage, the facilitators will understand the context and need for biodiversity monitoring with a list of C & I and the methods to measure each C & I and arrange equipment and training to use them.

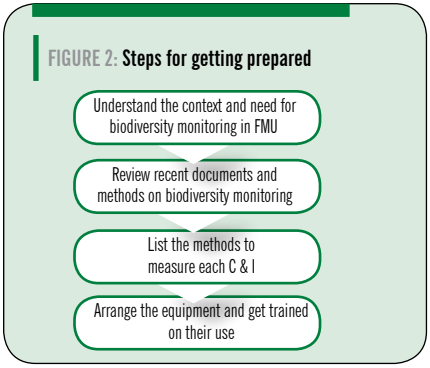


FIGURE 2: **Steps for getting prepared**

Step 1: Understand the context and need for biodiversity monitoring in FMU

At the first step of this stage, the facilitators need to gather basic information about the forest management units (FMUs) where the biodiversity monitoring work is being planned. They should have clarity about why the monitoring work is helpful for biodiversity management in the FMUs. Through office records and desk reviews, the facilitators should gather the following:

- area of forest
- forest type and distribution
- forest products used for subsistence and commercial purpose
- existing institutional set up of FMUs
- local need and interest on biodiversity monitoring and
- objective and benefits of biodiversity monitoring.

In addition, facilitators should make a list of potential stakeholders in local, regional and national level with whom consultation about monitoring would be necessary or useful.

Step 2: Review recent documents and methods on biodiversity monitoring

At this step, the facilitators should review relevant biodiversity-related documents (e.g. biodiversity strategy, laws and regulations) and reports, articles and other sources that provide methods and/or tools on biodiversity monitoring. These provide important insights about how best this toolkit can be used and adapted (if necessary). This review can be carried out through internet searches, relevant literatures and/or through consultation with experts. The reviewed methods and tools should be compared with this toolkit and notes about needed adaptation should be made.

Step 3: List the methods to measure each C & I

At this step, the facilitators have to gather available information on C & I being used in biodiversity monitoring by other organizations. This toolkit mentions three criteria (below) and their respective indicators (see stage two)

- Ecosystem health and vitality
- Threats to biodiversity
- Enhancing factors

The facilitator has to review the specific methods for measuring and assessing all these C & I. They should then prepare a list of methods for measuring each criterion (ecosystem health and vitality, threat to biodiversity and enhancing factors) and adapt this toolkit according to the specific field circumstances.

Step 4: Arrange the equipment and get trained on their use

At this step, the facilitators should organize the required equipment (especially GPS, Survey master, Densitometer and Vertex IV and transponder). The detailed list is provided in table 4 at step 2 of stage four. If they are not available in office or cannot be purchased the alternative equipment should be identified and arranged. If the facilitators are not already trained in the proper use and care of these equipment, they should be provided training for the same.

Stage Two

Develop Criteria and Indicators

The stage two of this toolkit presents steps and activities that allow the facilitators to develop and refine the Criteria and Indicators (C & I) for biodiversity monitoring in the forest management units (FMUs).It also provides methods about how the C & I will be measured in a monitoring exercise. It has three steps (Figure 3).

After the completion of the steps and activities mentioned in this Stage, the facilitator will be able to develop and adapt biodiversity monitoring C & I as well as their verifiers in a way especially suited to the targeted region or FMUs. They will also acquire skills and knowledge about what particular methods and procedures will be required for field measurement.

Step 1: Draft a set of criteria and indicators of biodiversity monitoring

At this step, the facilitators should draft a set of criteria, indicators and verifiers for biodiversity monitoring. The Annex 1 of this toolkit provides the C & I and verifiers as they were used in ANSAB's biodiversity monitoring program. ANSAB has three criteria, viz., ecosystem health and vitality, threats to biodiversity, and enhancing factors. Based on previous reviews about the region and FMUs and on the core objectives of monitoring, the facilitators should adapt these C & I and verifiers. They should then consult with biodiversity experts about the indicators and verifiers and make revision before going to site. For that the following activities should be carried out:

- identify national experts on biodiversity management;
- correspond them by email or telephone and take their commitment;
- send the draft form of monitoring C & I and verifiers, and solicit their input; and
- improve in C & I and verifiers as per experts' input.

But, there is no need to develop C & I and verifiers if they are already available (such as in case of ANSAB, as shown in Annex 1). But they should be adapted according to the particular needs of the region or FMUs, as discussed below.

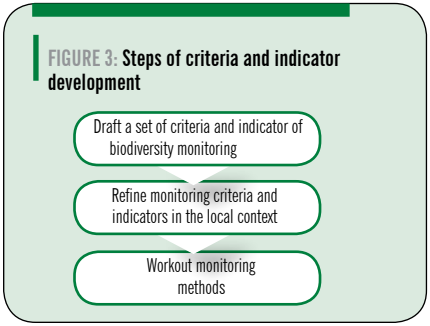


FIGURE 3: **Steps of criteria and indicator development**

Step 2: Refine monitoring criteria and indicators in the local context

2.1 Organize workshop for refining C & I in local context

Existing C & I (or the freshly drafted C & I, as above) are refined at local context through a workshop of district-level stakeholders. The facilitators should invite participants from government agencies, non-governmental and civil society organizations and representatives and/or leaders of the FMUs where biodiversity monitoring program is being planned.

In the workshop, all participants need to be oriented on the objective of biodiversity monitoring and its procedure and the role of stakeholders. Then, the facilitator has to share the list of C&I with the participants in a plenary, and divides the participants in groups (groups can be formed—based on the interest of participants—according to the criteria of monitoring. In ANSAB's monitoring program, three criteria were used, and three groups were formed for each criterion). Then, the groups will be asked to provide feedback and revisions on each of the C & I. By the end of the workshop, the C & I will be refined either with minor revisions or with addition or deletion of one or more of the C & I.

2.2 Pre-testing of the C & I

The C & I will be applicable when they can be measured in clear quantitative and qualitative form in the field. Therefore, the refined C & I should be tested in the field in the participation of major stakeholders

TABLE 1: Methods and frequency of measurement

METHODS	INDICATORS AND VERIFIERS	FREQUENCY OF MEASUREMENT
Resource inventory	Vegetation types and characteristics, plant species diversity, crown cover, dead and fallen trees, organic matter on the ground, growing stock (size class distribution, plant density of herbs, green biomass, vegetation height), regeneration, threats (fire, grazing, encroachment, biomass removal)	Once in five years (at the time of FMP preparation and revision or in mid-term for FMUs with 10 year FMP)
Transect walk	Vegetation types and characteristics, plant species diversity, fungal fruiting bodies, lopped trees, crown cover, ground cover, dead and fallen trees, old growth trees, area covered by CWD, organic matter and fine litter, factors of regeneration, threats (fire, grazing, encroachment)	Biennially (including at the time FMP preparation and revision)
Household survey	Demography, cattle population, household-wide forest product demand, agricultural land, education	Once in five years (at the time FMP preparation and revision)
Focus group discussion	All indicators related to threats and social response	Yearly
Key informants survey	Indicators related to threats, enterprise effects, social response	Yearly
FMU and enterprise records	Community participation in conservation, forest management, harvesting and use, threats (fire, theft, encroachment, etc.), fund mobilization, enterprise contributions	Yearly
Experimental plots	Utilizable biomass, growth and yield	Yearly
Photo monitoring	Vegetation, ecosystem change	Once in five years

of the district or site (e.g., leaders of FMUs, representatives of forest authority). After the pre-testing, the items which could not be objectively measured should be refined in a way that allows objective measurement. Similarly, the facilitators should change the units of measurement to those which are frequently used in local area (but which can be correctly converted into standard metric ones later in the data analysis).

Step 3: Workout on monitoring methods

At this step, the facilitators should practice the methods of measurement of all C & I. This toolkit provides eight methods for measuring the indicators and verifiers (see Table 1). The details of each method including a brief introduction, steps to be followed, other specific considerations and reference for the study are given in Annex 2.

The facilitator should be clear of which of these methods are measuring what C & I, and how, when, where and how frequently. The facilitators should check which of these methods will be fully applicable in the chosen FMUs or would need some revision. If some method is not practicable in an FMU, the facilitator should work out available alternative methods or revisions.

Stage Three

Establish a Community-Based Biodiversity Monitoring System

At the stage three, the facilitators and local people should develop a community-based biodiversity monitoring system at the forest management unit (FMU) level. For the FMUs to carry out various activities for biodiversity monitoring as an ongoing process, it is important to set-up a monitoring mechanism within the FMU itself. When the mechanism is functional, biodiversity monitoring activities can go on for a longer time frame. Doing this involves three steps (see Figure 4).

There are two main outputs of this Stage:

- community members—at the executive committee and hamlet levels—will be aware about the need, process and methods of biodiversity monitoring; and
- as community based biodiversity monitoring system will be set up at the FMU level.

Step 1: Orient FMU's executive committee members

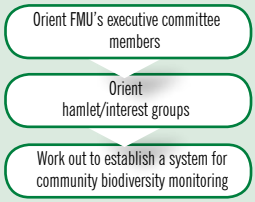
At this step, the facilitator organizes orientation sessions to FMU leaders who haven't participated in the district-level events (mentioned previously). For this purpose, the facilitator needs to request the FMU to organize executive committee meetings for orienting the remaining executive members on biodiversity monitoring. This orientation should include the content as given in Box 1, and additional subjects may be added to if needed in a particular FMU.

During the orientation sessions, the committee identifies the interest groups within the FMU (e.g., NTFP collectors, hunters, entrepreneurs, traditional users, occupational castes and indigenous groups).

Then the facilitator should support the executive committee members to develop an orientation plan at hamlet/interest-group level. This plan should include:

- identified interest groups with their location;
- fixed date and venue for orientation for each of them;
- final number and gender of people to be involved in orientation; and

FIGURE 4: **Steps to establish community-based biodiversity monitoring system**



BOX 1: Content of orientation for biodiversity monitoring

1. What is biodiversity?
2. What is biodiversity monitoring?
3. What are the objectives of the biodiversity monitoring?
4. What are the importance and benefits of biodiversity monitoring?
5. What are the activities to be done for biodiversity monitoring?
6. What are the role of executive body and community members in biodiversity conservation and monitoring?

- a committee member to support the facilitator for organizing orientation meetings

Step 2: Orient the hamlet/interest groups

At this step, the facilitator has to orient the interest groups and hamlet members (identified and arranged, in step one) with the support of FMU executive committee members. The content for the orientation sessions is given in Box 1. The major objective is to aware and empower the community for biodiversity monitoring. The facilitators need to support FMU executive committee members to select at least a male and a female, who have interest and knowledge on local biodiversity, from each hamlet or interest group for forming biodiversity monitoring team(s) which will be described in step 3.

Step 3: Workout to establish a system for community biodiversity monitoring

After the community orientation on biodiversity monitoring at the executive committee level and hamlet/interest group levels is successfully completed, a community-based monitoring system in the FMUs should be worked out. The participation of community members should be ensured which provides the basis for empowering the community and making them more active in the establishment and subsequent functioning of the monitoring system. Thus, each FMU needs to work out the system and make decisions on how to proceed with setting the system in motion. The following activities should be carried out to achieve them.

BOX 2: list of threats in Shree Binayak Pimi Danda CFUG, Nepal

The following threats were identified by Shree Binayak Pimi Danda community forest user group of Bajhang district, Nepal in the facilitation of ANSAB. For this, the executive committee members and representatives of various interest groups were involved.

1 Destructive collection of NTFPs (due to outsider intrusion, absence of local ownership, unscientific collection)
2 Encroachment and slash and burn (by locals as well as transhumance for cultivating food crops for household consumption)
3 Overgrazing (by outsiders and locals)
4 Fire from natural and intentional causes (clearing grasses and bushes, and accidental fire from heating, cooking and smoking), cutting of trees
5 Removal of fuelwood and timber (for local use)
6 Lopping and removal of leaf litter (excessive and unsystematic collection of fodder and bedding materials)
7 Illegal hunting (of wild animals)
8 Insects, diseases and pests
9 Soil erosion and landslides
10 Natural calamities such as hurricane, heavy snow fall, hailstorms

3.1 Organize a workshop to form a system of biodiversity monitoring

A two-day workshop should be organized at the FMU level, in which the facilitator should ensure the participation of executive committee members and representatives from various interest groups, entrepreneurs, resource collectors, school teachers and the people interested in biodiversity conservation and management. During the workshop, the facilitator should briefly repeat the previous orientation sessions

regarding the what, why, how and who to establish the community monitoring system. Then the participants should be led to discuss on the monitoring system that will work for a period of five years or more. The following are the major decision points to be taken in the course of these discussions:

a) Identify resources and habitat to be monitored

Monitoring of all resources and habitat is often impossible and unnecessary. Therefore FMU needs to identify and decide on the resources and habitats that will be put on the biodiversity monitoring program. The following criteria must be considered:

- Highly commercial forest species
- Red listed (threatened, rare and endangered species) floral and faunal species
- Highly threatened species from anthropogenic pressure
- Conservation area of high social and economic importance

b) Identify and rank the threats

After listing the resources and habitats, the facilitator needs to identify the major anthropogenic and other pressure/threats over the resources. Following activities are suggested:

- discuss about the anthropogenic and other pressure/threats and their impacts on biodiversity;
- facilitate to identify and list each of the threats/pressure to biodiversity; however the pressure may vary in type and intensity. Box 2 shows these threats/pressure in an FMU through an exercise conducted by ANSAB;
- finalize the ranking criteria for threats from discussion with workshop participation. A set of criteria for ranking the threats for biodiversity conservation used by ANSAB in Nepal are: (a) area coverage, (b) pressure on the resources, (c) degree of urgency to address,and (d) feasibility to address;
- select top three to five threats for interventions using matrix or pair wise ranking. In the community discussions:
  - Explain the objectives of threats ranking to the participants
  - Provide the criteria and methods of ranking for the participants and

TABLE 2: Threat Ranking Table

THREATS	CRITERIA/SCORE					TOTAL SCORE	THREAT PRIORITY	REMARKS
	Criteria 1	Criteria 2	Criteria 3	…….	Criteria m			
Threat 1								
Threat 2								
Threat 3								
……..								
……..								
……..								
Threat n								

facilitate the process to refine and finalize them.

— Keep the criteria in top row of the table (see Table 2) and threats in first column

— Determine the score for ranking (a score of 0 means no impact, 1-very low impact, 2- low impact, 3- medium impact and 4- high impact and 5 for very high impact on biodiversity).

— Add scores for all criteria for the threats, and the higher the overall score the higher the threats on biodiversity.

BOX 3: Case of threats ranking: practiced by ANSAB at Bajhang

During the meeting of CFUG, ten threats of biodiversity were identified (see Box 2). These threats were ranked on the basis of the four criteria: area coverage, intensity, urgency, and feasibility. Top high priority threats were identified through matrix ranking and were prioritized for monitoring as well as intervention.

The threat ranking is further illustrated with an example of Shree Binayak Pimi Danda Community Forest at Bajhang District of Nepal (see Box 3 and Table 3).

c) Delineate the area:

Now the area within the FMU, which is affected with the prioritized threats, is delineated. The delineated area shows the species and habitats that were selected during matrix ranking of threats. Participatory resource mapping is a major tool for its delineation. The detail of participatory mapping is given in Annex 1.

d) Fix the focal person and monitoring team

Now the FMU executive body should fix a focal person from executive committee and decide on who will be in the monitoring team. The monitoring team generally consists of people selected during hamlet or interest group orientations. They should discuss on the size of team and its formation and how to make that representative of all interest groups. The monitoring team will be functional when the team includes 5-7 members. However, two or more team can be formed if the forest area is large in order

TABLE 3: threats ranking in Shree Binayak Pimi Danda community forest, Bajhang

SN	THREATS	CRITERIA/SCORE				TOTAL SCORE	THREAT PRIORITY
		Area coverage	Intensity Ranking	Urgency Ranking	Feasibility to address		
1	Fire in forests /pastures	4	5	5	4	18	1
2	Uncontrolled harvesting of NTFPs	5	3	4	5	17	2
3	Slash and burn farming	2	5	5	3	15	3
4	Unmanaged harvesting of timber, fodder & firewood	3	4	3	5	15	3
5	Over grazing	5	2	2	2	11	4
6	Poaching	1	1	1	1	4	5

to share the work. In the team, at least a few members should be able to read and write.

e) Identify the methods and season of monitoring

The FMU needs to identify the methods for the measurement of C & I in support of the facilitators. They should also decide the appropriate season in which monitoring activities will be carried out in the field.

f) Determine the facilities and benefits for the monitoring team

Monitoring team requires incentives and equipment for monitoring activities. Thus the community needs to discuss the benefits and facilities to be covered as per the local norms.

g) Determine how to cover the cost of monitoring

The cost of regular monitoring needs to be covered by the FMU itself. However, facilitating organization and other stakeholders may support during the initial period. Therefore, FMUs need to identify these organizations to request for support. In ANSAB's program area in Nepal, the staff facilitated to allocate some fund of community forest user groups for biodiversity monitoring from within the budget earmarked for forest management and enhancement.

h) Arrange of logistics and expertise

FMUs need to arrange logistic and facilitation support for the collection and analysis of monitoring data. In initial period, facilitating organization provides the expertise, but to make sustain the monitoring program, the knowledge and skill of monitoring must be transferred in local monitoring team. With sufficient knowledge and skills, the team evolves into local resource persons.

i) Endorse the provision through general assembly

The above outputs and decisions made on the biodiversity monitoring should be discussed and endorsed through the general assembly of the FMU. It provides wider ownership of the monitoring program and can serve legal purposes as well.

Stage Four

Plan and Prepare for Data Collection

The stage four of this toolkit guides you through planning and preparation for the collection of biodiversity monitoring data. Planning is crucial for effective and efficient fieldwork. It helps avoid mistakes, recognize hidden opportunities and ensure that operations run smoothly. It should be done along with the process of FMU formation and forest management plan preparation. Planning and preparation involve four important steps (see Figure 5). At the end of this stage,

- base line data collection team is formed;
- monitoring equipment and formats for field data collection are arranged; and
- action plan is prepared.

FIGURE 5: **Steps to plan and prepare for data collection**

Step 1: Form data collection team

At the first step, the facilitator should guide the FMU executive committee to form a data collection team from the "monitoring team" decided previously. Here specific roles are allocated to the interest and capacity of individual members. The team ideally comprises 5-7 members.

Step 2: Arrange field equipment and data collection formats

At the second step, the field crew needs to prepare a list of equipment, data collection formats and stationery items for the fieldwork (see Table 4). Some of these may not be necessary for certain FMUs or some

TABLE 4: **List of equipment for biophysical data collection and monitoring**

EQUIPMENT/MATERIALS	PURPOSE
GPS	boundary survey, stratification and locating plots
Diameter tape	measuring tree diameter
Distance measuring tape	measuring distance
Compass	measuring bearing
Clinometers	measuring tree height and slope
Plot center marker	marking plots
Number tag or enamel brush	marking trees and plot
Spring scales	weighing destructive samples
Cloth or paper bags	collecting soil, wildlife fecal and understory samples
Large plastic sheet	mixing forest floor/understory samples
Hand gloves & mask	field work
Hand saws/Sickles	cutting destructive samples
Formats and stationery	taking notes and recording data
Distance Measuring Equipment	measuring distance between plot centre and tree
Map (Topo map/Survey map/satellite map)	accurate work as design in planning; habitat area identification
First aid kit	personal safety of field crew

TABLE 5: Action plan for biodiversity monitoring

SN	ACTIVITIES	TIME PERIOD	METHODS	RESPONSIBLE PERSON	REMARKS
1	Design and planning for field work				
2	Monitoring the resources-1 and recording				
3	Monitoring the resources-2 and recording				
4	Monitoring the resources-3 and recording				
5	Analysis and interpretation				
6	Intervention design				
7	Application				

equipment may not be available to the facilitator. They therefore should make sure how to do certain tasks in alternative ways. Similarly, they should prepare monitoring formats for all three criteria i.e. ecosystem health and vitality, threats to biodiversity and enhancing factors,as given in stage five.

Step 3: Provide orientation to the team members

At the third step, the facilitator trains the field crew members to get them ready to collect field data collection, use of the equipment and fill monitoring formats and the record of measurements. For this a one-day orientation should be organized. The orientation should be carried out in two sessions, theoretical and practical, on the following:

1. introduction and objectives of biodiversity monitoring—recap;
2. methods of monitoring;
3. the use of equipment and materials;
4. recording the measurement and use of data collection formats; and
5. season of monitoring

Toward the end of this training, the team members should be facilitated to develop an action plan (see Table 5 for template).

Step 4: Design and plan for field monitoring

Now, at the fourth step, the monitoring team exercises the design and planning for efficient fieldwork. This step helps avoid mistakes and make sure that operations run as smoothly as possible. It also enables the monitoring team to understand more clearly what they have to accomplish. The detailed activities to be performed during the monitoring is described in "Participatory inventory of Non-timber forest products", a toolkit published by ANSAB. In short they should perform following activities for field monitoring:

- calculate the area covered under selected species and the habitats they occupy;
- separate the rocky and steep area in the forest so that only the area that supports vegetation is considered;
- calculate the number of monitoring plots and observations between the two consecutive monitoring plots;
- draw the transect line on the map;
- calculate the length of the transect line and distribute the monitoring plots; and
- develop a table of monitoring detail based on transect and monitoring plots distribution in map.

Stage Five

Collect, Analyze and Interpret the Data

The stage five of this toolkit presents steps, methods and activities for the collection and analysis of biodiversity monitoring data. This stage has three steps (Figure 6). It starts with laying out the transect lines and monitoring plots on the forest site, followed by the measurement and recording of monitoring data. The data are then compiled and analyzed in order to provide a basis of biodiversity management within a forest management unit (FMU).

At the end of this stage, the following outputs are expected:

- biophysical and social data are collected in well developed formats;
- major threats to biodiversity are identified;
- response of community towards biodiversity conservation is explored; and
- collected data are compiled and analyzed.

Data collection and analysis work is normally carried out after the FMUs complete forest resource inventory and before the process of forest management planning. Combining inventory and biodiversity monitoring can be cost-effective. The steps for this stage are given below.

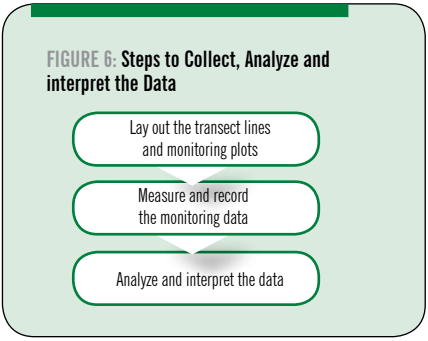


FIGURE 6: **Steps to Collect, Analyze and interpret the Data**

Step 1: Lay out the transect line and monitoring plots

The facilitator should carry out the following activities to lay out the transect line and monitoring plots on the ground. The team should use GPS (or compass and tape, if GPS is not available) for transect walk. The technical details of this step are presented in the Participatory Inventory of Non-Timber forest products toolkit, published by ANSAB in this series.

- remind the respective roles to each of the team members, as was agreed previously;
- find the starting point of transect line and first monitoring plot in participation of community members and from geographic reference (see Figure 7 for reference); and
- fix and mark the edges of the sample plots/quadrates.

Step 2: Measure and record the monitoring data

2.1 Measurement and recording of ecosystem health and vitality

The data collection formats given in Format 1 will be used to record the measurements. Here we start with how these measurements will be made use of.

Growing stock

The growing stock of forest vegetation is measured mainly in terms of volume per unit area. It is calculated from basal area, height and form factor of a tree. Density, or number of plants per unit area for each size

class, is also measured to understand of the structure and dominance.

Growth and yield

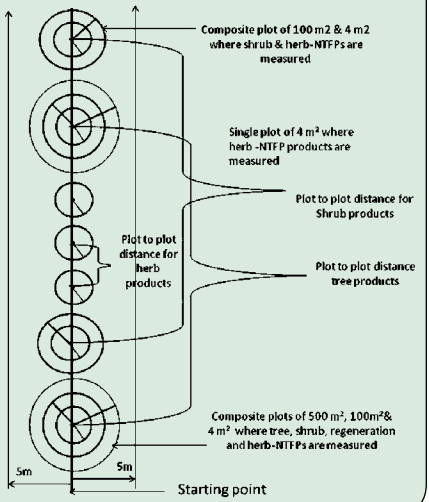
The information on growth and yield of economically useful plants provides the basis for the determination of sustainable harvest rates. The indicators for measuring growth depend upon the plant life form (such as trees, shrubs or herbs), and the product to be harvested.

For assessing the health of forest, the monitoring team should also measure the crown cover, old growth trees, dead and fallen trees, fungal fruiting bodies, coarse woody debris (CWD), and lopping intensity and the extent of old growth trees. Information is also collected as percentage of trees with lopped branches and litter cover. The litter cover is good certain time of the year- preferably in May for evergreen forest and December to January for decidious forest of high altitude. The team should also measure, in the case of alpine meadows, the height of plants, green biomass, and organic matter on the ground.

Regeneration

Regeneration enables a forest or grassland ecosystem to perpetuate over a long term. Therefore, the regeneration data allows the monitoring team to determine the future structure of the stand and about which species are to be selected for protection and for harvesting as well as other silvicultural treatments (such as singling, thinning). The data provides indication of critical ecosystem conditions and management intervention.

FIGURE 7: **Steps to lay out the monitoring plots**



FORMAT 1: **formats for ecosystem health and vitality measurement**

A. Resource Inventory Observation Sheet

(Sample plot size 500 m² for trees, 100 m² for Pole, Sapling, and Shrub and 4 m² for Regeneration)

1. Background Information

FMU NAME:	DATE:	PLOT REFERENCES AND MAP
NAME OF FOREST:	TRANSECT LINE NO.:	
BLOCK NAME/NO:	PLOT NO.	
NAME OF RECORDER:		

2. General Characteristics of the Plot

Aspect (circle one): N, S, E, W, NE, NW, SE, SW	Soil depth (m):	Tree crown cover (%):
Slope (average degree):	Soil type: clayey, loam, sandy, bouldery	Fire: Yes/No Natural/Man made
Altitude (m):	Soil color:	Shrub crown cover (%):
Vegetation type (among 23):	Soil erosion features:	Ground cover: in %
		Grazing: No, low impact, high impact:
		Encroachment: (Y/N), low impact, high impact
Age structure (Circle): Even/Uneven	Density (circle): Dense/Open	Water body (number/ha):

3. Stocking levels of trees (regeneration, sapling, pole and trees)

Plot No: CF Name: VDC & Ward: District:

SN	Species	Regeneration (<4cm)			Sapling (4-9.9 cm)		Pole				Trees (All standing Trees >30 cm)- measure diameter in cm and height in meter												Remarks
		Seedling	Coppice	Root Sucker			10-19.9cm		20-29.9 cm		30-39.9 cm		40-49.9 cm		50-59.9 cm		60-69.9cm		70-79.9cm		>80 cm		Dead and Over mature (>30 cm)	
					N	AH	N	AH	N	AH	N	AH	N	AH	N	AH	N	AH	N	AH	N	AH	N	AH

Note: N-Number, AH-Average height

4. Stocking of shrubs(Sample plot size for adult shrub 100 m^2, and for shrub regeneration 4 m^2)

SN	SPECIES	REGENERATION (NO.)			ADULT PLANTS		CROWN COVER (%)	REMARKS (INVADER, ETC.)
		Seedling	Coppice	Root Sucker	No	Avg. Height		
1								
2								
	Others							

5. Stocking of herbs (Sample plot size: 4 m^2)

SN	SPECIES	REGENERATION NO.	ADULT HERBS		GROUND COVER	BIOMASS	REMARKS (invader, etc.)
			No.	Avg. Height			
1							
2							

6. Other Ecological Observations

Digging by Wild Animals:
Nursing Role of Shrubs, Nigalo and Others:
Fallen and Dead Trees (Approx. Vol., condition, etc.):
Canopy Gaps:
Insect and Diseases:
Others:

All modes of regeneration (seedling, coppice, root suckers) should be considered for data generation. Seedlings and coppices of specified heights, as well as the key conditions that affect them should be measured and noted. See the Annex 1 for indicator to be measured to know the ecosystem health and vitality of the forest. Similarly, record all the measurement on the Format 1.

Wildlife

Wildlife is also a part of the forest and includes mammals, birds, amphibians, and insects. However, recording the wildlife data, such as through transect walks, would depend upon the objective of management for which the FMU is being put to. Number of birds' nests during spring time is easy to major.

All the indicators of ecosystem health and vitality will be measured through resource inventory, transect walk, and experimental plot establishment methods. The methods and frequency of measurement for each indicator of ecosystem health and vitality are given in Table 1, whereas the C&I and methods of monitoring are given in detail in Annexes 1 and 2 respectively.

Similarly, the following additional information is taken from transect walk of the forest area (use Format 2 for this).

Old growth trees

Old growth trees in Himalaya around human settlements are generally the remains of old growth forests. Their presence is a good indicator of the fact that the forest has not been clear-cut for a long time. Stands rich in old growth trees add to overall diversity, as they provide shelter to certain animals and birds normally absent in young forest stands. Old growth trees can be shown as percentage of total trees within an area or plot.

Coarse Woody Debris (CWD)

The presence of coarse woody debris indicates that the human pressure is low because such debris is collected by local people. Its frequency on ground surface can be measured within a 2 to 3 m wide strip or by taking a walk along a line.

2.2 Measurement and recording of threats to biodiversity (anthropogenic)

The indicators of "threats to biodiversity" criterion should be measured at least once a year, but FMUs are encouraged to record events as they occur, such as in case of fire or biomass removal. The data is compiled and analyzed by the community and the facilitator or local resource person on an annual basis. Fire damage will be compiled and analyzed at FMU and cluster level as well.

Fire

The part of forest destroyed by fire will be identifiable in the forest map or topo-sheet. Field observation of the fire-affected area should be done to assess the severity of damage. This should be recorded as percentage of area under fire damage, and explained in a note of its causes and effects.

Biomass removal, encroachment and grazing

The FMU should maintains a register for forest product distribution, forest product theft, encroachment and grazing. The FMU records all types of biomass removal from the forest either legally sanctioned or by theft. Incase of grazing, number and types of cattle grazing in forest and grazing density should be recorded. Similarly, trail density can also be a good indicator to learn the grazing intensity of the forest. The monitoring of all pressure can be done from observation and measurement along the transect line through transect walk and from FMU's records, key informant interview and focus group discussions. The methods and frequency of measurement for each indicator of anthropogenic pressure are given in Table 1.

Only transect walk does not provide frequency and severity of the threats. Thus, the monitoring team must identify their severity and frequency of the events in the forest area through focus group discussion and key informants interview. In addition, they must identify the root causes or

FORMAT 2: Transect Line Observation Sheet (seethe Guidelines that follow this format)

FUG Name: **Block Name:**
Observed Length of Transect Line: **F Bearing:**

Ecosystem Characteristics
Animals (species and number observed and approximate distance from the transect line)
Birds (species and number observed and distance from the transect line)
Water bodies and quality (Number of water bodies, streams, sediment loads)
Dead animal bodies (Species, number, location)
Hunters in action (type, number, success)
Fungal fruiting bodies
CWD
Old growth trees and stands
Crown cover
Lopping
Fire
Grazing
Fine litter
Biomass removal
Canopy structure
Soil condition (color)
Vegetation types

Guidelines for Data Collection(There should be 3-5 record points between two consecutive sample plots)

ECOSYSTEM CHARACTERISTICS	FREQUENCY OF MEASUREMENT	TRANSECT LINE WIDTH FOR OBSERVATION
Animals (species and number observed and approximate distance from the transect line)	As they occur	Unlimited
Birds (species and number observed and distance from the transect line)	3-5 recordings between 2 sample plots	100 m
Water bodies and quality (Number of water bodies, streams, sediment loads)	As they occur	Unlimited
Dead animal bodies (Species, number, location)	As they occur	Unlimited
Hunters in action (type, number, success)	As they occur	Unlimited
Fungal fruiting bodies	3-5 record	+2/-2, 5 m (left, right)
CWD	As they occur	2 or 3 m (left, right)
Old growth trees and stands	As they occur	
Crown cover	3-5 records	+5/-5, 5 m (left, right)
Lopping	3-5 records	+5/-5, 5 m (left, right)
Fire	As they occur	unlimited
Grazing	As they occur	100 m (left, right)
Fine litter	3-5 records	+/-2, 2 m (left, right)
Biomass removal	3-5 records	+/-5, 5 m (left, right)
Canopy structure	3-5 records	+/-5, 5 m (left, right)
Soil condition (color)	3-5 records	Where we stand
Vegetation types	As they occur (change in vegetation types)	100 m (left, right)

Recording format

1. Background Information

FMU NAME: NAME OF FOREST:	DATE:	TRANSECT LINE REFERENCES AND MAP
Block Name/No:	Transect Line/Segment No:	
F Bearing:	Observed Length of Transect Line (with starting and ending points in the line)	

2. Observation Sheet

In Name of the features, write the observed items (e.g., pond, stream, CWD, ghoral, kasturi, etc. Also see other items in the guidelines (point-4)

DISTANCE FROM PRECEDING SAMPLE PLOT	FORE BEARING	NAME OF THE FEATURES	OFFSET		QUANTITATIVE DETAILS OF THE FEATURES			REMARKS
			Left	Right	No	Area (ha)	Others	

drivers of these events such that future management options can be identified later.

2.3 Measure and record data of enhancing factors

The indicators, verifiers and units of measurement for "enhancing factors" is given in Annex 1. The following are the main variables to be monitored:

- Decision mechanism in FMUs
- Regeneration (species wise)
- Silvicultural activities (practices)
- Forest protection system
- Perception of the local people to biodiversity resources
- Practice of resource harvesting, conservation, record keeping and penalty system in FMU
- Institutional aspect of the FMUs: inclusion and forest product distribution system
- Change in knowledge and behavior regarding to regeneration, use and management
- Conservation knowledge like propagation techniques and harvesting techniques
- Techniques, tools/equipment and season used for the harvesting of biodiversity resources
- Fund generation and mobilization for biodiversity enhancement

Key methods to be used for the monitoring of enhancing factors include conducting household surveys, reviewing FMU records, facilitating focus group discussions, conducting key informant surveys and forest observation. The details of these methods are given in Annex 2 and recording formats are given in annex 3 (1), (3), (4), (5) and (6).

Step 3: Analyze and interpret the data

The third step of stage five of this toolkit presents methods and tools for the analysis of data according to the three criteria of biodiversity monitoring.

3.1 Ecosystem health and vitality

This analysis of "ecosystem health and vitality" gives:

- General features of the forest e.g. slope, aspect, soil type, forest type, and land use type
- Number of flowering and non-flowering plant species and their distribution
- Growing stock (number and volume) of forest crops (by species, per hectare and in block)
- NTFP growing stock-by number and volume (in block and whole forest).
- List and quantify the availability of other NTFPs (use wise).
- Sustainable yield for major forest crops (block-wise).
- Presence and absence of wild animals (types/species of animals and habitat area)
- Presence and absence of red-listed wild animals and plants
- Number of old growth tree, dead but standing tree
- Regeneration per hectare and in whole forest
- Number of plant according to diameter class
- Number and area covered by water bodies
- Biodiversity hotspots (area coverage)

The indicators need to be analyzed in terms of their type, number, volume and presence and absence. See the Guideline below for analysis.

Guideline for Analysis

Calculate volume of a standing tree

Timber stock (by volume) of a standing tree can be calculated as follows:

Volume of a standing tree(v)= $\pi/4\ d^2 \times h \times$ Form factor $\times$ tree quality

Where,
v = volume of a trees (cft)
d = diameter at breast height (1.3m)
h = height of the tree (ft.)

Calculate stock for a quadrate

Calculate the volume of timber for all tree counted in quadrates and sum them to estimate the total stock of a quadrate:

Conversion into feet
1 m = 3.28 feet (if height is measured in meters)
1 cm=1/(2.54×12) feet (if diameter measured in cm)

Total stock in a quadrate or sample plot (a) = $\sum$ v (sum of all tree counted within quadrate)

Calculate stock per hectare

Summing the stock of quadrates, divide by area covered by quadrates and multiply by 10000 then growing stock of forest per hectare can be calculated such as:

Stock (cft.)/ha = ($\sum$a)/(Area covered by total no. of quadrates (m ^ 2))×10000

Estimate growing stock of blocks or forest

It can be calculated multiplying by area of forest or block (ha) to growing stock (cft.) calculated per hectare. Similarly, calculate the total stock (by number) for important species which are listed for monitoring.

Data Interpretation

Now the monitoring team can estimate the trend (increasing, same, and decreasing) comparing with status of previous years. Similarly, the forest status can be expressed in terms of good, medium and low if there is a standard available for such classification.

Vegetation: The forest state is described on the basis of regeneration and total stock per hectare. Regeneration (one of the major variables) status can be determined in a manner shown in Table 6.

Similarly, the forest state can be estimated on the basis of the growing stock of the forest and regeneration status as given in Table 7.

Wildlife: A forest which maintains the population of a large number of wildlife species has high biodiversity. Thus the wildlife and their signs (such as footprints) are recorded from transect walk and forest assessment. Then their trend is analyzed with the comparison of the existing status with that of base year.

TABLE 6: Regeneration and sapling status

PLANT FORM	STATUS OF REGENERATION IN THE FOREST		
	GOOD	MEDIUM	LOW
Regeneration	>5000/ha	2000-5000/ha	<2000/ha
Sapling	>2000/ha	800-2000/ha	<800/ha

TABLE 7: Forest state identification based on growing stock and regeneration

TOTAL STOCK (MATURE AND POLE STAGE TREE)	GROWING STOCK = >7000 CFT/HA			GROWING STOCK = 2000-7000 CFT/HA			GROWING STOCK = <2000 CFT/HA		
Regeneration	Good	Medium	Low	Good	Medium	Low	Good	Medium	Low
State of forest	Good	Good	Medium	Good	Medium	Low	Medium	Low	Low

Source: Forest inventory Guideline, 2061, Forest Department, Nepal

3.2 Threats of biodiversity

The detail analysis gives:

- Major threats to biodiversity (anthropogenic)
- Major root causes of these threats

Data collected using the indicators, verifiers and methods described in 'Criterion 1: Threats to biodiversity' of Annex 1. The summarized data can be interpreted as described below.

Data interpretation

The monitoring data is interpreted in terms of trend (increasing, decreasing and no-change) in summary as given in Table 8. In order to ascertain the trend of "threats to biodiversity," information of base year is required, and the present status is compared with that of base year.

3.3 Enhancing factors

The facilitator and community members can summarize the data collected as per the description given in 'Criterion 3: Enhancing factor' of Annex 1. The facilitator needs to elicit following information from the summarized data:

- global and national priorities towards biodiversity conservation;
- policy changes on conservation at FMU and national level;
- number of species wise regeneration count;
- silvicultural activities (practices);
- perception of local people regarding biodiversity resources;
- practice of resource harvesting, conservation, recording and penalty system in FMU;
- institutional aspect of the FMUs, inclusion, forest product distribution system;

TABLE 8: Threats interpretation

RANK	THREATS	STATUS OF BASE (0) YEAR	YEAR 1 (STATUS)		TREND		
			AREA (HA)	NO. OR FREQ./YEAR	I	N	D
1	Fire (uncontrolled)						
2	Biomass removal						
3	Grazing						
4	Encroachment						
5	Unsustainable harvesting practices						
6	Illegal harvesting						
7	Hunting						

Note: I-Increased, N-No-change, D- Decreased

TABLE 9: Forest enhancement information interpretation

SN	DESCRIPTIONS	STATUS OF BASE YEAR (0 YEAR)					STATUS OF SUCCEEDING YEAR 1					REMARKS
		Y	N	I	S	D	Y	N	I	S	D	

Use Y-Yes, N-No and similarly use I-increased, S-Same, D-Decreased to know the trend where applicable.

- conservation knowledge like propagation techniques and harvesting techniques;
- knowledge about uses and values of forest products;
- processing and alternative use knowledge and skill;
- change in resources consumption patterns (stall feeding, improve cook stove to reduce pressure in forest resources; and
- conflict status in FMU such as boundary conflict, resource us conflict etc.

The summarized data can be interpreted as follows.

Data interpretation

When collected data is analyzed and maintained it in a database, the result is interpreted as given in Table 9, that can subsequently be useful in designing intervention strategies of biodiversity conservation and management.

Stage Six

Integrate the Results of Biodiversity Monitoring in Forest Management Plan

The stage six of this toolkit guides the facilitator through how to apply the results of biodiversity monitoring to enhance the ecosystem health and vitality; to reduce the threats on biodiversity; and to strengthen enhancing factors for biodiversity conservation at FMU level. It has four steps (see Figure 8).

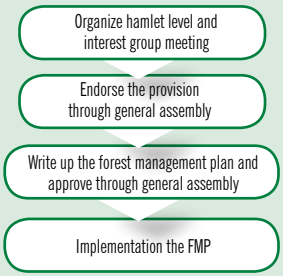
The following are the outputs of this Stage:

- Forest management plan (FMP) will be developed for reducing threats and enhancing biodiversity condition
- The FMP with the provision for biodiversity monitoring, will be approved from government authority
- The approved FMP will be implemented in the FMUs.

Step 1: Organize hamlet level and interest group meeting

At the first step, the facilitator and FMU executive committee members should organize the hamlet level meetings. In the meeting, the facilitator presents the analyzed result of the field measurement and provokes their voice in the interpretation of biodiversity monitoring results and their implications on management. Further meetings are organized with each of the interest groups previously identified in the FMU and their interest and concerns are recorded in order to incorporate them into the FMP. Two such meetings are possible in a day though it depends to a large extent on the spread of hamlets and households in the village. A core point to bring from these meetings is to define what provisions about management are essential in the FMP.

FIGURE 8: **Steps to apply biodiversity monitoring**



Step 2: Endorse the provision through general assembly

At the second step, the suggestions gathered from the above meetings are grouped and sorted. With this the facilitator develops a list of what new provisions about management are necessary, and which of the previous provisions are to be retained and which are to be deleted. These form the technical recommendations for the choice of local people. A general assembly at the FMU is organized by the executive committee and the provisions are debated, refined and endorsed through the assembly itself. If the new agreed provisions comprise a significant deviation from previous FMP (if any), the FMU should seek an amendment to the FMP. The following are the activities to be carried out to endorse FMP provisions.

- make a decision to hold a general assembly through a meeting of the executive committee;

- fix the date and venue of the assembly and invite a male and female participant from each household;
- present the interest and concerns raised from hamlet and interest group meeting;
- facilitate to reconcile and endorse these concerns and interests into FMP provisions, in a one-by-one basis in the assembly; and
- record the decisions in the FMU executive committee minutes.

Step 3: Write up the forest management plan and approve from Government authority

The third step of stage six comprises the following activities.

3.1 Write up of the forest management plan (FMP)

The FMU should write up their FMP in support of forest technicians. The outline of an FMP is given in Box 4. In addition to other items, the FMP should also include community based biodiversity monitoring system as was agreed previously at the FMU level. Relevant government guidelines should be followed in the writing up of the FMP, so that the approval would be easier.

The written draft FMP is put on public notice and discussed in the FMU general assembly. If there are new concerns, these should be incorporated and addressed. Now the document is ready to forward for approval from government authority.

3.2 Approve FMP from Government authority

The FMU needs to take approval from concerned government authority (e.g.

BOX 4: Main Contents of a Community Forest Management Plan in Nepal

1. Introduction
- Forest user group
- Forest area
- Objective of forest management
- Historical background and traditional forest management system

2. Description of forests
- Block
- Sub-block

(boundaries, area, slope, aspect, elevation, soil type, forest type, forest condition, crown cover, regeneration status, tree and NTFP species, stock of the species, growth, and harvestable yield)

3. Forest management
- Description of forest user group
- Demand of forest products
- Management of timber production areas
- Management of firewood production areas
- Management of fodder and grass production areas
- Management of NTFP production areas
- Management of commercial NTFPs
- Detailed management plan for targeted NTFP
- Management of grazing areas
- Management of other forest products production areas (cattle bed, litter, etc.)
- Management of regeneration

4. Distribution and sales of forest products
5. Forest protection system (including forest guarding and penalty provisions)
6. Fund management
7. Biological monitoring system
8. Others (role of forest department, NGOs, and FMU association; forest products pricing mechanism, and operational plan amendment)

district forest office in Nepal) for its implementation. The executive committee writes to the government authority with the attached FMP, and any suggestions available from the authority also comprise a part of the FMP itself.

Step 4: Implement at the FMP

At the fourth step, concerned with the implementation of the FMP, the following activities should be carried out.

4.1 Provide orientation to executive committee

To implement the FMP properly, the FMU executive body should be clear about the FMP provisions and their interpretation. For that, an orientation meeting is organized by FMUs themselves or in support of the facilitator. Its main objective is to develop a common understanding on FMP provisions.

4.2 Provide orientation to the community

After developing a common understanding on FMP provision in the executive body, each community group needs to be oriented by a member of FMU executive body itself or in support of the facilitator.

4.3 Facilitate to develop action plan

Now the provisions mentioned in the FMP should be broken down to detail. Action planning is thus a detailed annual planning that shows activities by the time they are carried out, the persons responsible and needed tools (e.g., formats). An example of action plan is given in Table 10.

TABLE 10 : Action plan for forest state enhancement and reducing threats

SN	ACTIVITIES	RESPONSIBLE PERSON/ GROUPS/ COMMITTEE	TIME PERIOD					FORMATS FOR RECORDING
			Y1	Y2	Y3	Y4	Y5	
1.	Maintaining community biodiversity register							annex 3 (1)
2.	Forest conservation and development activities							Annex 3 (2)
3.	Resource harvesting plan preparation and implementation							
4.	Enhancement of recording system in FMUs							
5.	Biodiversity threats mitigation plan							
6.	Strengthening of enhancing factors of biodiversity resources							
7.	Impact to other species when harvests commercial species							
8.	Strengthen harvesting process and methods							
9.	Activities related to enhance regeneration of forest species							
10.	Regular/periodic monitoring of the resources							
….								
…								
….								
20	Coordination and linkages							

Y1-Year one; Y2- Year two; Y3-Year three; Y4- Year four and Y5-Year five

4.4 Strengthen FMU for action plan implementation

The facilitator should work with the FMU executive committee to strengthen them in implementing the action plan. The facilitator should support the committee to implement the action plan by providing training and regular facilitation. The facilitator should support on the following:

a) Maintaining community biodiversity register

The information obtained from monitoring

BOX 5: A case study of harvesting system and practices in Nepal facilitated by ANSAB

Most of the community members used to collect immature and harvesting practices that were destructive to the regeneration and growth of the plants. These practices also adversely affected other species. Recognizing these threats, ANSAB strengthened community forest user groups to estimate total and annual allowable harvestable amount of forest products. ANSAB provided hands on training in the field and facilitated regularly to harvest with appropriate season, methods and tools and to maintain the record keeping of forest products harvesting. In return, community forest user groups delineated the area of highly tradable species and adopted a suitable harvesting practice within that. These activities led to improvement in harvesting practices, and forest health leading to conservation of biodiversity. Some examples of harvesting practice improved in CFUGs of Nepal are as follows:

PLANT SPECIES	PARTS HARVESTED	TRADITIONAL PRACTICES OF HARVEST	NEW HARVESTING PRACTICES ADAPTED BY FUGS IN FACILITATION OF ANSAB
Jatamansi	Rhizomes	Whole plants were dug out (without leaving any plant) from the earth using kuto, a local digging tool. No restrictions in the use of tools, seasons, parts of forest and quantity of harvest. The method was destructive to the regeneration and growth of the species. It also loosened the soil surface making it more prone to surface erosion.	Whole plants are pulled out from the bushy area and dug out carefully from the open grassland with Kuto leaving approximately 20% plants undisturbed for regeneration. Restrictions are applied in the use of tools, season, parts of forest and quantity of harvest, generally following a five-year rotational cycle.
Kutki	Rhizome and Roots	Whole Kutki plants were uprooted with kuto and are sometimes handpicked without leaving any plants and propagule for regeneration. No group restrictions were applied.	Kutki is dug out with kuto and handpicked if the rhizomes are long leaving about 20% of the Kutki plant. Similar restrictions are instituted as in the case of Jatamansi.
Sunpati	Leaves	Only negligible quantity of leaves are handpicked or twigs are cut for local use (mixed with other herbs to make incense).	Leaves are either handpicked or cut with scissors leaving more than 30% leaves for plant growth.
Juniper	Leaves and Berries	Branches are cut to collect the leaves for local use for subsistence purposes only.	Berries are handpicked and leaves are collected from the small branch cuttings with little disturbance to the plants.

activities should be maintained in a biodiversity register. The register serves as a documented source for all community members access information about existing species (flora and fauna), ecosystem types and rare an endangered species available in their forest. The register, at the minimum, includes the following:

- Local name of the species
- Number of plants or animals
- Area covered by those species
- Parts used
- Local uses of the species

Facilitator should encourage the executive committee to update the register periodically with new information obtained from the periodic monitoring. Please refer to Annex 3 (a) for the formats of biodiversity register.

b) Promoting sustainable harvesting practices

Similarly the facilitator should support the FMU in adopting sustainable harvesting practices. Please follow the ANSAB's toolkit "participatory inventory of non-timber forest products" to estimate sustainable harvesting stock of forest products. After calculating the sustainable harvesting rate in participation of local people, the facilitator creates awareness amongst the community members on the following aspects:

- Annually harvested stock
- Harvesting season
- Harvesting techniques
- Use of harvesting tools
- Involvement of harvesters

Thus facilitator needs to provide hands on training for those people who are indeed involved in harvesting. ANSAB has facilitated in Nepal for sustainable harvesting of forest products since decades which is given in Box 5.

c) Forest conservation and development activities

Forest conservation and development activities include those activities which support for sustainable forest management and development i.e. plantation, nursery, final felling/thinning, pruning, fencing, fire lines development, weeding/cleaning, controlled grazing, control firing, training and extension, enterprise development and recording. These are the important activities of forest enhancement. Therefore, facilitator needs to support FMUs to conduct and maintain record accordingly. The recording formats are given in Annex 3 (b).

d) Support to implement threats mitigation plan

The threats are identified and recorded in formats given in Annex 3 (C). These threats need to be addressed. Therefore, facilitator supports to FMUs to develop mitigation plan. The plan mainly contains annual/ periodic targets to mitigate major threats to biodiversity—for example, by discussing with community members about how to avoid a forest fire.

Additional References

ANSAB (2004). Biodiversity Monitoring plan developedfor the GCP Funded Project "Enterprise-Based Biodiversity Conservation in Western Nepal Himalaya"

ANSAB (2010). Toolkit on "Participatory Inventory for Forest Products Including Non-Timber" published in August, 2010.

ANSAB (1999). Monitoring the Effects of Community Based Conservation and Commercial Utilization of Natural Products on Biodiversity in Humla, Nepal

Annex 1: The criteria and indicators of biodiversity monitoring adopted in Nepal by ANSAB

Three main criteria of ecosystem health and vitality, threats to biodiversity, and enhancing factors form the basis of monitoring. Each of the criteria has a set of indicators and verifiers which was developed discussing with other stakeholders and locals as well as implementing it as an action research in the large area of high mountain districts of Nepal. Each of the criteria (along with indicators and verifiers) is discussed in detail below. Depending on the complexity, relevance and costs, these indicators were measured at different levels of precision and frequency using different methods.

Criterion 1 Ecosystem Health and Vitality

The preservation of biodiversity is possible in a healthy ecosystem that can retain its structure and perform functions by effectively integrating biotic and abiotic components.

Therefore, five groups of indicators were used to assess the health and vitality of an ecosystem. These indicators along

Indicators, Verifiers and Methods for Ecosystem Health and Vitality

INDICATORS	VERIFIERS	UNIT OF MEASUREMENT	METHODS OF MEASUREMENT
ECOSYSTEM HEALTH (FOREST)			
Vegetation types	Types	Nominal	Transact walk (TW)
	Area of each type	Ha	Resource inventory (RI), TW
	Characteristics	Qualitative	TW
Crown cover	Crown cover of trees	%	RI and TW
	Shrub crown cover	%	RI and TW
	Ground cover	%	RI and TW
Dead trees	Vol. of dead & fallen trees	M^3/ha	RI and TW
	Area covered by CWD	M^2/ha	TW
	Fine litter	4 point ordinal scale	TW
Old growth trees	Density of old trees	No./ha	TW
Fungal fruiting bodies	Fungal fruiting bodies	M^2/ha	TW
Lopping intensity	Lopped trees	No./ha	TW
	Avg. lopping intensity (individual tree)	%	RI
ECOSYSTEM HEALTH (MEADOWS)			
Height	Mean height of the vegetation	M	RI
Plant species diversity	Species richness	No. of species	RI and TW
	Invader species richness	No. of species	RI and TW
	Density of invader species	No./ha	RI and TW
Green biomass	Quantity of green biomass	kg/ha	RI
Organic matter on the ground	Organic matter at A horizon	%	RI and TW

GROWING STOCK			
Growing stock by Species (Tree)	Pole size	m^3/ha	RI
	Mature tree	m^3/ha	RI
	Over mature tree	m^3/ha	RI
Size class distribution by species (Tree)	Pole size	No./ha	RI
	Mature tree	No./ha	RI
	Over mature tree	No./ha	RI
Density by species (Shrub)	Mature Plant	No./ha	RI
Distribution and Biomass of herbs by species	Utilizable biomass	kg/ha	Experimental plot/RI
	Plant density	No./ha	RI
GROWTH AND YIELD OF SELECTED ECONOMIC PLANT SPECIES			
Growth	Tree diameter growth	mm/year	Experimental plot Est. and measurement
	Shrub height growth	cm/year	Experimental plot est. and measurement
	Utilizable biomass growth (herbs)	kg/ha/year	Experimental plot est. and measurement
Yield	Product yield	kg/ha/year	Experimental plot est. and measurement
REGENERATION			
Tree & shrub regeneration by species	Seedlings	No./ha	RI
	Saplings	No./ha	RI
	Coppices	No./ha	RI
	Root suckers	No./ha	RI
Herb regeneration by species	Young growth	4 point ordinal scale	RI
Habitat character of regeneration patches	Soil type	Nominal	RI and TW
	Humus quality	4 point ordinal scale*	RI and TW
	Erosion features	Qualitative	RI and TW
	Moisture stress	Qualitative	RI and TW
	Digging by wild animals	Qualitative	RI and TW
	Nursing role of shrubs, bamboo and others	Qualitative	RI and TW
	Canopy gaps	Qualitative	RI and TW
	Disturbance to survival and growth (grazing, fire, insects and diseases)	Qualitative	RI and TW
WILDLIFE AND BIRDS			
Wildlife	Species	Number	TW
	Habitat distribution	Area in hectare	TW
	Dead animal bodies	Species/number	TW
	Digging by wild animals	Area/ha	TW
	CITES listed species	Number	TW
Birds	Species	Types	TW
	Habitat distribution	Area in ha	TW
	Population	Number	TW
	Nests	Number/ha	RI and TW

* 1 for fresh and 4 for completely decomposed

with their verifiers, units and methods of measurement, are presented below.

Criterion 2 Threats to Biodiversity

Many species of plants and animals are seriously threatened primarily due to the human induced pressures like removal of vegetations, uncontrolled fire, hunting and etc.

Most critical and common anthropogenic pressures were taken which includes frequency and magnitude of fire, extent of utilizable biomass (leaves, wood, barks, fruits, flowers, roots etc.) removed extent of grazing, and methods of harvesting. Likewise, various indicators were developed according to criteria and their geographic location, community type and their perception.

Indicators, Verifiers and Methods for measurement of Threats to Biodiversity

Criterion 3 Enhancing factors

Enhancing factors are the key to biodiversity conservation. This criterion

Indicators, Verifiers and Methods for measurement of Threats to Biodiversity

INDICATORS	VERIFIERS	UNIT OF MEASUREMENT	METHODS (MEASUREMENT TECHNIQUES
Fire damage	Area	m2/ha/year	TW, FGD
	Frequency	No./year	TW, FGD
	Type	Crown, ground, surface	TW, FGD
Biomass removal	Timber	m^3/ha/year	FMU records
	Fuel-wood	kg/ha/year	FMU records, Enterprise records
	Fodder	kg/ha/year	FMU records, TW*
	Grasses	kg/ha/year	FMU records*
	Bedding materials (leaf litter & syaula**)	kg/ha/year	FMU records*
	Poles & implements	m^3/ha/year	FMU records
	Other NTFPs by products & species	kg/ha/year	FMU records
Grazing	Area	Ha	TW, FMU records
	Livestock units	No./ha/year	TW
	Period	Months/year	FGD, TW
Encroachment	Area by types	m^2/year	FMU records
Harvesting practices by products	Season	Degree of appropriateness	FMU records, FGD
	Tools used	Degree of appropriateness	FGD, FMU records
	Method/techniques	Degree of appropriateness	FGD, FMU records
Illegal harvesting	Species	Types	TW, FMU records, FGD
	Area	No/Ha.	TW, FMU records, FGD
	Frequency	No./year	TW, FMU records, FGD
	Person involved	No./year	TW, FMU records, FGD
	Season	Degree appropriateness	FGD, FMU records

* Of head load, weight and no. of head loads would be easier to measure. Make estimated as household level and the area from biomass is harvested. Do it for different seasons

** Syaula: A local word used for leafy and small branches of plants for bedding purpose

encompasses monitoring of organizational and individual behaviors of FMUs, local harvesters, enterprise beneficiaries, herders, and other beneficiaries to the biodiversity enhancement.

These factors were monitored in terms of both key human (individual and institutional) behaviors related to resource management as well as factors that determine them. Key systems, practices and actions related to biodiversity include harvesting, fire, silvicultural operations, promotion of regeneration, and protection/ damage to wildlife. The details of indicator, verifiers, unit of measurement and methods of measurement were used in Nepal are given below.

Indicators, verifiers, unit and method of measurement in relation to enhancement

INDICATORS	VERIFIERS	UNIT OF MEASUREMENT	METHODS OF MEASUREMENT
Forest protection and development	Silviculture operation (Thinning, pruning,		
	singling-season)	Descriptive	FMU records, FGD, KIS
	Plantation of timber species	Hectare	
	Plantation of non-timber species	Hectare	
	Protection methods	Types	FMU records, FGD, KIS
	No. of Encounter and charge to the hunters and illegal fellers	No/type	FMU records
	Provision of management activities in operational plan	Yes/no	OP, FMU records, KIS
	Is management plan implemented effectively	Yes/no	FMU records, FGDs, KIS
	Fire line development	Yes/no –length (m)	FMU records, FGDs, KIS
Area brought under community management	Area where community control is enforced and outsiders are excluded	Area of forest or % increase over time	FMU records
Regeneration	Controlled fire	Area/ha	FMU records, FGDs, KIS
	Grazing (controlled/rotational)	Area/ha	FMU records, FGDs, KIS
	Nursery (seedling production)	Area /No. of species	FMU records, FGDs, KIS
	Bush clearing	Area/ha	FMU records, FGDs, KIS
	Clearing invasive plant species	Area/ha	FMU records, FGDs, KIS
Resource Harvesting	Harvesting season	Month	FMU records, FGDs, Observation
	Harvesting techniques	Descriptive	FMU records, FGDs, Observation
	Tools used for harvesting	Type	FMU records, FGDs, Observation
	Types of harvesters (trained/untrained and Male/female or child)	No/year	FMU records, FGDs, Observation
	Total annual harvested stock	Ton/year (NTFPs) cft./year (TFPs)	FMU records, FGDs, Observation
Forest product demand and distribution pattern	Timber demand	Cft	FMU records
	Firewood demand	Bhari*	FMP, FMU records
	Fodder and grasses demand	Bhari*	FMP, FMU records
	Agriculture Implements	Cft	FMP, FMU records
	Is distribution system equitable	Y/N	FMU records, KIS
Conflict management	Conflict type (Boundary, resource…)	Yes/no	FMU records, FGDs, KIS

* Bhari: Local unit equivalent to approximately 30 kg

	Affect on biodiversity resources	Quantity	FMU records, FGDs, KIS
	Attempt for solution	Yes/no.	FMU records, FGDs, KIS
	Conflict solved	Yes/no.	FMU records, FGDs, KIS
Institution and governance	Established year	Date	Constitution/OP
	Member in FMU executive body	No.	Constitution/FMU record
	Female member	No.	Constitution/FMU records
	Dalit member	No.	Constitution/FMU records
	Committee meeting	No.	FMU records
	Participation of committee meeting	No.	FMU records
	General assembly	No.	FMU records
	Participation (gender and caste)	% or no.	FMU records
Income Generation and fund mobilization	Bank account	No.	FMU records
	Total cash income	Rs	FMU records
	Income this year	Rs	FMU records
	Income from forest product	Rs	FMU records
	Income from penalty	Rs	FMU records
	Expense this year	Rs	FMU records
	Expense in conservation activities	Rs	FMU records
	Loan provided to FMU members	No	FMU records
	Loan amount	Rs	FMU records
	Account system	Y/N	FMU records
Threats reduction strategies	Mitigation plan	Yes/no	OP, FGD
	Implementation of threats mitigation plan	Yes/no	FGD, KIS, FMU records
	Changes in threats status	%	FMU records, TW, KIS
	Poor people's perception to threats and its mitigation plan	Four ordinal scale	FGD and KIS
	Medium people's perception to threats and its mitigation plan	Four ordinal scale	FGD and KIS
	Rich people's perception to threats and its mitigation plan	Four ordinal scale	FGD and KIS
	Commitment of poor people to treats reduction	Four ordinal scale	FGD and KIS
	Commitment of rich and medium people to threats reduction	Four ordinal scale	FGD and KIS
Perception on key features of the biodiversity	Provision of habitat management	Yes/no	FMU records, FGD,
	Provision of red listed species of flora and fauna	Yes/no	FMU records, FGD, KIS
	Delineation of important social and religious area	Yes/no	FMU records, FGD, KIS
	Economically important species	Yes/no	FMU records, FGD, KIS
	Other unique features	Yes/no	FMU records, FGD, KIS
Perception towards value of forest	Types of value	Number	FGD, KIS
	Direct use value	Descriptive	FGD, KIS
	Indirect use value	Descriptive	FGD, KIS
	Existence value	Descriptive	FGD, KIS
	Value	Descriptive	FGD, KIS

Annex 2: methods of biodiversity monitoring in detail

1 Resource Inventory

This assesses forest resources i.e. timber and non-timber forest products (NTFPs). The recent change in government regulations made resource inventory compulsory before community forest handed over or revision of an operational plan implemented. The Department of Forest (DoF) has also issued guidelines relating to the method of inventory in community forestry. ANSAB is constantly innovating resource inventory techniques for a wide variety of NTFPs, regarding the local conditions. Several inventory options exist depending on the precision required. Different techniques use different equipment and tools, such as the altimeter, clinometer, compass, Global Positioning System (GPS), pedometer, linear tape, topo sheets and aerial photographs.

Step of resource inventory

Step-1: *Identify and demarcate tentative community forest area:* Select and demarcate the potential community forest area including meadows and scrubs.

Step-2: *Identify and delineate vegetation cover types in a sketch map:* Prepare a sketch map depicting the area under different vegetation cover types through observation, rapid survey, discussions and available records and reports.

Step-3: *Boundary survey and blocking:* Use topographical sheets and aerial photographs along with a field survey for delineating boundary and separating blocks in a participatory manner. Use these two instruments to prepare maps, delineate forest types, assess the forest condition, identify major species, and locate physiographic features.

Divide the forest into 5-10 blocks of appropriate size depending on the area and vegetation cover type. Sub blocks may also be delineated if needed.

Use natural boundaries (such as streams, gullies, trails) as much as possible to divide blocks, and vegetation cover types for sub-blocks.

Step-4: *design sampling***:** After having boundary delineated and blocks differentiated, it is important to select adequate number of representative stands, each with homogenous species composition. Thus the vegetation is stratified. Considering dominant species diversity, age, cover etc. The sampling intensity should also fulfill the DoF inventory guidelines. For example, the prescribed intensity is 0.3% if the forest size is between 500 ha and 1000 ha, and 0.2% if it is greater than 1000 ha. however, special attention should be paid if NTFPs are also to be measured.

If a NTFP has to be assessed in detail, efforts should be made to delineate the habitats of the species, and adapt sampling to capture habitat variations. please go through 'Participatory inventory of Non-timber forest products' published by ANSAB for more details.

Regarding plot size and shape, there are variations in practice and Government guidelines. Follow the ANSAB guidelines.

Step-5: *Observation and Measurement Trees:* After determining number of samples, plot size and shape: the team has to move to field for taking measurement. Following things are to be measured in the field.

Trees
Measure diameter or girth using a diameter tape or linear tape

- Measure height using a Sunto clinometer (or simple hypsometer) however it is not compulsory
- Identify and record data by species
- Assess the condition of individual trees measured
- Forest crown cover can be arbitrarily classified into: more than 70% (good forest), 40-70% (moderate condition), less than 40% (degraded forest)

Shrubs and thickets

- Measure girth
- Measure height
- Identify and record by species

Herbs

- Count the number of species
- Collect and measure the organic matter in the plot
- Measure crop height
- Determine biomass of the whole plant and utilizable part by taking a suitable number of quadrat
- Observe and measure additional details of NTFPs being focused in resource management

Qualitative data
Observe and maintain records of site characteristic (aspect, altitude, forest type, slope, soils, presence or absence of biotic interference, average crown height of the dominant species) within each plot.

Take note of easily measurable habitat characters such as presence of water course; aspect; slope angle; litter cover and presence of coarse woody debris (CWD) such as fallen logs; common under-canopy species as a useful habitat indicator such as short bamboos, laurels; presence of boulders, rocks etc.

For details, please study and refer the guideline developed by DoF of Nepal government and 'Participatory inventory of Non-timber forest products' published by ANSAB.

2 Transect Walk

This is a rapid technique of assessing ecosystem characteristics through observation and measurement of variables visually from a distance. The basic approach consists of moving from one point to another along a specified line, and recording relevant data. Approximate

What the things need to be recorded along transact line?

- Vegetation types, species, canopy cover
- Regeneration status
- Wildlife (Animal and birds) species, number
- NTFP growing area
- Habitat and major ecosystem and its status
- Major anthropogenic pressure like over-grazing, firing, landslide, hunting, illegal felling
- Coverage of each pressure, frequency of occurrence, and area
- Social response by observing conducted forest management activities

measurements with reference to the transect line is recorded. It can be used for identifying and explaining the cause and effect relationships among topography, soils, natural vegetation, cultivation, and other production activities and human settlement patterns. It also supports to identify major problems and possibilities perceived by different groups of local analysts in relation to features or areas along transect and triangulating data collected through other tools. In case of biodiversity monitoring, it strongly supports in observation of the changes in ecosystem health, major species of flora and fauna and major anthropogenic pressure and their reduction exercises.

Step of transect line design and study?

Step-1: Identify and demarcate tentative forest area

Select and demarcate the potential community forest area including meadows and scrubs.

Step-2: Select a group of villagers

After identifying and demarcation the tentative forest area, select individuals who have good knowledge on physical resources of the forest and who are willing to participate.

Step-3: Identify and delineate vegetation cover types in a sketch map

Prepare a sketch map depicting the area under different vegetation cover types through observation, rapid survey, discussions and available records and reports.

Step-4: Design transect line

- Design and locate transect line on the map. Plot transects line through the resource inventory where appropriate.
- Locate the line through all major spatial variations such as elevation, slope, vegetation cover type and stands, and intensity of harvest.
- At least 30% of the forest should be visually observed from the transect line.

Step-5: Observe and measure

- Record permanent reference of the starting point
- Observe both sides of the transect line and record approximate dimensions such as frequency of occurrence, quantity, and area.

3. Household Survey

The household survey measures socio-economic characteristics and the social response to biodiversity. In a household survey, data of individual households are compiled to arrive at the FMU level information. Household data are collected using a survey form, which includes survey questions on demography, economic activities, cattle, agriculture land, crops, private forest, demand of main forest products, etc. The analysis of these household level data uncovers community level information regarding demand of forest products (such as timber, fuel wood, litter, fodder, grazing, and NTFPs); knowledge and skills for resource management; as well as involvement in and contribution to biodiversity conservation.

A household survey is integral to the FMU formation and forest handover process. Information generated from the household survey is used to devise a FMU's resource management plan. While conducting a household survey,

facilitators or forest technicians learn the community's perception on biodiversity. As a result, forest technician can play a role in motivating community members to conserve resources. A sample household survey can be done at different time intervals throughout the project to monitor changes in perception and behavior at the household level.

Steps of households survey

Step-1: Identify the users of a particular forest

This step involves identifying all the households who are the users of the particular forest. The users are identified through discussions with the community leaders and households adjacent to the forest. Several meetings (settlement, village, and joint) may need to be arranged to identify the users. A participatory resource mapping exercise may greatly facilitate the users and forest area identification process.

Prepare a participatory social map showing settlements and individual households in FMU level meetings.

Step-2: Conduct household survey

Use the household survey form to collect data from every household in the community. Use the social map while making visits to households. Alternatively, a small settlement meeting can be arranged to collect the data of the households within the settlement.

Step-3: Observe and measure

The following information should be observed and measured for each household:

- population structure;
- landholding size;
- number of animal;
- demand of forest product and supply status;
- existing resource use and management; and
- response of people towards the biodiversity management.

4. Focus Group Discussion

Focus group discussion (FGD) is an important method in qualitative research. It consists of fostering interactions among an identified group of respondents or groups who have similar background and experience to specific issues are brought together to identify, assess and understand the perceptions, beliefs, knowledge, attitude, options, problems, power relations, linkages and other factors. Focus group discussion uncovers in-depth information by tracking a small sample of households carefully. The FGD also captures qualitative information missed in large surveys.

Steps of Focused group discussion (FGD)

Step-1: Discuss the objectives of the FGD

At first, conduct a discussion with FMU committee to clearify about the objectives of organizing FGD and for management of its logistics.

Step-2: Identify focus groups

Secondly, identify focus groups related to specific issues such as harvesting, grazing, participation and access to decision-making (women and dalits) through discussion with FMU committee.

Step-3: Conduct FGDs

After that, fix separate venue and time for discussion with each identified group keeping on mind their time. FGDs generate

qualitative information on changes in knowledge, practices, and attitudes as they relate to the resource management.

Step-4: Observe and measure

- Forest products, their collection and utilization status
- Participation of poor, dalit and women in decision making
- Indigenous knowledge on harvesting, processing attitude and practice for biodiversity conservation
- Forest protection mechanism
- Benefit sharing mechanism
- Major anthropogenic pressure for forest resources
- Major mitigation strategies to reduce pressure, improve forest condition

5 Key Informant Survey (KIS)

There are always people in a community who have more in-depth knowledge regarding a specific issue such as natural resources use, management, local biodiversity, social issues, community characteristics, and culture. Identify such key informants and interact with them to derive data on a wide range of issues.

Steps of key informant survey

Step 1: Prepare checklists:

First of all, facilitator needs to prepare a checklist with major threats and enhancing factors to biodiversity and its impacts on local livelihoods. In addition, s/he should incorporate some questions in the checklist to explore the threats minimization and status enhancement strategies of biodiversity resources in the future.

Step 2: Identify key informants:

Identify key informants having sufficient knowledge on specific issues harvesting, medicinal plant use, identification and threats to biodiversity in the area. These people can be NTFP collector, forest products traders, herders, old aged people, local teachers, and natural healers (AMCHI/BAIDHYA).

Step 2: Gather the facts:

Facilitator needs to gather ideas and experiences gained from selected key informants regarding enhancement of factors and threats to biodiversity as developed checklist as described in step one. It supports to explore the forest protection and development activities done in community managed forests, major threats of biodiversity and other community action on biodiversity conservation and management.

6 FMU and enterprise records

FMUs and enterprises are the key managers of the local resources. They are the primary users, and sources of information on biodiversity, resource use and management. They are associated with threats to, as well as, positive contributions to resource management. FMU records are developed to record information on use, conservation, management, status of biodiversity and threats. These records generate a great deal of useful information for FMUs and enterprises, DFOs, FECOFUN, and other projects. Likewise, enterprises linked with FMUs have access to useful data relating to financial and resources flows.

Steps of FMU and enterprise records study

Step-1: Discuss the idea of biodiversity monitoring with the Executive Committees of FMUs (FMU-EC) and enterprise management, and help them visualize how

information envisaged in the Biodiversity Monitoring Plan could be useful in the effective management of resources.

Step-2: Analyze existing monitoring system
Explore and assess existing monitoring/ record keeping systems and identify how the system can be strengthened.

Step-3: Design formats
Design biodiversity data record formats for FMUs and enterprises in a participatory way so that all the important parameters of their interest are included.

Step-4 Observe and record
Record all relevant information and lessons learned by the FMU and enterprise.

- Institutional development status
- Representation of poor, dalit, janajati and women in forest user committee and other sub-committee and sub groups
- Participation of poor, dalit, janajati and women in community forestry activities (committee meeting, general assembly, forest management activities, training and other capacity building program)
- Contribution and participation of local people in biodiversity conservation
- Forest resource utilization mechanism
- Enterprise related records
- Benefit sharing mechanism focusing poor, dalit and women

With this process, facilitators should provide periodic backstopping to the FMUs and enterprises to keep records, and facilitate reflections on the records maintained by them.

7 Experimental Plots

The past experiences of ANSAB in enterprise-based biodiversity conservation has identified several specific resource management and harvesting related issues that need to be intensively researched in a participatory approach. For some of the research issues identified, the project observes changes over a period of time (such as factors related to regeneration of key commercially harvested species). The process of biodiversity monitoring will be enhanced with participatory action research. Experimental plots can thus established so that cause and effect may be better understood with respect to sustainable and efficient resource use. Some efforts have already been initiated; these will be further expanded to include additional issues and be replicated in the project areas.

Design experiment considering the urgency of information needed, degree of precision required, and resources available.

Mark some of the experimental plots with a permanent reference. Associate treatments and replicates with the inventory sample as far as possible. Establish extra plots if needed to cover required treatment and replicates.

BOX 6: Some consideration at photograph

- Photo place should matched with objectives
- Photo should be taken once per year
- Photo rill should of same speed and company
- Photograph time should be during peak flowering season
- Photo should be taken repeatedly of same scene and from same place, distance, orientation etc.

Involve FMUs and enterprise persons to design experimental plots as well as observe, record, and analyze data.

8 Photo point monitoring

Photo point monitoring is an easy and inexpensive, yet effective, method of monitoring vegetation and ecosystem change. It consists of repeat photography of an area of interest over a period of time, with photographs taken from the same location and with the same field of view as the original photo. With appropriate site marking and documentation, photos can be precisely replicated by different people many years apart.

Steps of photo point monitoring

The following steps outline items for consideration and procedures for establishing photo points in areas selected for monitoring.

Step-1: Identify photo points

Within selected monitoring areas, identify elements in the landscape that are most critical to document in order to achieve objectives in participatory approach. General photography can be used to document a whole scene. Topic photography, on the other hand, narrows the target from a scene to specific elements (subjects) in the landscape. Ensure that enough photo points are established to adequately document changes that are expected to occur.

Step-2: Establish camera points

Based on the monitoring objective, establish camera points for each photo point. Pay particular attention to the distance between the photo and camera points to ensure that the photographs will adequately document the scene or subject and the expected changes.

Step-3: Mark photo and camera points

Photo and camera points should be permanently marked so they can be relocated in the future. Measure the distance and direction from camera points to photo points. Obtaining coordinates of the points using a global positioning system (GPS) unit can aid in relocating them in the future.

Step-4: Identify a witness site

A witness site is (preferably) an immovable object in the monitoring area that can be easily identified when returning to the area. It serves as a reference to quickly locate the monitoring area and also as a reference point from which the camera and photo points can be located. Measure the distance and direction from the witness site to the camera points, photo points, or both. It is helpful to attach a permanent identification tag to the witness site with the distance and direction to the photo and/or camera points inscribed on the tag. Assign identification numbers; assign identification numbers to all photo and camera points.

6. Observe and measure:

- Date of photograph taken
- Photograph and numbering
- Location (Using GPS/Altimeter/Compass)
- Site description
- Locations of witness site, photo points, and camera points, including distances and directions between points

Annex 3: Information recording formats

a) Sample formats for biodiversity register

General features of CFUG

NAME OF CFUG:		DISTRICT :	
TOTAL HOUSEHOLDS:		VDC AND WARD NO.	
TOTAL AREA FO CF:		TOTAL POPULATION:	

Biodiversity record

LOCAL NAME	SCIENTIFIC NAME	MAJOR FEATURES OF THE SPECIES	QUANTITY (NO./TON/ SPECIES TYPES)	HABITAT/ DISTRIBUTION	PARTS USED	INVOLVEMENT OF LOCAL PEOPLE IN COLLECTION

b) Forest Conservation and Development

Plantation

YEAR	MAJOR SP.	BLOCK/FOREST NAME	SEEDLING/WILDLING	SEEDLING SOURCE	CONTRIBUTION		REMARKS
					USER	OTHER	

Nursery

YEAR OF ESTAB.	CAPACITY (NO)	LOCATION	MAJOR SPECIES	DEMAND OF SUPPLY THAT YEAR	PLANTATION(NO)		REMARKS
					PVT. LAND	CF	

Final Felling/Thinning

YEAR	SPECIES	AREA (HA.)	THINNED/FELLED	TREE/SHRUB		USE OF THINNED/FELLED ITEM	REMARKS
				SIZE	NO		

Pruning

YEAR	SPECIES	TREE HEIGHT (M)	PRUNED HT.(M)	QUANTITY OF PRODUCT	REMARKS

Fencing

YEAR	FENCE LENGTH (M)	FENCE TYPE	LABOR(PERSON-DAYS)	REASON	IMPACTS/EFFECTS

Fire lines

YEAR	LENGTH	BREADTH	LABOR (PERSON DAYS)	REASON	REMARKS

Weeding/Cleaning (which part of forest, type of vegetation cover, area, participation of users)

YEAR	MONTH	AREA(HA)	FAVORED SPECIES	WEEDED/CLEANED SP.	LABOR(PERSON-DAYS)	REMARKS

Training and extension Program

YEAR	PROGRAM	ACTIVITY	TARGET AUDIENCE	IMPACT/REMARKS

Other activities of or contributing to better forest management

YEAR	ACTIVITY	DETAILS

c) Formats for existing threats recording

Encroachment

(Also prepare a sketch map of encroached area in CF)

YEAR	AREA HA.	USE AFTER ENCROACHMENT	WEALTH STATUS OF ENCROACHERS	ANY PREVENTIVE MEASURES	REMARKS

Fire

YEAR	SEASON	AREA UNDER FIRE HA	DAMAGE IN KIND	DAMAGE IN CASH	PREVENTIVE/REMEDIAL MEASURES	REMARKS

Illegal harvesting of resources

YEAR	SPECIES/PRODUCTS	NUMBER OF TREES/ VOLUME OF PRODUCTS	AREA COVERED	NUMBER OF PEOPLE INVOLVED	REMARKS

• Develop formats according the verifiers to be measured for other prioritized threats

d) Fund Utilization

INCOME			EXPENDITURES		
PARTICULARS		AMOUNT (RS)	PARTICULAR		AMOUNT (RS)
Balance of the Previous Year			Community Development		
Revenue form	Timber		Infrastructure Development		
Products	Fuelwood		Loan within FUG		
	Fodder		Forest Development	Watchers	
	Syaula and patkar			Nursery/Seedling	
	Agricultural implements			Management Actions	
	NTFPs			Extension and Training	
	Others				
Punishment				Administration	
Donation			Bank Balance		
Annual Charges of the Users			Cash Balance		
Interest on Investment			Payment for services hired		
Others			Others		
Total			Total		

e) Forest Products Use Record

SN	PRODUCTS		TOTAL AMOUNT	UTILIZATION		DISTRIBUTION SYSTEM
				WITHIN FUG	OUTSIDE FUG	
1	Fire wood (Bhari, Kg)	Green				
		Dry				
2	Timber (cft.)					
	Small Poles (No)					
3	Fodder (Bhari)					
4	Grass (Bhari)					
5	Syaula and Patkar (Doko, Kg)					
6	Agricultural Implements					
7	NTFPs (foods, medicines, spices, fibers etc.)					
8	Others					

f) Enterprise Records

Background Information

NAME OF ENTERPRISE:		VDC AND WARD:
DISTRICT:		ENTERPRISE RECORDS (TYPE): (E.G, REGISTER)
DATA COLLECTED BY:		DATE:

Enterprise Facts Sheets

NAME AND ADDRESS	DATE ESTABLISHED	NAME OF ENTERPRISE OWNER (S)	TOTAL CAPITAL ASSET (RS.)	SOURCE OF CAPITAL AND AMOUNT		REMARKS
				TYPE	RS.	
				SHARE, EQUITY AND PROFIT		
				LOANS		
				TOTAL		

Data that varies with time should be recorded for a year completed at the time of data collection. If this is not applicable, time period for which the collected figure apply should be indicated as a note.

Employees (record as of last year)

CATEGORY	TYPE OF EMPLOYEE	NO.	TOTAL SALARIES/WAGES PAID (RS.)	TYPE OF TRAINING PROVIDED	TRAINING EXPENSES	REMARKS
Full time	Management					
	Technician					
	Labor/worker					
Part-time	Labor/worker					
Total						

Raw Materials

TYPE OF RAW MATERIAL	TOTAL QTY PURCHASED KG.	AMOUNT PAID (EXCEPT ROYALTY) RS.	NO. OF COLLECTORS INVOLVED	COLLECTION SEASON	FEE PAID TO FUG	ROYALTY PAID TO HMG	REMARKS

a) Analysis table for forest/ecosystem health

INDICATORS	VERIFIERS	STATUS
Ecosystem Health (Forest)		
Vegetation types	Types	Nominal
	Area of each type	Ha
	Characteristics	Qualitative
Crown cover	Crown cover of trees	%
	Shrub crown cover	%
	Ground cover	%
Dead trees	Vol. of dead & fallen trees	M^3/ha
	Area covered by CWD	M^2/ha
	Fine litter	ton/ha
Old growth trees	Density of old trees	No./ha
Fungal fruiting bodies	Fungal fruiting bodies	M^2/ha
Lopping intensity	Lopped trees	No./ha
	Avg. lopping intensity (individual tree)	%
Ecosystem Health (Meadows)		
Plant species diversity	Species richness	No. of species
	Invader species richness	No. of species
	Density of invader species	No./ha
Green biomass	Quantity of green biomass	kg/ha
Organic matter on the ground	Organic matter at A horizon	%
Growing Stock		
Growing stock by	Pole size	m^3/ha
Species (Tree)	Mature tree	m^3/ha
	Over mature tree	m^3/ha
Size class distribution	Pole size	No./ha
by species (Tree)	Mature tree	No./ha
	Over mature tree	No./ha
Density by species (Shrub)	Mature Plant	No./ha
Distribution and	Utilizable biomass	kg/ha
Biomass of herbs by species	Plant density	No./ha
Growth and Yield of Select Economic Plant Species		
Growth	Tree diameter growth	mm/year
	Shrub height growth	cm/year
	Utilizable biomass growth (herbs)	kg/ha/year
Yield Product yield	kg/ha/year	
Regeneration		
Tree & shrub regeneration by species	Seedlings	No./ha

	Saplings	No./ha
	Coppices	No./ha
	Root suckers	No./ha
Herb regeneration by species	Young growth	Qualitative
Habitat characteristics	Soil type	Nominal
of regeneration patches	Humus quality	Qualitative
	Erosion features	Qualitative
	Moisture stress	Qualitative
	Digging by wild animals	Qualitative
	Nursing role of shrubs, bamboo and others	Qualitative
	Canopy gaps	Qualitative
	Disturbance to survival and growth (grazing, fire, insects and diseases)	
Qualitative		
Wildlife and Birds		
Wildlife	Species	Number
	Habitat distribution	Area in hectare
	Dead animal bodies	Species/number
	Digging by wild animals	Area/ha
	CITES listed species	Number
Birds	Species	Number
	Habitat distribution	

b) Analysis tablefor biodiversity threats

INDICATORS	VERIFIERS	MEASUREMENT	ROOT CAUSES/DRIVERS
Fire damage	Area	m2/ha/year	
	Frequency	No./year	
	Type	Crown, ground, surface	
Biomass removal	Timber	m3/ha/year	
	Fuel-wood	kg/ha/year	
	Fodder	kg/ha/year	
	Grasses	kg/ha/year	
	Bedding materials (leaf litter &syaula)		kg/ha/year
	Poles & implements	m3/ha/year	
	Other NTFPs by products & species	kg/ha/year	
Grazing	Area	Ha	
	Livestock units	No./ha/year	
	Period	Months/year	
Encroachment	Area by types	m2/year	
Harvesting practices by products	Season	Degree of appropriateness	
	Tools used	Degree of appropriateness	
	Method/techniques	Degree of appropriateness	

Illegal harvesting	Species	Types
	Area	No/Ha.
	Frequency	No./year
	Person involved	No./year
	Season	Degree appropriateness
Hunting	Type	(snare, shoot, . . .)
	Frequency	No/year
	Person involved	No/Year
	Type of animal hunting	

c. Analysis table for enhancing factors of biodiversity

INDICATORS	VERIFIERS	UNIT OF MEASUREMENT
Forest protection and development	Silviculture operation (Thinning, pruning, singling-season)	Descriptive
	Plantation of timber species	Hectare
	Plantation of non-timber species	Hectare
	Protection methods	Types
	No. of Encounter and charge to the hunters and illegal fellers	No/type
	Provision of management activities in operational plan	Yes/no
	Is management plan implemented effectively	Yes/no
	Fire line	Yes/no –length (m)
Area brought under community management	Area where community control is enforced and outsiders are excluded	Area of forest or % increase over time
Regeneration	Controlled fire	Area/ha
	Grazing (controlled/rotational)	Area/ha
	Nursery (seedling production)	Area /No. of species
	Bush clearing	Area/ha
	Clearing invasive plant species	Area/ha
Resource Harvesting	Harvesting season	Month
	Harvesting techniques	Descriptive
	Tools used for harvesting	Type
	Types of harvesters (trained/untrained and Male/female or child)	
	Total annual harvested stock	Ton/year (NTFPs)
Cu.ft./year (TFPs)		
Conflict management	Conflict type (Boundary, resource. . .)	Yes/no
	Affect on biodiversity resources	Quantity
	Attempt for solution	Yes/no.
	Conflict solved	Yes/no.
Forest product demand and distribution pattern	Timber demand	Cft
	Firewood demand	Bhari

	Fodder and grasses demand	Bhari
	Agriculture Implements	Cft
	Is distribution system equitable	Y/N
Institution and governance	Established year	Date
	Member in FMU executive body	No.
	Female member	No.
	Dalit member	No.
	Committee meeting	No.
	Participation in committee meeting	No.
	General assembly	No.
Income Generation and fund mobilization	Bank account	No.
	Total cash income	Rs
	Income this year	Rs
	Income from forest product	Rs
	Income from penalty	Rs
	Expense this year	Rs
	Expense in conservation activities	Rs and % of total income
	Loan provided to FMU members	No
	Loan amount	Rs
Threats reduction strategies	Threats mitigation plan	Yes/no
	Implementation of threats mitigation plan	Yes/no
	Changes in threats status	%
	Poor people's perception to threats and its mitigation plan	Four ordinal scale
	Medium people's perception to threats and its mitigation plan	Four ordinal scale
	Rich people's perception to threats and its mitigation plan	Four ordinal scale
	Commitment of poor people to treats reduction	Four ordinal scale
	Commitment of rich and medium people to threats reduction	Four ordinal scale
Perception on key features of the biodiversity	Provision of habitat management	Yes/no
	Provision of red listed species of flora and fauna	Yes/no
	Delineation of important social and religious area	Yes/no
	Economically important species	Yes/no
	Other unique features	Yes/no
Perception towards value of forest	Types of value	Number
	Direct use value	Descriptive
	Indirect use value	Descriptive
	Existence value	Descriptive
	Value	Descriptive

Some Relevant Publications from ANSAB

- ANSAB and FAO. 2009. Challenges and Opportunities for Nepal's Small and Medium Forest Enterprises.
- Subedi, B. P. 2006. Linking Plant-Based Enterprises and Local Communities to Biodiversity Conservation in Nepal Himalaya. ANSAB. Adroit Publishers, New Delhi.
- ANSAB and FECOFUN. 2005. Forest Certification in Nepal (In Nepali). Kathmandu
- ANSAB and SNV/Nepal. 2003. Commercially Important Non Timber Forest Products (NTFPs) of Nepal (In Nepali). Kathmandu.
- ANSAB. 2003. Forest Products Based Enterprise Development. Field Manual (In Nepali). Kathmandu.
- Subedi, B. P., Binayee, S.B., Ojha, H.R. and Nicholson, K. 2002. Community Based Enterprises in Nepal: Case Studies, Lessons and Implications. ANSAB and SNV/Nepal, Kathmandu.
- ANSAB, EWW and IRG. 2006. Role of Natural Products in Resource Management, Poverty Alleviation, and Good Governance: A Case Study of Jatamansi and Wintergreen Value Chains in Nepal.
- ANSAB. 1999. Monitoring the Effects of Community Based Conservation and Commercial Utilization of Natural Products in Humla, Nepal.
- ANSAB. 1999. Socio-Economic and Institutional Impacts of Community Based Ecosystem Management Project in Humla, Nepal.
- Video Documentaries on

- Forest Certification - Steps Towards Sustainability (English and Nepali)- 30 Minutes
- In Search of Yarshagumba (English and Nepali)- 29 Minutes
- Community Enterprises (In Nepali)- 29 Minutes

The Asia Network for Sustainable Agriculture and Bioresources (ANSAB) is a civil society organization that has been conserving biodiversity and improving livelihoods across South Asia for almost twenty years. It places community empowerment and economic incentives at the heart of its approach, believing that as people benefit from natural resources they become more motivated to conserve them – and vice-versa. ANSAB implements a variety of innovative solutions in line with this core conviction, such as the creation of enterprises based on the sustainable use of natural resources, especially Non Timber Forest Products (NTFPs), and the establishment of payment-schemes for environmental services, especially for Reducing Emissions from Deforestation and Forest Degradation (REDD) plus. It has notably pioneered the Forest Stewardship Council (FSC) certification in Nepal and introduced the concept of subgroup in community forestry to ensure that ultra-poor and marginalized people benefit from the natural resources of their communities. ANSAB is also deeply involved in climate change mitigation and adaptation as the issue continues to threaten the environmental and economic progresses achieved so far – in Nepal as in the rest of the world.

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Rich Biodiversity and Prosperous Communities

Asia Network for Sustainable Agriculture and Bioresources (ANSAB)
P.O. Box 11035, Kathmandu, Nepal

Tel: (977-01)-4497547 or 4478412
Fax: (977-01)-4476586
E-mail: ansab@ansab.org
Website: www.ansab.org

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