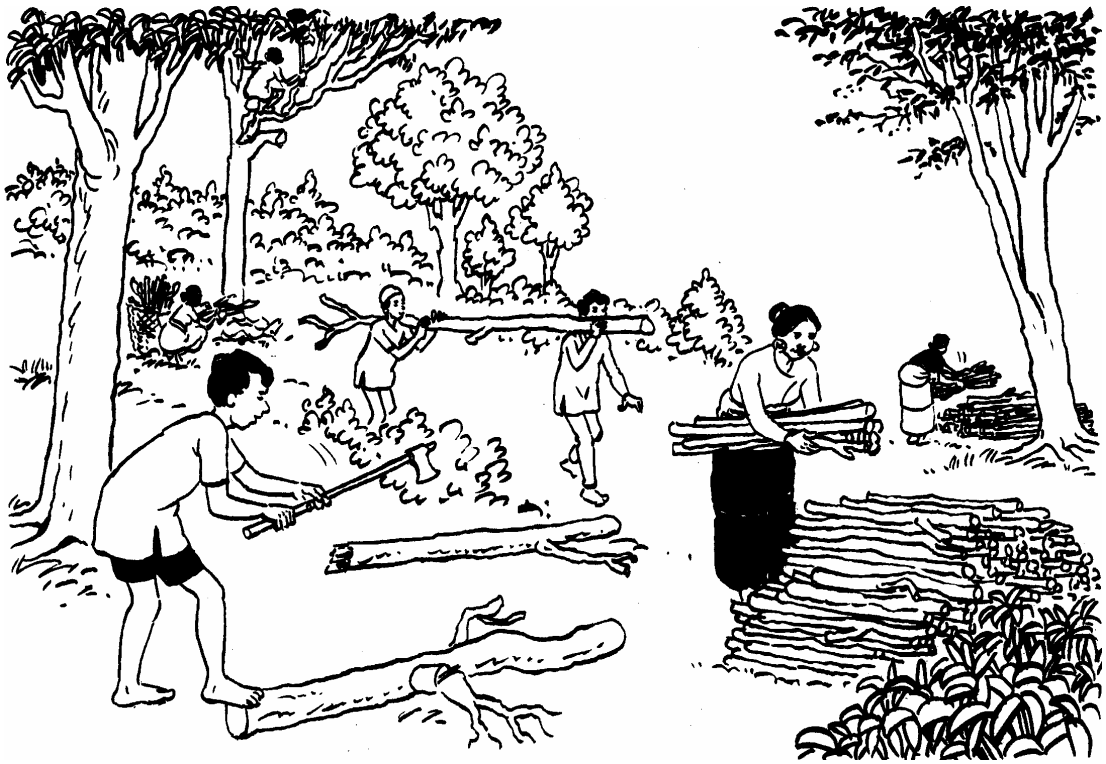
FOREST USER GROUPS FOREST MANAGEMENT PROJECT
[FFMP]

INNOVATIVE FORESTRY: A SYNTHESIS OF SMALL-SCALE FOREST MANAGEMENT PRACTICE FROM NEPAL

A Field Worker's Guidebook For Supporting Community Forest Management



Peter Branney
Yam B. Malla
Basundhara Bhattarai
Prayag R. Tamrakar
Hari R. Neupane

Department of International and Rural Development
University of Reading
Reading, United Kingdom

Livelihoods and Forestry Programmes
(HMGN/DFID)
PO Box 106
Kathmandu, Nepal

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Our Community Forestry Programme in Nepal is widely considered to be successful in terms of achieving its dual objectives of environmental conservation and local community development. However, we are becoming increasingly aware that if we wish the programme to succeed in the longer term, we need to ensure that community forests need to be managed as well as protected. Only by doing this will the forest products give incentives and benefits for continued protection in a sustainable way. It is clear that many FUGs have been innovative and effective in their forest management activities, but also that there are many FUGs which have much scope for improvement. We should attempt to learn from successes and best practice to ensure that all FUGs are sustainably managing their community forests. This Guidebook gives a series of steps for carrying out forest management planning, and describes the forest management options and activities which FUGs could use in different situations. It is a useful tool for Department of Forests staff and NGOs in their work with FUGs and for preparing good operational plans.

On behalf of the Department of Forests, I would like to congratulate the members of the FFMP Team for their efforts in putting together this important and useful document.

Dibya Dev Bhatta
Director General
Forest Department
Babar Mahal
Kathmandu

Foreword

Prior to the start of community forestry activities in the early 1980's, there was little tradition of Government forest management in Nepal – especially of natural forest in the middle hills. However, indigenous forest management systems pre-dating the current rise of community forestry are common in many parts of Nepal. Most such systems emphasise protection rather than management, and in practice, often vest control of the resource with traditional village elites. Despite this, these local management systems have often provided a basis for beginning the forest user group (FUG) formation process under community forestry.

The management of community forests in the hills of Nepal continues to be characterised by a largely conservative and protectionist (passive) approach. This is partly due to the quality of the operational plans. Whilst these have been useful in guiding protection of the resource, they do not articulate clearly those management objectives that meet overall FUG requirements, and have not identified the silvicultural interventions to achieve those objectives.

The implications of FUGs moving towards a more commercially oriented level of forest productivity – particularly an increased focus on non timber forest products (NTFPs) from community forests implies a knowledge of marketing mechanisms and information which is not necessarily available at FUG level. There are, however, innovative examples developing in various FUGs of how community forests can be managed to meet multiple objectives, including marketing mechanisms.

These guidelines provide a reference source for FUGs and for those people who are assisting them in managing their forests, including HMGN Forest Department staff; project staff and NGO representatives. I'm sure that the guidelines will provide a great source of useful ideas and information on moving FUGs to a more sustainable management of the resources under their control. Only through sustainability will FUGs become self-reliant and help to contribute to improved livelihoods of their members.

The Livelihoods and Forestry Programme and its precursor, the Nepal UK Community Forestry Project, is delighted to have been involved in contributing to these guidelines and wishes all potential users success in their sustainable forest management endeavours.

Peter Neil
Programme Coordinator
Livelihoods and Forestry Programme
Kathmandu

Acronyms and Abbreviations

AERDD	Agriculture extension and rural development department
CF	Community forest
DBH	Diameter at breast height (1.3 m above the ground)
DFID	Department for International Development
DFO	District forest officer
DoF	Department of forest
FFMP	Forest user groups forest management project
FUG	Forest user group
HMGN	His Majesty's Government of Nepal
IGA	Income generation activity
LFP	Livelihoods and forestry programme
NGO	Non-governmental organisation
NTFP	Non-timber forest product
NUKCFP	Nepal-UK community forestry project
RNRKS	Renewable natural resources knowledge system

Separate men's and women's groups

Preface

This document has been prepared as part of the Forest User Groups Forest Management Project (FFMP) which is a small research project (R6918) funded by the UK Government's Department for International Development (DFID) through its Forestry Research Programme (FRP) under the Renewable Natural Resources Knowledge System (RNRKS). The project has been operational during the period 1997-2001. The project is implemented by the International and Rural Development Department (IRDD) of the University of Reading, in UK and in collaboration with the Livelihoods and Forestry Programme (LFP) in Nepal (formerly the Nepal-UK Community Forestry Project - NUKCFP) – also a DFID-funded project.

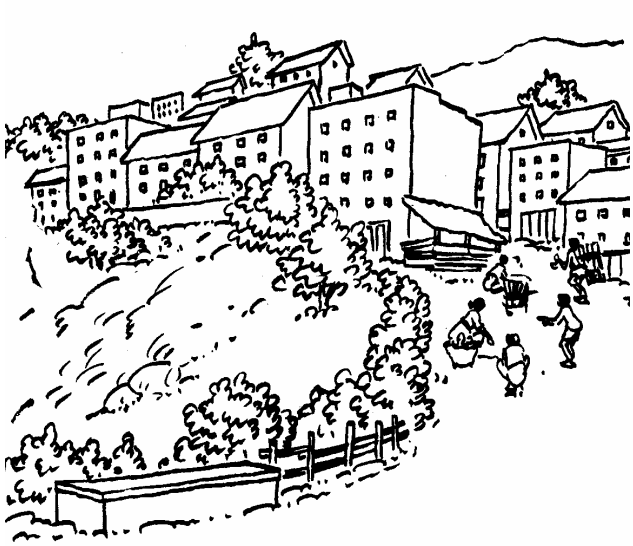
What is the origin of this document?

It was originally envisaged that a set of silvicultural guidelines would be produced as one of the project outputs of FFMP. These would assist forest user groups (FUGs) and Forestry Department staff in the field in improved and more sustainable management of community forests (CF). As a result of the experiences of FFMP (and NUKCFP) and the wider developments which are taking place in community forestry in Nepal the concept of these guidelines has been somewhat modified from the original idea. Whilst still recognising that more productive and more needs-oriented forest management by FUGs is critical to promoting the sustainable livelihoods of rural communities – particularly the poorest members of FUGs, the underlying principle of FFMP is that this improvement in forest management practices can most effectively take place through a process of "learning by doing" or participatory action research by FUGs themselves. Bearing this in mind, the original idea for silvicultural guidelines has been altered in order to incorporate the great range of experiences and activities by FUGs which are already taking place in community forests. In other words, we have tried to collate and describe successful innovations and practices to provide FUGs with options they can then utilise and adapt to their own site-specific circumstances. These options are based on actual practice, rather than being theoretical. The title of this book has also been changed to reflect this altered view.

This document is not a set of forest management or silvicultural "guidelines" in the conventional sense. As authors we have tried to avoid falling into the trap of imposing our own professional views and opinions on the way the large number of forest user groups in Nepal manage their forests. We readily acknowledge that even as subject matter specialists we often do not have precise or relevant answers to hand which will address the forest management issues being encountered by many different FUGs. Since every community forest is different, and every FUG has a different set of priorities and requirements, their own forest management interventions need to reflect this.

Sustainable forest management

We recognise that sustainable forest management does not simply involve a series of technical interventions focusing on manipulation of the forest resource to achieve certain defined outcomes. Ultimately the relationship between the forest and the livelihoods of those people who are wholly or partly dependent on it is critical. This relationship is closely determined by the decision-making processes for choosing the actions to be implemented by the FUG, and by the ways these activities are controlled and monitored. Therefore, much importance has been correctly attached to the development of participatory and equitable decision making and benefit sharing mechanisms by FUGs and this has subsequently been the focus of much study and documentation in the participatory forestry literature. However, we have not focused on the institutional side of FUG management in this book. This has been partly because it is outside the framework of FFMP as originally planned, but more importantly, because we wish to highlight the point that "technical" issues are also important, and that community forestry cannot bring sustainable local benefits unless forest management activities or interventions are being carried out by FUGs. Our coverage of the institutional side of community forestry has not therefore been comprehensive, but there is clearly a place for a similar synthesis to this one focusing on FUG institutional development. We hope that in future someone will take up the challenge to gather and disseminate the wide ranging experiences from Nepal in this area.



Learning by doing

The underlying principle of the Forest User Groups Forest Management Project has been that of encouraging "learning by doing" by FUGs. This appears to be the best means by which each FUG can build up their own level of skills and experience in forest management most appropriate to their particular site specific conditions. Forest user groups tend to learn about forest management from their own practical experiences rather than from published literature. Lessons learnt from within a particular community forest area managed by an FUG are likely to have greater relevance to that specific forest and that particular FUG than ideas which are transposed unaltered from outside. On the other hand, FUGs do need a starting point from which they can develop their forest management capability, and this is often provided from the experiences of other FUGs who may already be tackling similar problems and who may have developed some solutions.

In practice "learning by doing" is widespread amongst FUGs in Nepal. Having visited and spoken with many FUG members across the country we are very aware that many groups have ideas and experiences which are leading to significant improvements in the management of their community forests. This document has tried to capture some of these innovative and commendable examples of FUG forest management. By doing this we hope to provide information which can be shared with other FUGs as a means of assisting them to improve their own forest management. We also hope that these innovative examples and ideas will provide a good indication to government officials, donors and NGOs of the enormous capacity which already exists within FUGs in the way by which they manage their forests. By highlighting and describing some examples of these innovative

practices we hope to encourage "more of the same" eventually leading to a situation where every FUG is managing their forest in a productive and sustainable way.

FFMP Team
Kathmandu, Reading, & Edinburgh
October 2001

Acknowledgements

The origins of this document lie with the many FUGs with whom the authors have held discussions over the past few years. Without their willingness to take the time to explain and share their ideas, the information contained here would not have been obtained. It is hoped that this document will contribute something to their forest management efforts in return.

The authors are also grateful to DFID who have provided the funding for FFMP and to NUKCFP and their staff who have assisted us in many ways - particularly in administration and logistics. The assistance of many staff of HMGN Forest Department especially during field visits and in discussions is also gratefully acknowledged.

Fuelwood sellers

Introduction

Forest Management in Nepal

Community Forest Policy in Nepal

Development of forest policy in Nepal promoting community forestry has been an evolutionary process – often based on the success or failure of particular approaches. The Master Plan for the Forestry Sector (MoFSC, 1988) clearly identifies community forestry as being a key strategy for ensuring that forests continue to provide the products and services which rural people of Nepal depend on for their survival.

Forest Act 1993

The 1993 Forest Act has been critical to the development of community forestry in Nepal. It has provided the framework within which FUGs can become legally responsible for protection, management and utilisation of community forests and within which the Forestry Department can operate to facilitate this shift in management responsibility from government to local institutions. The regulations associated with the 1993 Act outline the steps which need to be taken to transfer the control of patches of forest from HMGN to FUGs under an agreed constitution and operational plan.

The extent of community forest in Nepal

Although community forestry and the formation of FUGs started well before the 1993 Act, since then, FUG formation and registration has proceeded very rapidly, especially in the Middle Hills Districts. By January 2000 nearly 9,000 FUGs had been formed in Nepal with a combined membership of almost one million households and with a total community forest area of about 650,000 ha (or approximately 11% of the total forest area of the country). The rate of formation of new FUGs is still approximately 1000 new groups per year, although this is expected to decline slowly. Community forests therefore represent a substantial productive resource for the country. Since they are scattered throughout the rural areas, community forests are very important in the day to day lives of rural people, and they provide essential products including fuelwood, fodder, timber, poles, leaf manure, medicinal plants and many other things.

The role of Department of Forest staff and other agencies

Since the 1993 Forest Act, the Department of Forests has been mandated to provide support for community forestry working on the principle that most accessible forest will eventually be handed over to FUGs. District Forest Office (DFO) staff are therefore involved with forming and registering FUGs, and in providing advice to FUGs as to how best they can manage their forests. This is an enormous task, especially given the inaccessibility and dispersed nature of many FUGs, and the few HMGN staff who are entrusted with this job. Many donors, projects and NGOs have also become involved in community forestry recognising its potential importance for rural livelihoods and the need for assistance in order to make it work effectively.

Participatory forestry principles

There are a number of important principles which have led to the success of community forestry in Nepal. These have been well documented elsewhere, but it is worth listing them because they need to be applied at all times if community forestry is going to achieve its objectives. These principles include:

θ **Forest Users**
The concept of forest users is important. Users are those people whose livelihoods depend on a particular forest and they must be involved in its management.

θ **Participatory planning**.
The process of planning in a participatory way involving forest users is as important as (or is even more important than) the actual plan itself.

θ **Forest user groups**.
The formation of the FUG must come before the management plan (operational plan) for the forest is prepared. This has to be an inclusive process involving all users.

θ **Sustainability**.
An essential part of any forest management plan. In the case of community forestry, this is not just sustainability of the supply of forest products, but sustainability in terms of the capacity of the FUG to function as a permanent forest management institution.

θ **Operational planning**.
As with most forestry activities, having a good operational plan is a key to successful achievement of management objectives.

Need for productive forest management

There is no doubt that FUGs have been very effective in protecting their community forests. CF condition is improving as a result, and areas which were previously highly degraded are slowly regenerating. But forest management is not just about protection. It is about using forests in a sustainable way to provide products and benefits which FUG members need. These benefits are only likely to come about through a programme of active or productive forest management based on agreed management activities as written in the operational plan. Although certain FUGs have been very successful in initiating productive forest management of their CFs, others have been less so. Many CFs are not being utilised to their productive potential with the result that the pressure for

forest products is simply being transferred to other (non-CF) forests, and forest products are still in short supply for many households.

Why is it this book needed?

This document tries provide a reference source for FUGs and for those people who are assisting them in managing their forests (HMGN staff; NGOs etc). There are many innovative and successful ideas being put into practice by FUGs in the field. This book tries to put these ideas into an accessible format which helps to share them more widely following the principle that in the case of community forest management, practical and real experience is much more useful than theory.

Where has the information come from?

The information used to prepare this book has been drawn from a range of sources. The first of these includes numerous meetings, visits and discussions between ourselves (as the authors) and FUG members from many parts of Nepal. In some cases visits have been specifically arranged for the purposes of discussing forest management for this book, in other cases, information has come through discussions, reports and field notes which we have undertaken and prepared over the past 10 years or so, since as authors we have all had extensive field experience of community forestry in Nepal giving us many insights into what is actually taking place at the level of FUG forest management.

Secondly, we have tried to make use of the extensive literature which has been produced over the past 15 years concerning forest management by FUGs in Nepal. This has been an enormous task, and we do not claim that we have exhausted all the information. Many of these sources (such as case studies, dissertations and project reports) are not widely available, and this has been an opportunity to look for innovations in FUG forest management and give them wider dissemination.

Thirdly, we have discussed FUG forest management with a range of project staff (of various projects); HMGN Forest Department staff; and NGO representatives who have experience of working with FUGs in Nepal. This has included a workshop on community forest management which was held in August 1999. This has given us a different perspective on innovative aspects of community forest management.

Who is it for?

Unfortunately, we recognise that very few FUG members are likely to see this document. Literacy rates are low, and literacy in English is even lower. There are now some 9,000 FUGs in Nepal, and it would be extremely difficult to disseminate this book directly to them all even if they were able to make use of this material. Accepting these problems, we see the main readership of this book as being HMGN Forest Department staff; project staff and NGO representatives who may be working directly in the field with FUGs. We hope that these people will act as extension agents and facilitators using the material contained here to stimulate and encourage discussions with FUGs in the field.

How to use it?

This book is divided into 2 main parts:

Part 1 Provides guidelines for small-scale forest management planning
Part 2 Provides guidelines for implementation of various forest management operations

Taken together, these 2 parts provide a wealth of information on forest management in Nepal, with emphasis on small-scale and natural forest management for the purposes of meeting local people's forest product requirements

Tree planting

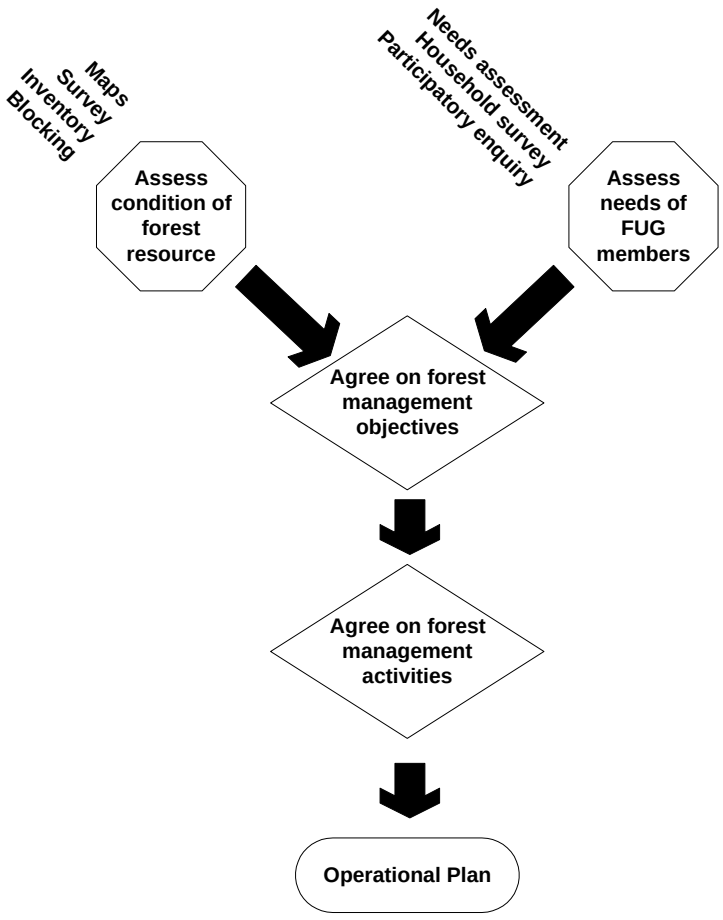
Guidelines

Part 1 Forest Management Planning

1.1 What is forest management planning for?

The planning process is a critical part of forest management. If a plan is not carefully prepared, the forest management operations carried out may not give the results which FUG members expect. In community forestry, planning must be a participatory process closely involving individual FUG members and representatives of different stakeholder groups.

The planning process has been described briefly in the Operational Guidelines for the Community Forestry development Programme (HMGN/MFSC, 1995). A simple forest management planning process is shown here. This ends with the production of an operational plan. The reasons for following this planning process are:



- **For legal purposes**. An approved operational plan has to be prepared at the time of handover before any forest management operations can be implemented.

- **For awareness raising.** FUG members need to be involved in the planning process. If not, they may not know what is contained in the plan, and will not be able to implement it.

- **For equitable benefit sharing.** The operational plan will make sure that the benefits obtained (e.g. various forest products) are those which are actually required by different forest users.

- **For Clarifying Responsibilities And Rights**. The operational plan will describe the responsibilities of different forest users in implementing the plan and their rights to the various benefits. This also includes the rights and responsibilities of HMGN Forest Department.

- **For Monitoring**. If the plan clearly states what the FUG intends to achieve, actual achievements can then be monitored against this.

1.2 Operational Plans

Every community forest in Nepal needs an operational plan which is prepared through a participatory planning process. This planning process is, and should be, different from the process of forming an FUG. The FUG should be formed first (through a separate process not described here) and the operational plan should be prepared afterwards. The main steps in the participatory planning process include:

- Mapping
- Forest resource assessment
- Needs assessment
- Objective setting
- Activity planning and scheduling
- Monitoring

OPERATIONAL PLAN CONTENTS

According to the regulations (bylaws) relating to the Forest Act of 1993, the operational plan for a community forest should contain the following elements (HMGN, 1995).

- Details of forest name, boundaries, areas, condition, forest type
- Map
- Block division with details of each block
- Objectives of forest management
- Methods of forest protection
- Forest development activities
- Nursery, plantation and income generating programme
- NTFP development activities
- Provisions for using income from sale of products
- Penalties
- Provisions for wildlife protection

In many cases operational plans have been hastily prepared as part of the community forest handover process with only limited participation of real forest users. In this case the plans will probably be inadequate for forest management purposes, and in many cases are probably not being implemented anyway. In other cases the operational planning process is mixed with the FUG formation process with the end result that the quality of the plan suffers.

Sometimes FUG members are unaware of important aspects of their operational plan. Older FUGs may have plans which were originally prepared several years ago when forest conditions and FUG member's experiences and ideas were different. Alternatively, some FUGs are now carrying out new, innovative and skilled forest management activities which are not mentioned in their operational plan at all.

Occasionally, a plan originally prepared for a 5 year period is now out of date, but no new plan has been prepared – this means that some FUGs do not have a current plan. It is very common to find operational plans which concentrate mostly on forest protection, and have very little to say about more productive forest management. A survey in the Koshi Hills showed that "active" forest management involving harvesting of forest products through lopping, pruning, and coppicing was only taking place at 19% of sites in community forest, although protection was very much more widespread.

A well-prepared operational plan involving the active participation of all stakeholders in the FUG is the key to more productive forest management.
Operational plans have to be prepared according to the regulations (bylaws). The operational plan contents are shown in the box above. There are many different ways which FUGs are using to put together the contents of their operational plans. These are described in the following sections.

1.3 Maps

Why is a map needed?

A map is necessary in the operational plan to show the forest boundaries and locations of the settlements where FUG members live. It shows exactly which piece of forest has been handed over to the FUG and if the map is accurate it can also be used for calculating the total handed over community forest area, and the areas of different blocks within the forest.

Maps are also very useful for discussing the handover and forest management with members of the FUG who are not literate and who may not be able to read other parts of the operational plan. The process of preparing the map is as important as the final map produced. Preparation of a detailed participatory sketch map (or other type of map) is a good opportunity to involve all local users in preparation of the operational plan even if a surveyed map is also available for more accurate measurements.

Table 1 shows the main options being used by FUGs for preparing maps for forest management planning and forest handover. In many cases, more than one of these types of map is being used for a single operational plan.

Table 1 Options for Preparing Maps

Type	*Features*	*Advantages*	*Disadvantages*
Sketch maps	Prepare these through PRA exercises with forest users. Get users to mark features which they think are most important.	Can be very participatory - a good way to include disadvantaged groups. Preparation of separate men's' and women's' maps is a good way to show contrasting perceptions of the use of the forest.	May not be very accurate but can be supplemented by more accurate maps of other types

Type	*Features*	*Advantages*	*Disadvantages*
Cadastral maps and cadastral records	These have been used to accurately show the legal boundary of the community forest. Trace CF areas from the cadastral sheets and add forest blocks and other features separately.	Can give accurate area figures. Maps are readily available at district level. Local people understand cadastral maps and cadastral records.	Do not show any features inside forest areas. May lead to boundary disputes. Elites may misuse cadastral information for their own benefit. May be out of date if old.
Surveyed maps	The traditional way to prepare maps – normally using a tape (or chain) and compass survey.	Can be accurate for the calculation of forest area, and for showing the alignment of the community forest boundary.	The process is very slow and difficult (especially on very rugged terrain), and the survey requires the use of equipment and skills which may not be available at the village level. Errors may lead to inaccuracy. Not very participatory. Boundaries may be hard to define.
Photo-maps	Use aerial photographs (or computer corrected aerial photographs) printed on a large scale.	Local forest features very easily recognisable to FUG members (including non-literate members). Can be used as the basis for a participatory planning process	Expensive to produce and require the use of technologies not usually available in districts. But this situation is changing fast and this may be a real option in the near future.
Use of topomaps	Use good quality 1:50,000 or 1:25,000 topomaps which are now available for much of the country.	Accurate and recent maps. They can be used for planning at a district or range level rather than community forest level.	The small scale makes their use for community forest management very limited. Type and condition of forest is not differentiated Maps will have to be purchased in Kathmandu.
GPS	Not a type of map, but use of GPS as a tool for producing a surveyed map.	Can be very accurate. May be best combined with other types of maps	Technology not yet widespread, but use of computers is increasing and offers much potential for the future. Can be participatory - forest users can walk the boundary with the surveyor.

1.4 Forest resource assessment

Why is forest resource assessment needed?

To work out what is actually in the forest and where it is. It is important to know this information so that forest protection, improvement and utilisation activities can be applied where they are most important. Forest resource assessment includes forest inventory.

There are usually 2 parts to forest resource assessment. The first of these is blocking where the community forest area is divided into suitable and convenient management units (called blocks). After this each block can be separately described (or assessed) to see and describe what is actually in the block.

1.4.1 Blocking

It has become common practice in operational plans to divide a single community forest area into a number of blocks *(Bhag)* for management purposes. This is a good idea because most community forests are quite variable and may cover a large area. A single description of the forest will not be site specific and a single management activity cannot usually be applied over the whole community forest area. Blocks are usually given names or numbers, and their boundaries are marked on the community forest maps. From these maps, their areas can be calculated - either by measuring from the map, or by an estimate.

There are a number of different ways in which blocking can be carried out. Normally an operational plan will combine various of the options shown in Table 2.

Table 2 Options for blocking in community forest

Type	*Features*	*Advantages*	*Disadvantages*
Local names and locally known features	Use existing and well-known local names to identify different blocks and the boundaries between blocks. e.g. local names for hills, ridges cliffs etc.	Blocks will be easy for forest users to recognise and they will know where the boundaries of different blocks lie. Good for non-literate forest users who often know the forest best.	Boundaries may not be exact. e.g. where is the exact boundary between 2 small hills? Because the boundaries are slightly vague, it may be hard to know the area of each block.
Natural features	Use easily recognisable natural features such as ridges, streams, rocks etc. to define the boundary of each block.	This will mark the boundaries exactly and people will know where the blocks lie. These features can often be recognised on maps and aerial photographs	The features being used (e.g. streams and rivers) may not form boundaries in the most convenient places for management purposes.
Different forest types	Community forests often consist of several distinct forest types. Each of these can be used as a block. e.g. pine forest block; sal forest block.	These are easy to recognise on the ground. Forest types will sometimes match management objectives (see below)	Not possible if the community forest is only of one type. Boundaries between forest types may not be sharp, but may gradually change from one type to another.
Location of the block and use patterns	It is sometimes convenient to identify blocks based on where they lie in relation to villages or hamlets (*toles*) and who has traditionally been using them.	People living close to a particular block will know it very well, and it will be their nearest supply of forest products.	Different hamlets (toles) may have access to different sized blocks or different types of forest. This may cause some inequity and can lead to disputes.
Creating equally sized blocks	Divide the forest map into blocks of the same size.	Very convenient for managing the forest, and estimating yields of forest products.	Although this may look good on the map, the boundaries will be hard to identify exactly on the ground. Not generally practical
Using management objectives to identify blocks	Have a block of the community forest for each main management objective. e.g. fuelwood collection block; grazing block; fodder production block etc.	The rules for each block will be very clear, and preparation of the operational plan will be simple	In practice, there will be multiple management objectives for each block, and many blocks may have a similar management objective. This may make this method impractical.

1.4.2 Resource assessment

Before deciding what management operations or activities need to be carried out in the community forest, it is important that some sort of resource assessment is done to find out what is actually in the forest at the moment. Since the forest area will have already been divided into blocks, the resource assessment can be based on these blocks - to find out what is actually in each block.

Forest resource assessment is not just about trees. It should also include an assessment of the grass, fodder and NTFP resources in the forest, as well as some environmental assessment e.g. soil erosion features.

Participatory resource assessment

Table 3 Options for forest resource assessment in community forest

Type	*Features*	*Advantages*	*Disadvantages*
Inventory	Use traditional inventory techniques requiring survey and measurement	• Can give accurate information about the forest resource (especially trees)	• Inventory techniques for measuring anything except timber are not readily available e.g. NTFPs and grass • Very time consuming • Require a high level of literacy and numeracy to carry out, and to analyse. • Not very participatory • Needs some measurement tools
Participatory resource assessment	Using people's own qualitative assessment of the forest condition based on mostly visual observations	• Useful for recording forest type and forest condition. • No data to analyse • Easy to understand by FUG members • Highly participatory • Can also be adapted for non-tree resources e.g. grass	• Lack of quantitative data makes accuracy limited • Can be time consuming if all FUG members have to be involved.

Type	*Features*	*Advantages*	*Disadvantages*
Sample plots	Lay out small sample plots in each forest block.	• Much quicker than a formal inventory • Can be made more participatory by involving FUG members in plot assessment.	• Data may not be sufficient for a proper inventory. • To get a statistically reliable sample, many plots will be needed especially in large forests
Combination of the above	A combination of participatory techniques and more conventional inventory	• Ensures that participation is good, but also helps to make sure that the resource assessment has some useful information	• Techniques are developing, but still need to be improved.

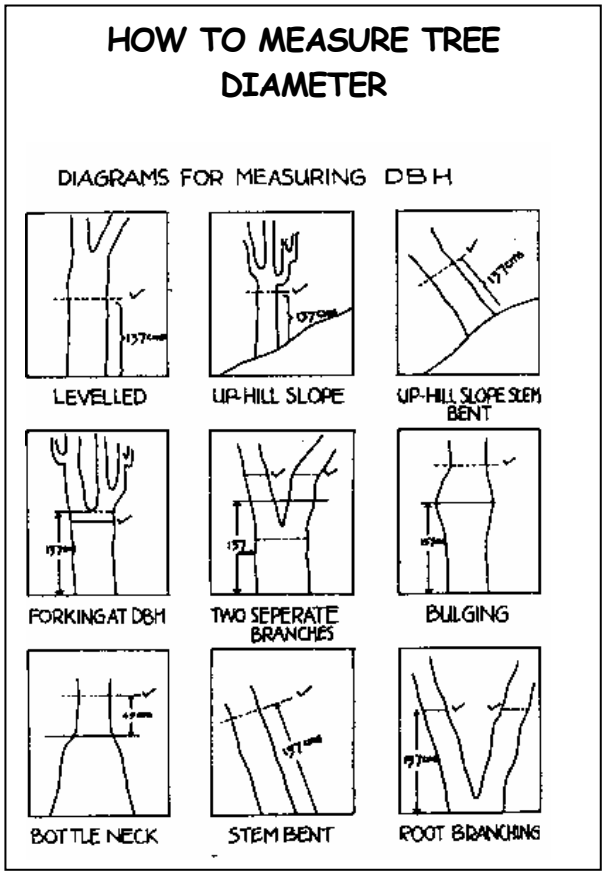
SUGGESTED NUMBER OF PLOTS FOR DIFFERENT FOREST AREAS

Area of forest (ha)	*Number of plots*		
	Timber	Pole	Regeneration
< 10	2	3	6
10-20	5	8	18
20-30	8	13	30
30-40	11	18	42
40-50	14	23	54
50-60	14	23	54
60-70	14	26	54
70-80	15	30	60
80-100	18	36	72
100-500	30	60	120
500-1000	45	113	225
> 1000	60	150	300
Note: timber plot = 20x25 m^2 (0.05 ha); pole plot 10x10 m^2 (0.01 ha); regeneration 5x5 m^2 (0.0025 ha)			

CPFD have recently produced some guidelines for inventory of community forests. These guidelines describe how to lay out sample plots (as in the table above). The box shows the recommended number of plots for different forest areas. Note that there are different sized sample plots for measuring different parts of the forest - timber trees; poles and regeneration/saplings. Timber trees are defined as trees > 30cm dbh; poles are trees between 10-30 cm dbh; saplings are between 4-10 cm dbh; and regeneration is everything smaller than this.

As the forest area increases, the number of plots required increases significantly. This may make this system very time consuming in some forests.

Inside the sample plots, the main measurements which need to be taken are of diameter. The next box shows the correct way to measure diameter - remember that tree diameter is always taken at breast height - defined as 1.3 m above the ground.



It is not normally necessary to measure tree height because you can roughly estimate the volume or the weight of trees using diameter only (see part 2.3.5). When you are measuring trees, you can group them into diameter classes - for example you will need to know how many trees there are 10-15cm dbh; 15-20 cm dbh and so on.

You should also separate trees of different species so that you know (for example) how many *chilaune* trees there are compared with the number of *katus* trees etc.

1.5 Needs assessment (for forest products)

It is important to find out what FUG members need from their forest - what the demand is for different forest products and some estimation of the quantities required. Unless this information is known, it will not be possible to decide how best to manage the forest to meet people's requirements.

Household survey

A household survey is normally done at the time of FUG formation. Often very little of the information collected during this survey is actually used for operational planning except for including the actual statistics (e.g. number of households; livestock numbers etc. in the operational plan).

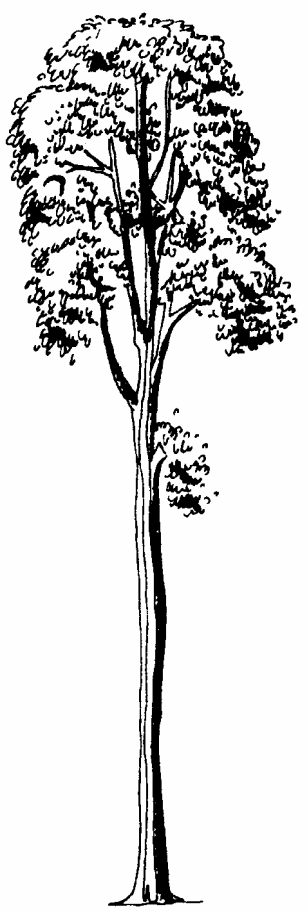
The needs assessment can best be treated as a series of steps rather than as a set of options. Probably all these steps are needed. These steps are described in detail in the Guidelines for Participatory Action and Learning and are summarised here.

Table 4 Steps for needs assessment

Type	*Features*	*Advantages*	*Disadvantages*
1. Carry out wealth ranking	Carry out a wealth ranking exercise with the FUG to identify which households belong in each wealth rank. This is normally done in small group exercises. This is to ensure that the needs of poorer households can be clearly identified. It is not necessary to know how wealthy each household is in money terms	• Very good PRA exercise to focus FUG attention on the different needs of richer/poorer households.	• This requires some skill to carry out. • People may be unwilling to disclose information
2. Identify landholding by wealth classes	Using the wealth ranking, find out the average areas of land owned by households in different wealth ranks. Include different types of land (*khet, bari, kharbari*) This is best done by a survey of a selection of FUG member households	• Can give accurate information which can clearly distinguish between different wealth classes	• Household interviews may be time consuming. • A sample system will bee needed so that all households are not interviewed - this should be based on the wealth ranking
3. Identify forest product consumption needs and sources	Again by wealth category, find out what types of forest product people need; what quantities are needed; and where they get them from at the moment. This is best done by a survey of a selection of FUG member households	• Can give accurate information which can clearly distinguish between different wealth classes. • Sources of different forest products are very important for the operational plan	• It is important to take time during the household interview to make sure that the information is correct.
4. Identify problems with forest products.	Based on the information you get during questions on forest product consumption and sources try to get the FUG to list the particular problems which arise.	• Problems are identified based on good information • Forest related problems will arise - these will be important for the operational plan.	• Forest related problems may not be those which are priority for the FUG

1.6 Objective setting

What is an objective?
A forest management objective is a clear statement which identifies exactly what an FUG wishes to achieve with a certain community forest, or part (block) of a forest. There are several problems with the forest management objectives which are commonly found in operational plans.



- **Objectives too general**. Forest management objectives are often stated generally for the whole forest. It is much better to have objectives which are site-specific e.g. they relate to a particular block of the forest. For example, "to produce timber" - some parts of the forest may be more suitable for timber production than others - for example where there are already timber-sized trees of suitable species.
- **Objectives too vague**. Many operational plans contain very vague objective statements. For example "to manage the forest". This may be correct, but it is not very useful for preparing the forest management plan.
- **Objectives not related to a particular problem or need**. It is common to find objectives which are not related to any identified problem. For example, "to improve the forest" - for what purpose? Is the forest already degraded? It is better to have site-specific objectives so that a degraded forest block has an objective to improve it; a shortage of fuelwood leads to an objective to increase the fuelwood production from the forest and so on.
- **Objectives confused with activities**. This is very common. For example, "to thin the forest" is not an objective, but is an activity. The actual objective can be identified by asking the question "Why?". For example, the answer may be "to supply more poles" or "to improve the growth of the forest by reducing congestion". It is useful to try to relate forest management objectives to particular forest products e.g. "to increase fuelwood production"; "to increase resin production" etc.

The best operational plans have a different set of forest management objectives which have been agreed and identified for each block of the forest. Remember that there can be several management objectives for a single block of forest - these are multiple objectives. Objectives can also be changed over a period of time - during operational plan revision.

1.7 Growth and yield assessment

What is growth and yield assessment?
Growth and yield assessment means finding out what the production from an area of forest actually is - this is sometimes called yield regulation. This will help to make the operational plan more accurately reflect the potential of the forest. There are 2 ways of doing this based on measuring or calculating the yield in a small area (plot):

- Measuring actual yields from plot harvest
- Calculating (estimating) yields from plot measurements

Because every community forest is different it is not possible to accurately estimate yields in advance. However, a rough estimate is usually enough to help the FUG to decide what area they can harvest in their community forest and how much they will get if they do so.

HOW TO MEASURE ACTUAL YIELDS FROM PLOT HARVEST

- In a small area of forest (e.g. an action research plot) it is easy to measure the actual yield by carrying out harvesting
- Harvest the fuelwood, poles etc.
- Separate different products. Make sure that material from outside the plot does not get mixed up.
- Weigh the harvested material from the plot. Either by using a large spring balance, or by dividing the material into similar sized headloads (*baris*). Count the number of *baris,* and if possible weigh a few of them to get an idea of average *bari* weight.
- For poles, stack and count similar sized poles. For example 25 poles between 5-10 cm diameter average length 3m etc.
- It is better to weigh material using locally understood units - normally *baris*
- Based on the plot area, you can then calculate

HOW TO CALCULATE YIELDS FROM THE MEASUREMENT IN PLOTS

- Information from action research plots can be used to estimate yields without actually harvesting.
- Count how many tree stems there are in different dbh classes.
- Keep separate records for conifers and other species
- Mark trees which will not be harvested and put these into dbh classes too.
- Use table 12 to calculate total weight (biomass) and biomass which will be harvested in each dbh class.
- Work out the totals.
- Compare total biomass (growing stock) with that which will be harvested. With coppicing and singling, you can safely harvest up to 70% of the growing stock. With thinning you should not remove more than about 30% of the growing stock.

Distributing fuelwood

Remember that whether you are measuring actual yields being harvested, or trying to get an estimate based on tree measurements it is not necessary to be highly accurate.

The guidelines produced by CFDP suggest estimating age and then calculating annual increment based on dividing the growing stock by age. However, there

are two major sources of inaccuracy in doing this:

- Firstly, estimating age is very difficult - especially when trees in the forest come in different sizes, ages and species. Most natural forest is of mixed age even if small patches - or blocks might be of similar age.
- Secondly, growing stock may not represent annual increment - especially in degraded forests which have been harvested and cut by people - often for generations. For example, you divide growing stock by age in a highly degraded forest and decide to harvest a percentage of the mean annual increment (annual allowable cut) you may be harvesting from a patch of forest which should be protected only - at least until it's condition improves.

It is suggested that yield regulation based on annual increment calculation and allowable cut is impractical and likely to be inaccurate. The measurement systems described in the boxes above (both based on measurements taken in a small area) are likely to be simpler to use and easier for FUGs to carry out themselves.

1.8 Monitoring

What is monitoring?
Monitoring activities should be included in the operational plan, and should be agreed during the preparation of the plan in the same way that objectives and activities are agreed.

Monitoring is needed as a check that the operational plan is being implemented as planned and that it is having the desired results. The information from carrying out monitoring can then be used to make modifications to the operational plan if necessary. The participatory principles which are being applied in operational planning must also apply to monitoring - in other words, monitoring should involve all forest users or representatives of all stakeholder groups.

FUG meeting

DFOs or projects may wish to carry out monitoring too. However, they should not be monitoring each operational plan. A good principle is that monitoring should be the responsibility of the same group of people who are implementing. Therefore, as implementers of a community forest operational plan, FUGs should monitor at the operational plan level. DFOs and their staff should monitor more strategically since they are responsible for implementing the community forestry programme in a district.

Basically there are 2 kinds of monitoring which are important for operational planning in community forestry. Some examples are given in Table 5, but monitoring - particularly impact monitoring is an area where many FUGs are weak.

Impact monitoring
This means monitoring the operational plan objectives - in other words, is the FUG achieving its objectives?

Activity monitoring
This means monitoring operational plan activities - in other words, have the planned activities been carried out?

Table 5a Options for operational plan monitoring (impact)

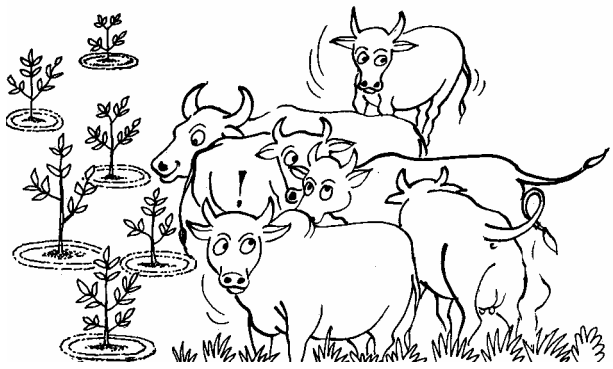
Option	*When and How ?*	*Advantages and Disadvantages*
Establish of action research plots and take annual measurements	Small plots with repeated annual measurements of dbh to monitor the impact of protection and thinning operations on tree growth.	Important if several options are still being tested
	Small plots with repeated regeneration and stem counts	This can test if forest condition is improving
Fixed point photography	Take repeated photographs from the same point in the CF to monitor changes in forest condition	This can show changes taking place in forest condition which may be hard to measure. Requires equipment and photography skills. Not very participatory, but the pictures can be used with non-literate groups
Household surveys (sample surveys)	Visit a sample of households and assess changes in the ways they are suing and benefiting from community forestry.	Can give good quantitative data, but requires skills and time which is not normally available within the PUG
Pictorial monitoring systems	Carry out participatory exercises with different focus groups in the FUG (e.g. women; poor etc) to see what changes and impacts they can identify	Requires good facilitation skills. May not produce quantitative information, but can distinguish impacts between different stakeholder groups
Monitoring of agreed impact indicators	Carry out a participatory exercise to agree impact indicators (see box)	Good way of monitoring against objectives. May be difficult to identify simple, measurable indicators

Table 5b Options for operational plan monitoring (activity)

Option	*When and How ?*	*Advantages and Disadvantages*
Elect a subcommittee to monitor harvesting activities	A committee is elected just before harvest. Their job is to make daily checks at the time of harvesting to make sure that it is being correctly carried out, and that products are being stacked and measured	May put monitoring in the hands of village elites
Annual FUG monitoring meetings (assemblies)	An FUG assembly is held. During this discuss what activities have taken place and identify any constraints	Participatory - can involve all FUG members
FUG records	Use FUG records of forest product production and distribution (and of other activities).	FUG needs to have a good record keeping system (often lacking) Important to try to monitor against a set of planned activities e.g. an annual action plan.
Monitoring of FUG expenditure	Check expenditure against activities.	Not participatory, and may not give any significant conclusions. For example, some activities may be important, but not incur any expenditure.
Monitoring by FUG committee	The committee checks the agreed actions from the previous meeting to see if they have been carried out	This should be routine for the committee.

EXAMPLES OF MEASURABLE MONITORING INDICATORS

- Number of months a spring has flowing water (environmental impacts)
- Number of wild animal sightings (biodiversity impacts)
- Quantity of fuelwood a household gets from the CF (direct economic impacts)
- Percentage of households practising stall feeding (indirect economic impacts)
- Percentage of women attending FUG meetings (social impacts)
- Number of regeneration in a measured plot (forest resource impacts)
- Frequency of FUG committee meetings (social impacts)
- Awareness of FUG members of CF rules (social impact)
- Frequency of visits by DFO field staff (social impact)



Grazing damage

The box gives some examples, but it is better if the FUG identifies indicators and monitors themselves.

Every management objective should have at least one indicator which will help the FUG to decide if the objective is being achieved (having impact)

Part 2 Forest Management Operations

Why should forest management operations be carried out?

The main reasons for carrying out forest management operations in community forest are:

- To protect the forest from damage
- To improve the condition of the forest
- To harvest products from the forest.

The different activities described below will contribute to one or more of these aims. For example, branch pruning will help to improve forest condition (by improving timber quality) and will also yield some small fuelwood for the benefit of FUG members.

The operational plan for a community forest should describe and plan for the various activities which will be carried out by FUG members. If possible, the operational plan should describe the actual areas where these operations will be carried out; the time or season; the people who will be involved both in carrying out the operations and as beneficiaries; and the quantities of products which will be produced.

The sections which follow describe various forest management options and give examples from where FUGs are actually using or implementing these options in each of the following categories:

- Protection
- Regeneration
- Harvesting
- NTFP management
- Income generation
- Grass management
- Planting and plantation management
- Bamboo management
- Leaf litter, compost and fodder management

Tree felling

2.1 Protection

Why protect?

- To enable degraded forest to improve
- To maintain the condition of better forest

Protection is an essential part of forest management. Because most community forests have been degraded in the past, they now require some protection to enable their condition to improve.

After only a few years of protection (sometimes as little as 1 or 2) there is a visible improvement in forest condition with better regeneration and more coppice growth from rootstock. This has been quantified by Branney and Yadev (1998).

It is often easier to protect a forest then manage it. In Nepal, most indigenous forest management systems have focused on forest protection with only conservative levels of forest product harvesting (Fisher 1989). In these situations forest is being protected but local forest users may be getting few benefits from it. This is still a common situation in rural Nepal where forests have been handed over to forest user groups.

ASSESSING FOREST PROTECTION OPTIONS

Discuss these questions with FUG members. Use the table of forest protection options below to choose the best one for their community forest.

- Is protection needed?
- Which threats are most serious?
- What is the level of pressure? (high/low/insignificant)
- How close is the community forest to the village? (near/distant)
- How large is the forest? (small/large)
- Are funds are available within the FUG to pay for a watcher?
- Are users' aware of the rules?
- Are non-FUG members aware of the rules?

Forest protection is not the same as forest management!

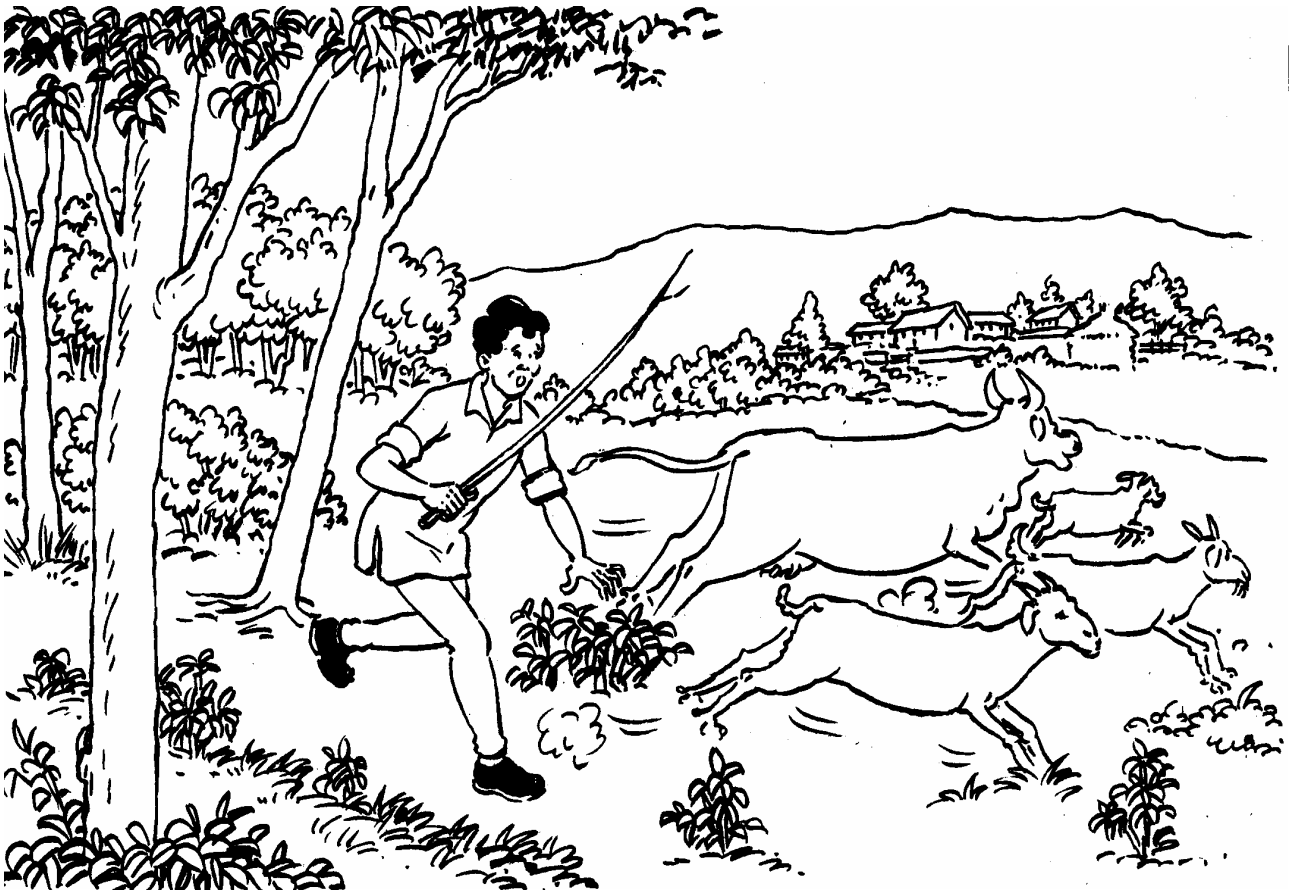
Protection against what?

The main threats which cause forest degradation are shown below. These mostly have biotic (human) causes. Because of this it is important to understand that to solve these problems you need to involve people – unless this is done, you will not be tackling the real causes of the problems.

The most common threats to community forest are:

- Grazing
- Encroachment
- Illicit cutting
- Fire

Each of these may need a different kind of protection system.



Grazing control

The management options listed below are divided into two groups. Firstly, those for protecting forest against grazing; encroachment and illicit cutting, and secondly those for protecting forest against fires.

Table 6 Forest Protection Options (grazing, encroachment and illicit cutting)

Option	*When and How ?*	*Advantages and Disadvantages*
Mana pathi system.	A good system where there is much biotic pressure on the forest. This is a traditional protection system formerly used in many locally protected forests Each household contributes food grain to a watcher who is selected by the FUG committee. The watcher usually works all year round.	The system is already understood by local people Can be used to create employment and income for poor and/or landless households Each household makes an equal contribution (in grain). This may be a problem for poorer households. In very large FUGs, collection of the grain by the watcher may waste much of his time.

Option	*When and How ?*	*Advantages and Disadvantages*
Cash contribution system.	A good system for established FUGs where there is high biotic pressure. Each FUG member household pays an agreed amount per month to the watcher who is selected by the FUG Similar to *mana pathi* system but payment is by cash instead of grain.	Requires some organisation by the FUG committee to collect and distribute the money. Every household makes an equal contribution (in cash). This may be difficult for low-income households. Can be used to create employment and income for poor/landless households
Lauro-palo system.	A good system where there is much pressure on the forest where the FUG does not have funds. Watchers rotate. The watcher on duty has a stick (*lauro*) which is passed on to the next watcher at the end of the day's turn (*palo*). Each watcher registers with a signature at the start of their turn.	An effective and low cost system, but requires some organisation and planning Every household in the FUG makes an equal contribution (of labour). Poorer households may not be able to afford the time to contribute a whole day as watcher.
Rotation system.	A good system where the FUG has limited funds and where biotic pressures are less. Each household takes a turn to provide a watcher on a voluntary basis. More than one watcher may be on duty at once (patrolling different parts of a large forest)	Each household makes an equal contribution to protection (of labour) Can be problematic for households where there are no available adults. May be difficult to manage and organise – especially in large FUGs
Payment system (by FUG)	A good system which works where there is much pressure on the forest, and where the FUG has funds available, The FUG selects and pays for a watcher using their own funds. Sometimes clothing, shoes, food etc are given as well. Sometimes watchers are employed only during certain critical seasons.	Only possible where FUG has funds available. Can be used to create employment and income for poor/landless households Works well where FUG members are getting real benefits from their forest (e.g. harvested forest products). A good incentive to manage forest more productively.

Option	*When and How ?*	*Advantages and Disadvantages*
Payment system (by Government or project)	Was often applied to plantations - but often proved ineffective. This was a common system in the past where payment for the watcher came directly from government or project funds (sometimes joint FUG/government payment systems are used) Now becoming less common and should normally be avoided	A serious disadvantage is that this system is totally dependent on outside support (not sustainable) Creates the impression of project or government-managed forest rather than FUG-managed No incentive to manage forest rather than simply protect.
Informal protection system	A common system which works best when biotic pressure on the forest is low and when the FUG is small. No specific watcher, but everyone in the FUG agrees to follow the rules and protect the forest.	Can lead to a system of no protection if not properly implemented or understood. Can be very effective where there are clear rules and a high level of awareness amongst FUG members Low cost (in time and money)
Different rules for different users.	This is not yet a widespread system, but it works well where certain households are highly dependent on the forest for particular products Different rules about forest product usage may be applied to different households in the FUG. (see also forest product utilisation)	Needs good organisation by the FUG with a high level of awareness of the rules Can be used to directly benefit households which are most forest dependent or poorest (e.g. headloaders, NTFP collectors). Equitable rather than equal.
Different rules for different products.	Harvesting of some products is restricted whilst others can be freely collected. (e.g. green wood harvesting is often banned whilst dry wood collection is permitted) Often needs to be applied if forest condition is poor to help it to recover. (see also forest product utilisation)	Encourages some active forest management other than just protection. Can be used to make sure that those people who are most dependent on the forest get access to some of the products they need. May be difficult to organise and control
Seasonal protection system	Rules are made which allow use of the forest only at certain times of year Used particularly for grazing and collection of grasses (see also grazing and grassland management)	Encourages forest management rather than just protection. Allows systematic management to take place, and use of the forest to be matched with forest condition.

Option	*When and How ?*	*Advantages and Disadvantages*
Fines	Fines are imposed to punish offenders who break the FUG rules on protection. Different fines may be imposed for different offences (or products harvested illicitly) and for repeat offenders A widespread system amongst FUGs	Fines may discourage FUG members but may be very difficult to impose on offenders who are not members of the FUG. The fine for committing an offence may be a very strong incentive not to commit it again Can be used to raise revenue for the FUG
Fence or wall construction	Barbed wire fences have been used in the past to keep livestock out of plantations and forests, but with little success. Some FUG still use stone walls to protect critical points in the forest boundary. Live fences can be successful but again require maintenance and protection during early years Extensive fencing or walls are not generally recommended or needed.	Barbed wire fences are expensive to construct and maintain. Apart from grazing, fences are ineffective against biotic pressures and may reduce the sense of responsibility for forest protection amongst FUG members. All fences and walls need to be maintained if they are to be effective.

Fire protection differs slightly from other types of protection. Various management activities can be used to reduce the risk of fire happening, and to make sure that if it occurs it causes as little damage as possible.

Table 7 Forest Protection Options (fire)

Option	*When and How ?*	*Advantages and Disadvantages*
Collect leaf litter and burn or dispose of it	This system is good for plantations (especially Pine). Leaf litter (especially pine needles) creates a fire hazard if left in the forest. Especially important near busy trails and roads since this is often where accidental fires start. (see also leaf litter and compost management)	Labour intensive. It also encourages better grass production (especially in pine plantations) Leaf litter (and pine needles) can be used for animal bedding and compost making Effective at controlling accidental fires.

Option	*When and How ?*	*Advantages and Disadvantages*
Create fire lines around the forest	A common system in the past for plantation establishment and protection. Fire lines are strips cleared of all vegetation around a forest or plantation which fires cannot cross.	The fire lines also mark the forest boundaries. They require much labour to create and need to be maintained every year They will only stop fires spreading into the forest from outside. They cannot stop a fire from starting inside the forest area.
Counter-fire strips in vulnerable areas	This is similar to fire lines except that strips are burnt (carefully) rather than being cleared by hand.	Difficult work, and difficult to align the strips to be most effective. As with fire lines, this does not prevent fires from starting inside the strips.
Signboards and notices	Normally along roadsides, and on main trails. Using picture rather than words can overcome problems of illiteracy.	Can have some impact (especially on non-local people), but limited impact where people are not literate. Signs need to be maintained and renewed regularly.
Employ watchers	Use one of the systems described in the previous section. Watchers' responsibility includes preventing and controlling fires. (see also other protection systems above)	Since fires are normally seasonal, watchers may not be needed all year round. Many fires are accidental rather than deliberate – therefore better awareness may be more effective than watchers

Fire control

2.2 Regeneration

Regeneration may be a management objective if the forest is already degraded. However, in any forest which is productive, and where harvesting of products is taking place, regeneration is essential to make sure that the forest continues to survive and grow.

Why regenerate?

- To ensure the sustainability of the forest management and harvesting operations
- To improve degraded forest
- To create new forest in bare areas
- To introduce new species into an area where they do not already occur.

IS REGENERATION NEEDED?

Discuss these questions with the FUG members.

- Is the forest degraded, or are there blank patches in the forest which have no trees?
- Is there already any natural regeneration either from seed or from existing rootstock?
- Are preferred tree species regenerating?
- Does the operational plan specify that regeneration and/or planting will be carried out?

Regeneration options

Table 8 Regeneration options

Option	*When and How ?*	*Advantages and Disadvantages*
New growth from existing rootstock	This is the common situation in many CFs. After protection, existing rootstock sends out new shoots which regenerate the forest. This can sometimes be encouraged by cut-back operations to stimulate new growth Does not occur with pine (*khote salla*) and with other conifers since these do not coppice.	Suitable where there is existing rootstock. It is often difficult to know whether this is enough. Many FUGs have found that by waiting a couple of years after protection the regeneration from rootstock is enough to regenerate the forest without planting. Much cheaper and successful than planting. New growth is quicker than planting. There is no control over which species come up since this depends on the existing rootstock.

Option	*When and How ?*	*Advantages and Disadvantages*
Planting	Planting nursery-raised seedlings into a plantation area. Previously this was a very common practice - both for open areas and degraded forest. Most FUGs are now only planting in a very limited area which is less expensive, and easier to protect. Where there are large areas available for plantation, it is usually better to plan a small area each year rather than a single large area. It has been found that natural regeneration from seed and rootstock is coming up in many planted areas after a few years of protection.	Expensive. Tree seedlings have to be produced in the nursery, and the site has to be prepared for planting (pitting). After planting, plantations need to be maintained by weeding etc. Requires careful matching of species with site. There have been many failed plantations and many cases of poor survival. Good control of species is possible. For example timber species or NTFP species can be introduced if they are not already present. Sometimes this is the only option if there is not existing rootstock and where there is not regeneration from seed taking place.
Enrichment planting	Used to supplement natural regeneration or growth from existing rootstock where this is not adequate for some reason. Usually used with particular species e.g. bamboo, NTFPs	Can successfully introduce a preferred species where it is required. Requires careful matching of species and site.
Natural regeneration from seed	Can be particularly successful in pine forest and sal forest where there has been good control of fires and grazing Only occurs if there is a good source of trees (mature seed producing trees)	A very cheap method of regeneration Depends on the availability of seed trees, and good seed production. Can be difficult (sometimes impossible) if seed is eaten by wild animals e.g. oak
Seed sowing	This involves sowing seed collected from elsewhere into prepared sites.	Much cheaper than planting. Has been successful with a few species e.g. *utis, sal*
Transplanting wildlings	Transplanting natural seedlings from other forest areas (or private land) into blank patches. Can be used for certain species which are difficult to raise in nurseries e.g. *Ficus* species	Not usually recommended. Survival is usually quite poor. This can contribute to degradation in other forests. Can be successfully used to introduce fodder species into a forest area - especially where wildlings are moved from areas where they will otherwise not survive e.g. agricultural land.

2.3 Harvesting

Harvesting means removing forest products from the forest. In managed forest, harvesting takes place in an organised and planned way. It concerns regulation of the use of the forest as opposed to preventing its use. If, as has been suggested by Fisher (1989), indigenous forest management systems have developed in response to degraded forest where few products are actually available then it is not surprising that these type of systems have not been much concerned with systematic harvest. However, forest is a living system and responds well to protection. As a result, there are many FUGs which now have forest products available for harvest – unfortunately fewer FUGs are actually taking advantage of this situation

Why harvest forest products?

There are several reasons for carrying out harvesting:

- To get supplies of forest products for domestic use
- To produce forest products for income generation
- To remove unwanted trees or other plants from the forest
- To improve the condition and growth of the forest

Cutting fuelwood

HARVESTING OPTIONS

Discuss the questions below with FUG members. Use the tables and boxes below to help the FUG choose the best options for their community forest.

Questions to ask:

- Is there anything in the forest suitable for harvesting?
- Does the forest contain products which FUG members need?
- Can harvesting be controlled in an organised way? Are harvesting rules needed?
- Which is the best type of harvesting to carry out which could be carried out?
- How much harvesting should be carried out? What quantity of products will be produced?

Harvesting is an important part of forest management. Without harvesting, FUG members will receive few benefits from their efforts in forest protection, and forest growth may slow down or decline as the forest becomes congested and over-mature.

What type of harvesting can be carried out?

Several harvesting options are possible depending on the type, and condition of the forest. In many cases these can be combined into a single operation which is often called "harvesting" or "cutting" . The main options are:

- Thinning
- Singling
- Coppicing
- Pruning
- Felling

Other more specialised types of harvesting for certain forest products (e.g. lopping for fodder; or tapping for pine resin) are in other sections of this book.

Table 9 Harvesting options (summary)

Option	*What is it?*	*Benefits*
Thinning	Removing some of the trees or poles from a forest at intervals (the thinning cycle) to give the remaining trees a chance to grow larger and more quickly. Normally done in pole-stage or young forests.	• Unwanted trees can be removed before they get too large • Produces useful poles and fuelwood before the end of the rotation • Increases the growth rate of the remaining trees • Weak, diseased and suppressed trees can be removed • Increases light penetration on the ground surface and allows better grass to grow.
Singling	Cutting the stems from a multiple-stemmed tree or stump, normally to leave a single straight and vigorous stem.	• The remaining stems will grow stronger and more quickly • Can be used to remove crooked or damaged stems • Produces firewood
Coppicing	Repeated cutting back of tree stems to just above ground level. With many species these stems will grow back from the cut stump to form the new crop after a number of years (the coppice rotation). Often combined with standards which are single trees which are not cut back at all.	• Produces considerable quantities of fuelwood as well as some poles and fodder on a regular basis • Can be used to improve the condition of damaged and degraded forest • The best way to get maximum biomass production from many types of forest

Option	*What is it?*	*Benefits*
Pruning	Removing live or dead branches from growing trees – often carried out in plantations	• Produces a quantity of fuelwood during the rotation • Increases light levels in a plantation allowing natural regeneration to take place and grass to grow • Improves the quality of timber which eventually comes from the plantation (fewer knots)
Felling	Cutting down larger trees – usually after a long period of growth (the rotation)	• Produces timber, poles and fuelwood (from branches) • Can be used to remove trees which are not wanted or which have stopped growing • Creates conditions inside a forest to encourage regeneration of more desirable species

Harvesting fuelwood

2.3.1 Thinning

What is it?

Removing some of the trees or poles from a forest at intervals (the thinning cycle) to give the remaining trees a chance to grow larger and more quickly. It is normally done in pole-stage or young forests.

First, use the box to decide if thinning is actually needed or not. Remember that you should be considering each block of the community forest separately.

Once a suitable block has been selected the next step is to decide how to actually do the thinning.

You will need to decide:

- What is your management objective?
- How many stems to cut?
- Which type of stems to cut and which to leave?
- Whether thinning can be combined with other harvesting operations like singling or coppicing?

DOES THE FOREST NEED THINNING?

Discuss these questions with the FUG members.

- Does the forest have many closely spaced stems?
- Is there a demand for fuelwood and/or poles which will be produced from thinning?
- Can thinning be controlled in an organised way? Are thinning rules needed?
- Does the operational plan specify that thinning can be carried out?
-
- If the answer to these questions is yes, then thinning can be carried out.

To answer these questions you will need to refer to your operational plan and resource assessment (see section 1.4.2). Use the information from the resource assessment, and the guidelines in "How to thin" section below to find out how to carry out the thinning.

How to thin

Thinning is very much a matter of common sense observation and experience. How the thinning is carried out also depends on your management objectives.

General guidelines for thinning

- If the crowns of the trees are not touching (or canopy density is less than about 60%) thinning is probably not needed
- In one thinning it is usually safe to remove about 30% of the trees or stems. You can always carry out another thinning after a few years if it is needed.
- Before thinning make sure that you know what the management objective is. The way in which the thinning is done may vary according to the management objective for the block.
- Most FUGs are finding that leaving a spacing after thinning of 2-3 m between trees is best for young, pole-stage forests.

- The interval between thinning varies according to age and forest type, but in young forests can be every 5 years.
- You will find that thinning can almost always be combined with singling and felling in an overall "harvesting" operation to give a mixture of forest products.
- Some FUGs mark the trees to be kept with paint. Trees which are to be cut can then be marked or slashed with a knife or axe.
- Mark the trees in the forest before getting all the users to come and cut the them - otherwise it will be chaos!
- Plan the thinning carefully -otherwise it will not by systematic and may damage the forest.
- Thin forest in winter or early spring (before March)

For **timber** production - follow these guidelines:

- Keep straight trees with few forks
- Keep healthy and vigorous trees
- Keep trees which have a healthy crown covering about 1/3rd of the stem
- Keep species which are good for timber
- Remove up to 1/3rd of the trees - but don't leave large bare gaps (> 10 m across)
- Try to identify which will be the best timber trees for the future and thin the other trees around them selectively.

For **pole** production - follow these guidelines:

- Remove trees which have already formed good-sized poles - if nearly all trees have already reached this size, then consider coppicing everything
- If gaps are small, then consider enlarging them so that more light reaches the ground. This will encourage the growth of coppice shoots or natural regeneration to form a future pole crop. Gaps need to be at least as wide as the average tree height to be effective for regeneration.
- Keep small trees which are growing vigorously but which will form poles in the future.

For **fuelwood** production - follow these guidelines:

- You might not need to thin at all. Consider coppicing or singling rather than thinning.
- Remove all large trees - especially those which are misshapen and branchy
- Keep young trees which are growing vigorously

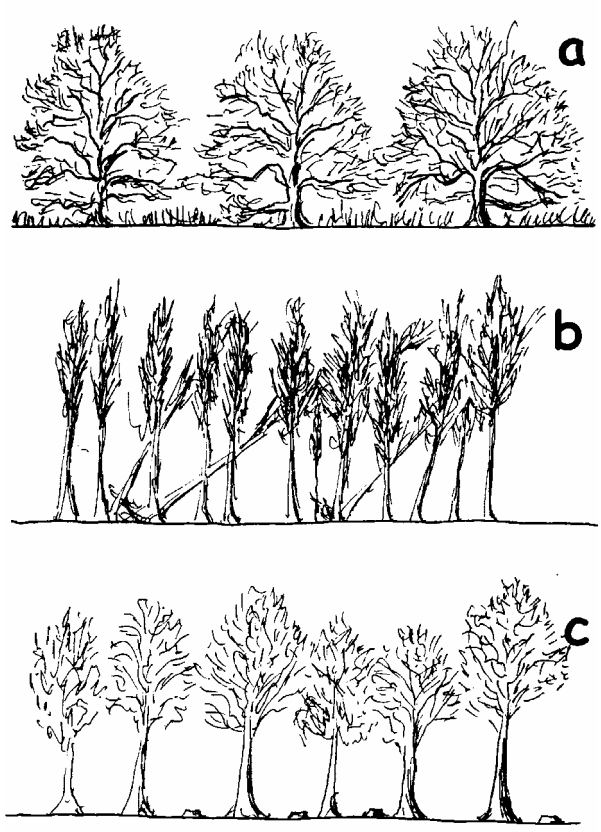
Yields from thinning

You can measure the yield from thinning in different ways (see the table below). It is useful to use units which are easily understood by FUG members - for example numbers of headloads (bari) or numbers of poles of a certain size.

Since every forest is different, it is difficult to generalise about the yields from thinning. For young, dense pole-stage crops, a thinning can produce about 1000 baris of fuelwood per ha. In older forests the actual yield per ha may be greater than this, but the thinning cycle may be longer (until the next thinning).

Table 10 Measuring and estimating yield

Option	*How ?*	*Advantages and Disadvantages*
By inventory	Measure all the trees you have marked for thinning and calculate the total Traditional inventory techniques can be used.	Very time consuming and not very practical Requires the use of measuring equipment
Use thumb rules to estimate the yield	See the Annex to this document. This is basically a system of yield estimation based on ocular assessment.	This will give a rough approximation of the yield for the forest block
Action research plots	Lay out a small plot and carry out the thinning in it. Measure the quantity of products from the plot, and use this to calculate the quantity for the whole block.	Quite accurate, but requires some initial skill in measuring and calculating. Much quicker than a complete inventory.
Get information from other sources	Visit nearby FUGs. See how they have done their thinning and get information about the quantity of products they got. Look up in the FUG records about how much produce was obtained in previous years from other blocks.	Can be quite inaccurate because there is much local variation. Good information may not be available.



a - These widely spaced trees do not need thinning. However, they will not form good timber because they are very branchy and they do not have long straight stems. Consider felling them for fuelwood, and replanting or coppicing or pollarding for fodder.

b - These closely spaced trees require thinning. They are tall, spindly and not vigorous. The thinning will produce some poles

c - These trees have been regularly thinned. They will produce timber and poles and are vigorous.

2.3.2 Singling

What is it?
Cutting the stems from a multiple-stemmed tree or stump, normally to leave a single straight and vigorous stem. It is usually done in young sapling or pole-stage forests.

Use the box to decide whether singling is actually required.

Singling is almost always carried out as part of other forest harvesting operations - especially coppicing and thinning, so it will rarely be needed on its own.

DOES THE FOREST NEED SINGLING?

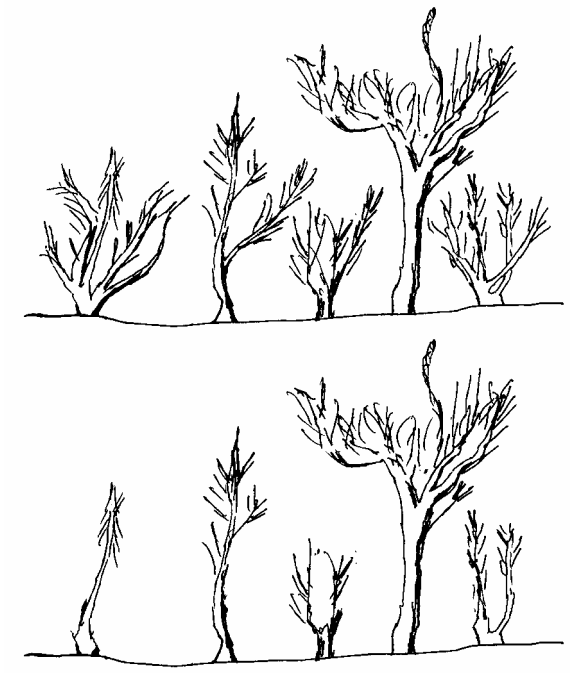
Discuss these questions with the FUG members.

- Do the trees in the forest frequently have multiple stems?
- Is there a demand for fuelwood and/or small poles which will be produced from singling?
- Does the operational plan specify that singling can be carried out?
-
- If the answer to these questions is yes, then thinning can be carried out.

How to single

General guidelines for singling

- Where there are several stems coming from a single stool (coppiced stump), some of these are removed by cutting



Degraded forest before (above) and after (below) singling

- Most FUGs prefer to leave 2 or three stems and cut the rest - however, leaving a single stem will be enough in most cases.
- The stems to be kept are normally the most vigorous and healthiest ones.
- If all the stems are deformed or growing poorly, then it may be better to consider coppicing them all rather than singling.
- Carry out singling in winter or before March.

Yields from singling
It is unlikely that singling will be carried out unless it is part of a harvesting operation combining singling, pruning, thinning and coppicing. Yields should therefore be considered for the harvesting as a whole (see section on thinning).

2.3.3 Coppicing

What is it?
Repeated cutting back of tree stems to just above ground level. With many species these stems will grow back from the cut stump to form the new crop after a number of years (the coppice rotation).

Coppice stool

CAN THE FOREST BE COPPICED?

Discuss these questions with the FUG members.

- θ Does the forest have many closely spaced stems?
- θ Is there a demand for fuelwood and/or poles which will be produced from coppicing?
- θ Can coppicing be controlled in an organised way?
- θ Are the main species in the forest suitable for coppicing?
- θ Does the operational plan specify that coppicing can be carried out?
- θ If the answer to these questions is yes, then thinning can be carried out.

Coppicing is often combined with growing larger trees called standards (coppice-with-standards). The coppice stems are cut quite frequently (maybe every 4 or 5 years) to produce fuelwood and small poles. The standards are single trees grown for timber which are felled only after they reach timber size.

Coppice shoots

Normally, coppicing involves cutting all the stems from a single stool. Most FUGs prefer to leave 1 or 2 stems to grow - the system is therefore a combination of coppicing and singling.
Coppicing only works if the tree species actually *coppice*. In other words if they send up shoots from the cut stump. Many species will do this, but some important exceptions in Nepal are *khote salla* and most other conifers. *Sal*, *chilaune*, *katus* and oak and rhododendron are all good coppicers.

Most community forests in Nepal are all or partly of coppice origin. That means that they have grown up from new shoots produced from stumps after trees have been cut in the past. Because past management has not been very systematic, the result is now that these forests usually have many stems of different sizes and ages. Coppice management aims to create a dense and more productive crop of more or less even-aged stems suitable for fuelwood and poles.

How to coppice

General guidelines for coppicing

- Coppice shoots usually need plenty of light to grow vigorously. If only a few stems are cut, the regrowth will be weak and spindly. If all or nearly all of the shoots are cut, there will be more light on the ground and the new growth will be strong and healthy.
- Protection after coppicing is very important. Otherwise the young and tender coppice shoots will get eaten by livestock or burnt by fires.
- Cut the tree stems at about 15cm above the ground.
- Make a clean cut with a sharp tool such as a knife or axe. Blunt tools will damage the stump and future growth will be affected.
- Try to leave cut sloping outwards so that water will not collect on the cut surface and cause the stump to rot.
- Larger trees can also be cut, and new shoots will come from the cut stump (of suitable species). However, very large and old trees may coppice poorly compared with younger and more vigorous trees.
- Coppicing should be carried out in winter or before March.

Table 11 Coppice cycles and approximate yields

Forest type	*Cutting cycle*	*Types of product*	*Approximate total yield of all woody forest products at one cutting*
Sal	5 years	Fuelwood Small poles	25 tonnes per ha
	8 years	Fuelwood Large poles	40 tonnes per ha
Katus chilaune	5 years	Fuelwood Small poles Leaves and fodder	40 tonnes per ha
	10 Years	Fuelwood Small poles Leaves and fodder	70 tonnes per ha
Oak	8 Years	Fuelwood Small poles Leaves and fodder	25 tonnes per ha
Pine (khote salla)	Will not coppice		

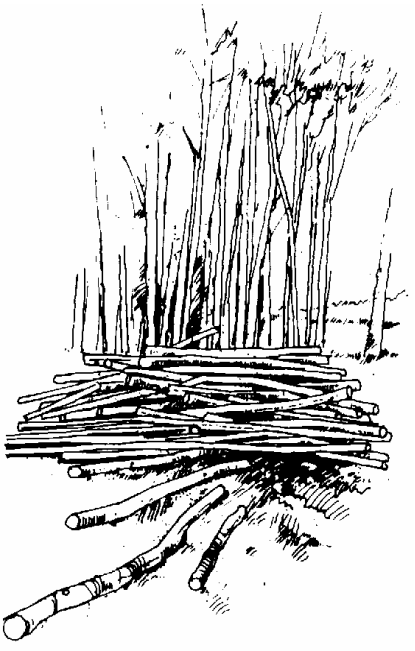
Notes:

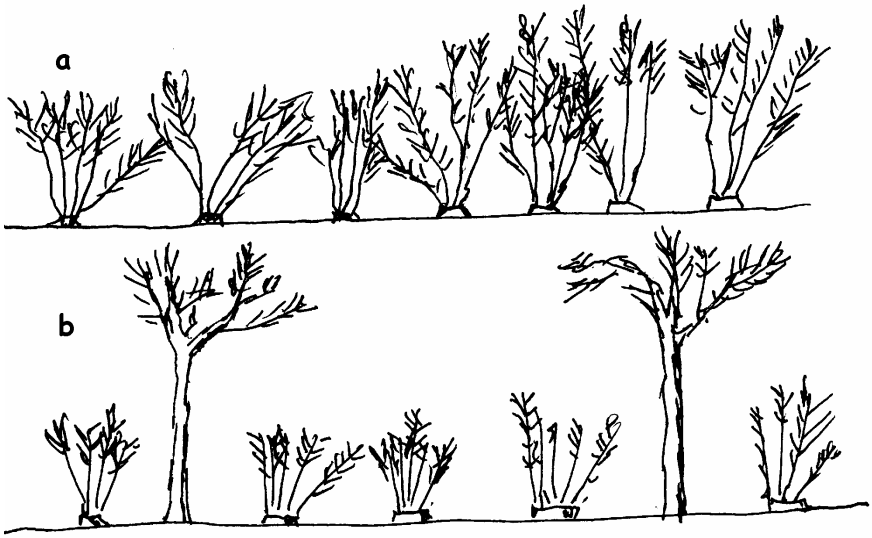
(a) Approximate yields for forest in good condition (non-degraded) are shown
(b) Figures assume active harvesting i.e. all stems being cut or stems being left at no closer than 3m spacing after cutting. If the harvest is less than this, then the yield shown can be reduced accordingly.
(c) To covert tonnes to *baris* multiply by 34.
(d) Yields include fuelwood and poles totalled (not leaves)
(e) For previously unmanaged forest, yields may be higher or lower than these depending on forest condition.

Coppice with standards

This is a variation of the simple coppice system which is probably preferred by most FUGs.

- Cut most stems as with coppice, but leave a few widely spaced stems/trees uncut. These will produce timber in the future (these are called standards)
- Select suitable timber species for keeping as standards e.g. *chilaune, sal, champ*. Make sure these trees are straight and healthy.
- Do not keep too many standards otherwise they will create too much shade and the coppice shoots will not grow. Initially you should keep standards at 3m spacing (about 1000 per ha). This number can then be reduced to about 300 per ha at the next cutting cycle.





a - coppice growth
b - coppice with standards (note the widely spaced standards)

2.3.4 Pruning

What is it?

Removing live or dead branches from growing trees. Pruning is frequently done in plantations, but can also be used in natural forest.

The purpose of pruning is to improve the quality of timber produced by a tree by minimising knots in the main part of the stem - the lower part.

It can also be used to produce a significant quantity of firewood.

Pruning reduces the shade case by the trees and allows more light to reach the ground. This will encourage better development of grass - especially in plantations.

In natural forest, pruning is often combined with other harvesting operations such as singling, thinning and coppicing. In plantations it is often carried out alone.

DOES THE FOREST TREES NEED PRUNING?

Discuss these questions with the FUG members.

- Does trees in the forest have many branches - especially lower on the tree stem?
- Is there a demand for the fuelwood will be produced from branch pruning?
- Can pruning be organised in a controlled way?
- Does the operational plan specify that pruning can be carried out?
-
- If the answer to these questions is yes,

Table 12 Options for pruning

Option	*How ?*	*Advantages and Disadvantages*
Pruning in pole stage plantations	Cut all live and dead branches from the lower half of the tree stem	• Produces better quality timber • Gives fuelwood for FUG use • Reduces fire risk in pine plantations • Encourages better grass growth on the ground. • May allow diseases to enter the tree stem through the cut.
Pruning in mixed age natural forest	Cut lower branches from larger trees up to half of the tree height	• Produces better quality timber • Gives fuelwood and fodder for FUG use • Encourages better grass growth on the ground. • May allow diseases to enter the tree stem through the cut.
High pruning in isolated timber trees	Prune all or most branches right to the top of the tree (mostly for mature timber trees)	• Reduces the risk of the stem snapping in a high wind • Makes the tree grow more slowly • May kill the tree if carried out too often. • Reduces shade to crops beneath

How to prune branches

The table shows 2 options for pruning in different situations with their advantages and disadvantages. The following are guidelines for carrying out branch pruning:

- Do not prune small trees (if they are less than 5cm dbh). They need all their branches and foliage for growth
- Do not prune to more than half the tree height or do no remove more than half of the crown of mature trees.
- Use a sharp tool to cut the branches to avoid tearing or damaging the bark.
- Do not carry out high pruning except in special circumstances (e.g. of there is a real risk of the tree snapping in high wind) because this will weaken the tree.
- Do not prune frequently - trees need branches and leaves to grow.
- Carry out pruning in the winter or before March.

a - "coat hook" b - flush with bark c - correct cut

Pruning cuts.

Coat-hooks (a) are not recommended because they do not prevent knots in the timber, although they are often necessary to allow people to climb the trees later.

Do not cut flush with the bark (b) since this will damage the bark and it will take a long time for the cut to heal.

Best practice (c) is to leave a small bark collar untouched. This will prevent disease entering at the cut and will allow the bark to quickly regrow over the cut.

2.3.5 Felling

What is it?
Cutting down larger trees – usually after a long period of growth (the rotation).

The main reason for felling trees is to produce timber. Normally felling a large tree will also produce a quantity of fuelwood and perhaps some poles from the branches.

It may also be necessary to fell a tree which has become diseased or damaged.

How to fell trees

Guidelines for felling

- Individual trees are usually felled because there is a demand for timber. The conditions when trees can be felled to meet such a demand are normally written in the operational plan.
- Make sure that there is really a demand for the timber and that the felling is in accordance with the operational plan.
- Do not only select the best trees for felling. Poor quality trees will also need to be felled too to make sure that the forest condition slowly improves.

IS FELLING NEEDED?

Discuss these questions with the FUG members.

- Does the forest have many closely spaced stems?
- Is there a demand for timber of fuelwood from the felling?
- Can felling be controlled in an organised way? Are felling rules needed?
- Does the operational plan specify that felling can be carried out?
- If the answer to these questions is yes, then thinning can be carried out

- Felling should be carried out in the winter - usually before March.
- Avoid felling trees on very steep slopes or where they may cause damage to the soil or to smaller trees.
- Try to avoid felling trees only from one small part of the forest - felling should be distributed throughout the forest according to the operational plan.
- Try to use the table below to estimate the tree volume before felling.

Table 13 Estimation of tree volume from diameter measurement

	Approximate tree stem volume		*Approximate woody weight of whole tree (kg)*	
Diameter (breast height)	*Conifers*	*Others*	*Conifers*	*Others*
cm	*cu ft*	*cu ft*	*kg*	*kg*
5-10	0.3	0.2	4	4
10-15	1.1	0.9	14	18
15-20	2.8	2.2	37	46
20-25	7.0	5.6	93	119
25-30	14.0	11.2	189	246
30-35	19.6	15.7	269	358
35-40	28.0	22.4	391	533
40-45	42.0	33.6	597	835
45-50	56.0	44.8	809	1,164
50-55	70.0	56.0	1,029	1,524
55-60	84.0	67.2	1,257	1,920
60 +	100.8	80.6	1,536	2,425

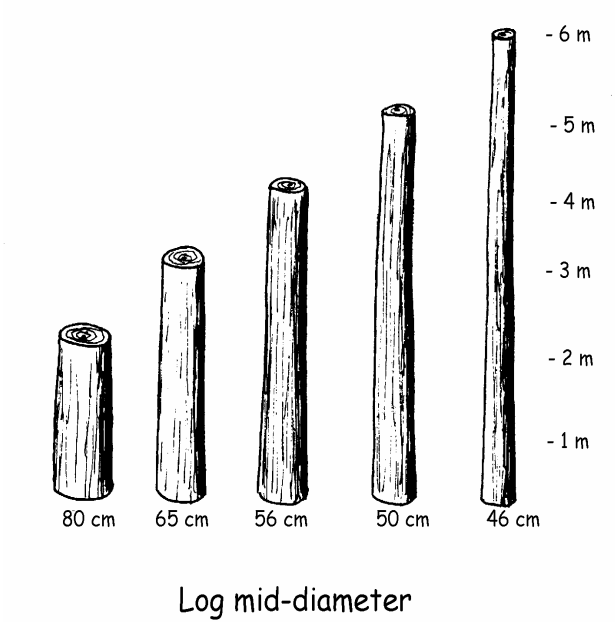
Information in this table is based on biomass tables (compiled by by Tamrakar, 2000) with modifications to make them better suited to real community forest conditions

Tree volume

Table 13 will allow you to make a very rough estimate of the tree volume based on measuring the diameter at breast height of all the trees in a small plot. However, this can only be applied to tall, and unlopped trees. The remember to use the separate columns for conifers and other species

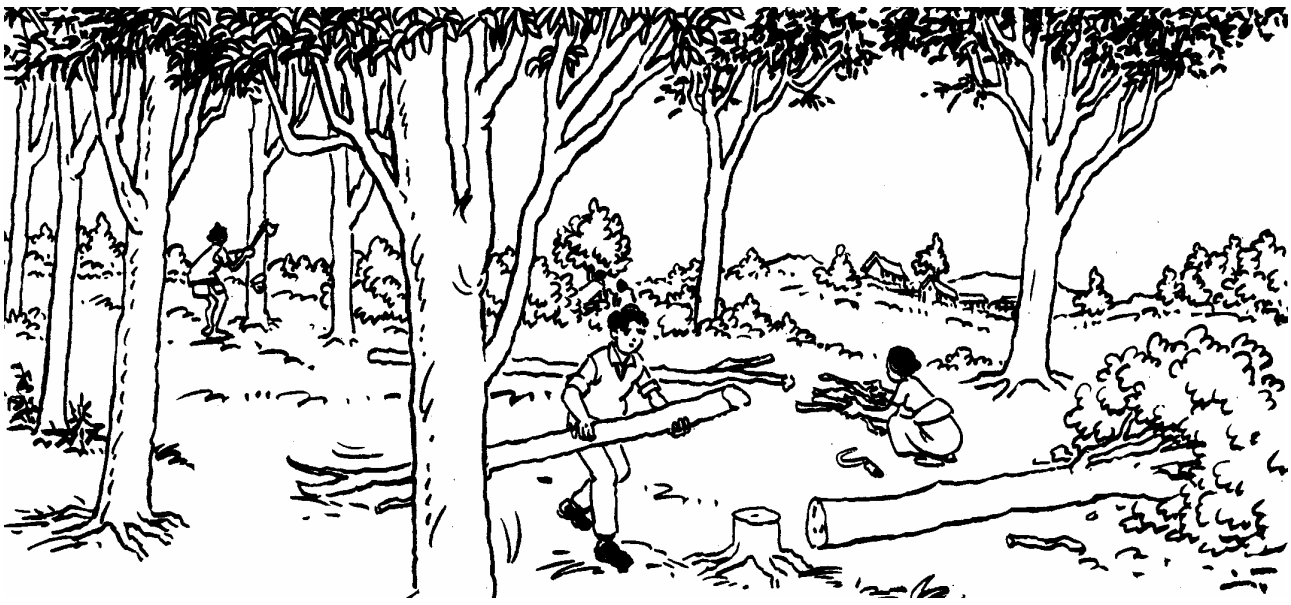
Log volume

The diagram below will also allow you to roughly estimate the volume of trees after they have been felled.



Log mid-diameter

In this diagram each of the logs shown measures 1 cubic metre (35 cubic feet).



Felling

2.4 NTFP management

The term NTFPs (non-timber forest products) refers to those products which can be harvested from forests but which are not timber, fuelwood or poles. The exact definition of NTFPs varies, but it can include products used for the following:

- Medicinal plants
- Fibres and fibre plants
- Essential oils
- Resins
- Dyes
- Spices and herbs
- Fruits and foods
- Plants used for handicrafts and other items

In addition, fodder and leaves (for compost) are also sometimes included with NTFPs. In this book these are treated as a separate section. Similarly, bamboos (bans) are also covered in a separate section.

Selling chiraito to a trader

The forests of Nepal are very rich in plants which can be used for a wide range of products. In general, degraded forests produce fewer NTFPs than forests which are in better condition. Often, forests which previously produced NTFPs now produce very little, although many FUGs are finding that as a result of protection, their forests are becoming richer in NTFP species.

It is important to recognise that many NTFPs which are already collected and traded commercially in Nepal may not come from community forests. Many NTFPs are collected from remote high altitude forests which are less likely to be community forests. However, there is still much potential for increasing the NTFP production from lower altitude forests. Some examples of common NTFPs are given in Table 14 (but there are many more than this). Ways of managing forest for NTFP production are given in Table 15.

Table 14 Some examples of NTFPs from community forests

Category	*Name (Nepali)*	*Species*	Comments
Medicinal plants	Chiraito	Swertia chirata	Medicinal plant
	Nagbeli	Lycopodium clavatum	Medicinal spores
	Dhangre salla	Taxus baccata	Medicinal leaves
	Harro	Terminalia chebula	Medicinal fruit
	Barro	Terminalia bellerica	Medicinal fruit

Category	*Name (Nepali)*	*Species*	Comments
Fibres and fibre plants	Lokta	Daphne bholua; D, papyraceae	Bark for papermaking
	Allo	Girardinia diversifolia	Fibres for cloth and rope
	Hattibar	Agave sp.	Fibre for rope
	Malu	Bauhinia vahlii	Bark fibre for rope
	Bhimal	Grewia optiva	Bark fibre for rope
	Khanyu	Ficus semicordata	Bark fibre for rope
	Argeli	Edgeworthia gardneri	Bark for paper making
Essential oils	Machhino	Gaultheria fragrantissima	Oil from leaves
	Sunpati	Rhododendron anthropogon	Oil from leaves
	Dhupi	Juniperus spp.	From leaves
	Neem	Azadirachta indica	Oil from fruit and leaves
	Jatamansi	Nardostachys grandiflora	From rhizome
Resins and oils	Sal	Shorea robusta	Oil from seeds
	Khote salla	Pinus roxburghii	Resin from tree stem
Dyes	Majitho	Rubia cordifolia	From stems
	Chutro	Berberis asiatica	From fruit
Spices and herbs	Alaichi	Amomum subaltum	Seed
	Timur	Zanthoxylum armatum	Fruit/seed
	Tej pat	Cinnamomum tamala	Bark
Fruits and foods	Chiuri	Aesandra butyraceae	Fruit for vegetable butter
	Lapsi	Choerospondias axillaris	Fruit
	Amala	Phyllanthus emblica	Fruit
	Okhar	Juglans regia	Nut
	Koiralo	Bauhinia variegata	Edible flowers
	Mahuwa	Madhuca longifolia	Alcohol from flowers
	Kafal	Myrica esculenta	Edible fruit
	Jamun	Syzygium cumini	Fruit
	Bel	Aegle marmelos	Fruit
	Bayer	Zizyphus mauritiana	Fruit
Plants used for handicrafts and other uses	Rudraksha	Elaeocarpus sphaericus	Seeds for religious use
	Khayer	Acacia catechu	Wood for "cutch" production
	Ritha	Sapindus mukorossi	Fruits for soap

Why manage NTFPs?

There are various reasons why FUGs may wish to manage their community forests for the production of NTFPs. These include

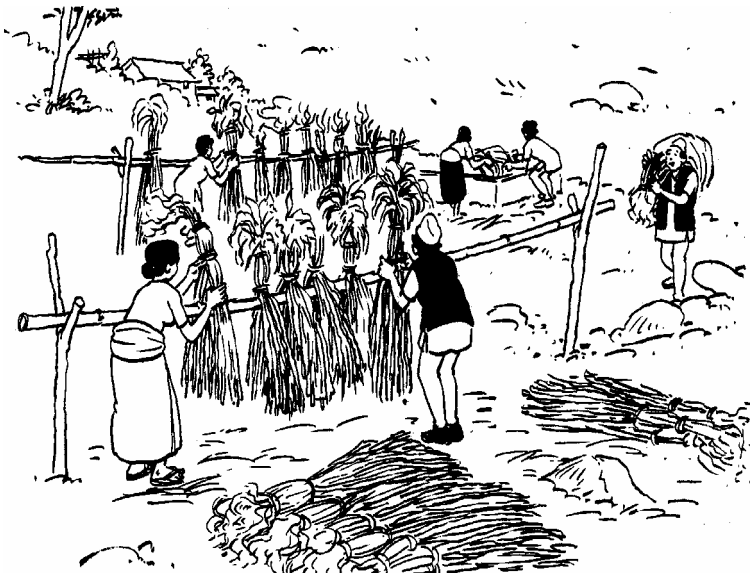
- Harvesting and processing of NTFPs can provide cash employment which is very important for poor people in rural areas (e.g. as resin collectors; lokta collectors and paper makers; medicinal plant collectors)
- Sale of NTFPs can be used to generate cash income for FUGs. This is particularly important for poor people who do not have many ways of generating cash.
- Under the rules of the Forest Act, it is often easier for FUGs to sell NTFPs than other forest products such as timber
- NTFPs can often produce an early benefit from community forests (i.e. after only a few years) compared with other forest products

- Harvesting NTFPs is often (but not always) less destructive than harvesting other forest products
- Many NTFPs are light and can easily be transported from remote rural areas to markets.

How to manage NTFPs

General guidelines for NTFP management

Since there are many different plants which produce NTFPs, this section is limited to a few plants which FUGs have already started to manage and harvest in various places. Remember that at the moment, many NTFPs are collected from the wild – in many cases they are being collected, but it is more unusual for them to be managed in a systematic way.



Drying lokta bark

Management of NTFPs can follow through a series of steps which is similar to management of community forests for any forest products. The following steps are usually needed for NTFP management.

Planting alaichi

- An assessment of the availability of the NTFP plant in the community forest. This requires some sort of inventory or participatory forest resource assessment.
- An estimation of the area available for harvest (this may be throughout the forest, or only in certain blocks)
- Harvesting rules (i.e. which type of plant can be cut (age, size etc); when plants can be cut or products harvested (i.e. which season); how much can be cut; techniques for harvesting (tools, type of cut etc)).
- Distribution and utilisation systems – these will normally be part of the operational plan.

Table 15 shows what management options and rules can be used for NTFP management. In some cases the rules will have to be developed by FUGs through learning by doing and from their own experience. All types of NTFP management will need to include rules about protection from grazing and fires.

Table 15 How to manage NTFPs

Name	*Management Options and Rules*	*Comments*
Chiraito	• Harvest on plants in their second year (not first-year plants) • Only harvest plants after seeds have ripened (between mid-December to February) • If these 2 rules are followed, all 2-year old plants can be harvested • At this time, the whole plant can be harvested by pulling it out of the ground (including roots) • Shake plants after harvesting to scatter any remaining seed • Scatter seed on patches of open soil in open patches in the forest. • Consider transplanting wildlings if the site is suitable, but where there is no chiraito growing at present	Dried chiraito plants are sold for their medicinal uses. The whole plant is used. Since the plants die after producing seed in the second year, all plants of this age can be harvested, but it is essential to ensure that enough seed has been produced beforehand to ensure that the next year's crop will be produced. Chiraito grows well in disturbed soils in open (not shady) but moist places, especially north facing slopes. It can be cultivated through direct sowing of seed e.g. in plantation areas Chiraito grows between 1,200-3,000m altitude
Lokta	• Cut only those stems which have reached a minimum harvesting height of 175cm • Break the stem when harvesting and peel the bark off down to the roots. Do not make a sharp cut. • Lokta grows best in moderate shade, so if growing lokta, do not open the main forest canopy by felling or coppicing • Growing lokta from seed (in a nursery) is possible, but difficult. • Hardwood cuttings about 15cm length taken in June can be grown in a nursery bed • Some FUGs have tried layering stems to increase the amount of lokta in their forest.	Stems are harvested and the bark is stripped off. This is used to make paper The quantity of lokta to be harvested should be based on an inventory. Try to estimate how much lokta there is in each block of the community forest. If the number of lokta stems is low, then do not do any harvesting at all. If the number is high, then use the prescriptions shown here. Lokta regenerates well from root suckers. These can be stimulated by tugging and stressing the roots. Lokta grows between 2000-3000m altitude and prefers to grow in light shade

Name	*Management Options and Rules*	*Comments*
Machhino	• Harvest leaves from the shrubs using a sharp tool to make a clean cut • Do not harvest more than once per year from the same shrub • Only cut the youngest leaves at the end of the branches. Do not cut all the branches off a single shrub • Harvest leaves and twigs after June when seed will have been dispersed	An essential oil is extracted from machhino leaves. The oil is used for massage oil; flavouring; and for pharmaceutical and perfume use. Machhino grows between 1,500 and 2,700m altitude
Jatamansi	• Harvest the whole plant by digging out the rhizomes • Harvest in identified blocks on a 5-year cycle (do not return to the same area before 5 years) • Leave at least 20% of the plants undisturbed for regeneration • Carry out harvesting during autumn (not summer) for better oil yields	Jatamansi is a high elevation plant which is not normally found in community forest areas since it grows between 3,300-5,100m altitude. Oil extracted from dried rhizomes is used for medicine and perfumery
Khote Salla	• Only the "rill" method for tapping should now be used (not the French cup and lip method as it is too damaging to the trees) • Ensure that fires are controlled in the tapping area • Remove dead bark from the area of the channel • Cut a single vertical channel 5mm deep and 15mm wide. • Then cut 20cm long side channels at a 45 degree upward angle on both sides (see diagram) • Hang the pot below the main channel • Refresh the grooves weekly with 20% nitric/sulphuric acid • Only make one channel per tree • Only tap trees > 35cm dbh • Only tap trees for 8 months in the year (not during the monsoon)	Resin is tapped from mature salla trees for use in the turpentine industry. Khote salla grows in pure stands between 700-2,500m – often on dry and south facing slopes. FUGs can set their own rates for selling resin, but the prices they can get will be higher if they can ensure that resin is clean and free of impurities. Yields will vary depending on the size of the tree and altitude, but from approximately 2kg per year can be obtained from one tree.

Name	*Management Options and Rules*	*Comments*
Alaichi	• Plant young plants (grown from rhizomes) under shade in existing forest areas in moist patches (especially under utis) • Seeds will be produced 3 years after planting on a good site • Seeds should be dried before storage to avoid deterioration	This is not usually a natural product of the forest, but alaichi can easily be planted in existing forests for income generation. The seeds are sold as a spice. The best sites are moist forests with good canopy density between 1,500 –2,700m often on north facing slopes.
Chiuri	• Raise chiuri seedlings from seed in a nursery • Seed has a low viability and cannot be stored more than 1 week • 1 year old seedlings can be planted out on good soils for better growth.	From the terai to 1,500m especially in Western Nepal. A type of butter-oil is made from the seed. This can be sold for income generation. The fruits can also be used to distil alcohol.
Lapsi	• Seedlings can easily be raised from seed in a nursery • Seed can be collected after the fruit has been removed • Grows best on well-drained sites with good soils	Grows between 1,000-1,700m mainly in Central Nepal usually not found growing in forests Fruit can be used for making achar and sweets for income generation
Amala	• Can easily be grown from seed in the nursery • Seed can be collected after the fruit has been used • Grows well on poor, dry sites but gives better yields on better soils	Grows on drier sites from the terai to 2000m altitude. The fruit can be eaten or made into achar or sweets for income generation
Okhar	• Can easily be raised from seed in a small-scale nursery • Good quality "khagazi" seeds (thin shelled) should be obtained for planting since these are more valuable	Seeds can be eaten or sold for income generation, although trees will not bear any fruit for 8-10 years after planting. Grows best between 900-3,000m altitude on better soils
Kafal	• Easily grown from seed in the nursery • Natural regeneration often comes up readily in forest areas if there are seed trees nearby and with good protection from grazing • It also coppices well, and multiple stems can be singled	Kafal grows between 800-2,000m often associated with katus-chilaune or oak forest. Fruits are produced on mature trees and these can be sold in local markets or eaten

Name	*Management Options and Rules*	*Comments*
Rudraksha	• Can be grown from seed, but germination is difficult. • Raising plants from hardwood cuttings is an alternative • The tree grows on rich soils often on moister northerly aspects	The seed of rudraksha has great religious significance. Seed can be sold without any processing. Certain types of seed with different numbers of sides (*mukh*) can be extremely valuable and a single seed may be very valuable The tree grows between 600-1,700m mainly in Eastern Nepal – it is not usually found in forests, but mainly on private lands
Khayer	• *Khayer* can easily be grown from seed in nurseries. • Collect seed during November to March and soak in water before sowing • Direct sowing of treated seed is also possible • Protection from grazing is essential for good growth and survival	*Katha* used in *paan* is made from boiled heartwood chips of khayer. The wood is therefore valuable for income generation. In addition, the *katha* has various medicinal uses Khayer grows from the terai to 1000m often on poor dry soils and gravels
Ritha	• Management of existing trees for seed is simple – ripe seed is collected as it falls to the ground (October-November) and dried. Quality reduces if seed is stored for too long (more than 1 year) • Seedlings can be easily raised from the seed in a nursery	Between 1,000-2000m on deep and well drained soils. Seed coats are removed and sold for soap making

Tapping resin by the rill method

2.5 Income generation

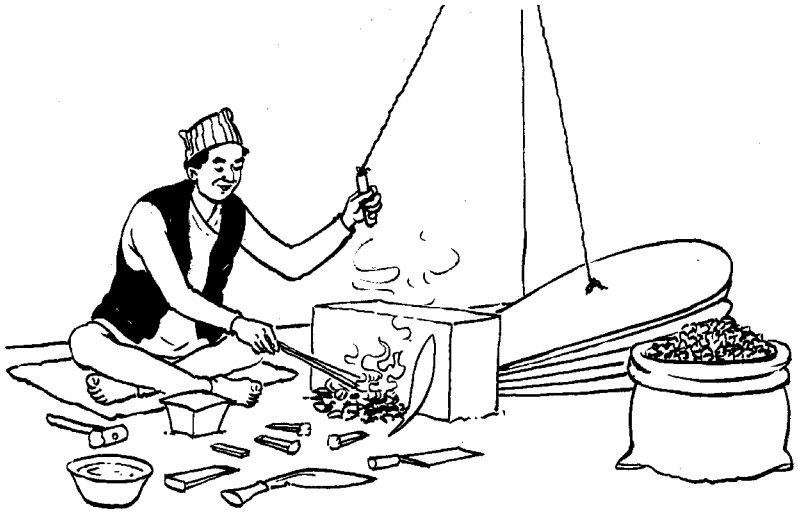
Income generation activities (IGAs) means using the forest as a source of products not for use at household level, but in order to generate money which can be used for a range of local development activities or for personal benefit. We are not really concerned here with how such money might be used, but how the forest can be used to generate such funds. Normally income generation activities involve the sale of some sort of forest product - sometimes after it has been processed or treated in some way.

In many cases this product may be an NTFP, bamboo, grass or a range of woody products. You should look in the relevant sections to see how forest can be managed to produce such products.

Income generation from the community forest is a good way for FUGs to focus more benefits on poorer households in the FUG, because these poorer households may have less opportunity to get income from their limited private land. You will often find that people are already getting income from the community forest - even before it was handed over e.g. headloading fuelwood for sale in bazaars; collecting NTFPs; working as a paid watcher.

Why generate income?

- To provide a sustainable livelihood for poorer members of the community who may be disadvantaged by reduced access to forest as a result of forest protection
- To maximise the benefits for the whole community coming from a managed forest resource
- To utilise any surplus forest products
- To generate more interest in forest protection and forest management by emphasising the value of the forest



Blacksmith using charcoal

The table here gives some examples of income generation which are being used by FUGs. You will find details about how these actually work in different parts of this document - especially in the section on NTFPs. Although many FUGs have become interested in income generation, there seem to be few examples where significant amounts of income have actually been raised - either by individual households or by the FUG as a whole apart, from the "main" forest products of fuelwood, timber, fodder grasses etc.

Income distribution from IGAs by FUGs are of 3 main types:

- Allowing individual households to cultivate, collect and sell products from the CF - and to keep the income from this for themselves (sometimes with a small payment to the FUG). Sometimes each household has a clearly identified area of the forest for this activity. e.g. fruit tree cultivation
- By keeping all the income from produce in the FUG account and using this for village development activities or for distribution as loans to FUG members e.g. income from grass or fuelwood distribution.
- By the FUG paying wages to certain households for them to carry out certain income generation activities. The households get a wage income, the FUG gets the benefit from sales of the product e.g. resin tapping.

Table 16 Income generation options

Option	*Comments*
Plant and harvest *am/iso* grass for broom making	• Good market (in Nepal and India) for brooms - also locally • Can also be used for fodder and to stabilise soils • Grows on a range of sites, but most productive where there is high rainfall and good soils. • Slips for planting are often contributed by FUG member households
Bamboo and nigalo cultivation (see also section 2.8)	• Bamboo can be used for income generation, but there will always be a demand for bamboo within the FUG for a range of uses. • *Nigalo* is more commonly harvested from naturally growing plants - especially at higher altitudes • There is quite a long delay between planting and getting any income (about 5 years)
Tapping pine resin	• Depends on the local market. Only a few companies will buy resin and they may be unwilling to pay a higher price then they have previously, although FUGs can now set their own royalty rates. • Quality is important - FUGs will need to be careful about storage and impurities in the resin • Companies are normally only interested if a significant quantity is available - marketing networks of FUGs have been successful in selling their resin together. As a group of FUGs they can have greater influence over the price they set, and can create more employment for resin tappers • Caution is needed to avoid damaging pine trees through poor tapping practices (see section 2.4 NTFP management). The rill system should be followed. • A good opportunity to create employment for disadvantaged groups.

Option	*Comments*
Cardamom cultivation	• Being tried by many FUGs but will only succeed where there is a good site, and if there is a market for the produce. • Need to consider the requirements for drying the pods before sale • As the number of growers increases, the market prices may reduce. • Equitable distribution of benefits may be a problem if only a few people are involved in cultivation in the CF.
Establish plantations of fruit species	• Many FUGs have planted fruit trees, but so far benefits have been limited because growth is slow and quantity of products is small. • Examples include *citrus* spp (orange; *suntala*); *ritha; chiuri; okhar; lapsi; badahar; katahar; tendu; amp; kafal; amala; jamun; bayer.* • Benefit distribution may be a problem in the future - who will be responsible for protecting, harvesting and selling the fruit? • In many cases fruit trees are raised by the FUG (or obtained by the FUG) and are planted on private land for the benefit of the landowners rather than in the community forest for the benefit of the whole FUG.
Fodder grass cultivation	• A number of FUGs have planted fodder grasses inside their forest area - especially on the edge of the forest, or in open patches and plantations. • Although often mentioned as an income generation activity for the FUG, the fodder is normally used by FUG members individually.
Fuelwood selling	• Some FUG have allowed traditional headloaders to continue to operate, but have regulated them by making them only collect certain types and quantities of fuelwood and according to agreed rules. • Normally the headloaders pay a "royalty" to the FUG
Charcoal production	• Some FUGs have allowed *kamis* (blacksmiths) to continue to produce charcoal inside the community forest to enable them to continue their traditional livelihoods practices • Normally there is some regulation by the FUG - what can be cut, and from where. • Since blacksmiths depend on charcoal for their livelihoods, it is important that the FUGs should make provision for ensuring that they can continue to obtain or produce the necessary supplies.
Seedling production	• Some FUGs have raised income by growing tree seedlings and selling them to their members; to other FUGs; or as buy back arrangements with the DFO. • Investment in basic nursery facilities and *naike* training are needed • Better results normally come through the sale of higher value plans e.g. grafted seedlings of fruit trees etc.

Option	*Comments*
Forest product distribution charges	• Most FUGs get revenue by making a small charge for fuelwood, grass or other products harvested from the CF. This is a nominal charge, much less than the market value of the product. • This is a good system, but it requires that the FUG should also have a good record keeping system and accounts. • Many FUGs are now using their accumulated funds to give loans for their members for their own income generation activities (often not forest related), and some have started to use wealth ranking to target those households (poorest) who need to get loans.
Fines	• This is also a main source of income for many FUGs • Money from fines is deposited in the FUG account and can be used in various ways.
Other miscellaneous income generating ideas	• Some FUGs are charging for visitors to come to their forest. This is mostly where the forest is accessible (e.g. near a road) and where many students and study tours come to the FUG • Some FUGs have

Using cash income to buy supplies

2.6 Grass management

Grass management is an important activity amongst many FUGs. Grass is required for either fodder for livestock or for thatching (for houses)

Why manage grass ?

There are various reasons why an FUG may wish to manage the grass production from the community forest area:

- In young plantations, grass growth is often very vigorous if protection from grazing and fire has been good. Grass can therefore give an immediate benefit to the FUG before any other forest product is produced
- If grass is not harvested from a plantation area, the risk of fires from dry grass will be increased, and young trees will become suppressed.
- Grass is usually in high demand in the village – especially if an area has been closed for free grazing. Even if the grass is not needed by FUG members it could be sold for income generation outside the FUG

IS GRASS MANAGEMENT NEEDED?

Discuss these questions with the FUG members.

- Is all or part of the forest open with no large trees e.g. a new plantation?
- Is there a demand for grass for fodder or thatching?
- Can grass harvesting be controlled in an organised way? Are harvesting rules needed?
- Does the operational plan specify that grass production is permitted from the forest?
- If the answer to these questions is yes, then grass management is needed.

Harvesting grass

Table 17 Grass management options

Option	*When and How ?*	*Advantages and Disadvantages*
Cut and carry system for grass production	In young plantations before the tree canopy has closed. The grass is allowed to grow for a certain period, then FUG members are allowed to cut it providing they follow certain rules	• Gives higher overall yields of grass than free grazing • Requires more labour and time than free grazing (especially for women and children) • With good protection, better and more palatable grass species start to appear • Yields will decline if the tree canopy closes • Good for fire control and weeding of the plantation • Most benefits go to those households with the greatest number of livestock (normally the wealthiest) • Livestock will need to be stall fed and tethered. As a result they may suffer from health problems due to their lack of activity
Allotment of grass cutting areas to households	Each household is allocated a grass cutting plot within the plantation or open area at random. They may cut the grass from this plot but they have to protect any planted seedlings. Each year the allocation of plots is changed to ensure that allocation is fair Some FUGs may charge a fee for each plot – the fee can vary according to the size and/or quality of the plot	• This can be used to raise income for the FUG • People who do not have livestock – normally the poorest people – will not benefit from this system • The system must be transparent to ensure that it is fair to all • Management of the system is complicated and the FUG committee will need to be closely involved
Timing of grass cutting season	The plantation area may be opened for grass cutting at a certain season agreed by the FUG members. Some FUGs open the entire forest for grass cutting 2 or 3 times per year. Member households can cut grass on payment of a fee to the FUG according to the rules of the operational plan. Usually the fee is related to the quantity of grass cut (particularly for thatching grass)	• This system can be used to make some fodder grass available during the fodder scarce season (pre-monsoon) • May be difficult to ensure that benefits are equitably distributed

Option	*When and How ?*	*Advantages and Disadvantages*
Allocation of an agreed quantity of grass	Some FUGs have a system (especially for thatching grass) where households needing grass make an application to the committee. Normally a fee is payable based on the quantity of grass required.	• Can be a disadvantage for poor people who cannot afford to pay. • Payment reflects the actual quantity used.
Direct sowing or enrichment with introduced grass varieties	Sowing seed or slips into the plantation area to improve the species of grass available	• This requires the purchase of seed or slips • Growth and survival may not be good – careful species selection is needed • In practice, the natural grasses are often as good as introduced varieties
Improvement of existing grazing areas	In grass areas under low density pine forests (or pine plantations), pine litter can be collected into heaps and burnt.	• This prevents the pine litter from suppressing grass growth and improves grazing value • Labour intensive
Controlled grazing system	As an alternative to cut and carry systems, some FUGs allow grazing to take place but control it e.g. on a rotational system; or seasonally Many FUGs do not allow grazing in newly planted areas, but allow free grazing, or controlled grazing in forested areas. A fee may be payable to the FUG for grazing depending on the number and type of livestock.	• If there are any planted trees or regeneration grazing will damage this • It may be difficult to manage grazing and ensure that livestock owners follow the rules • The overall quantity and quality of the fodder produced will be less than with cut and carry systems • Less labour intensive than cut and carry systems • Grazing allows animal manure to be returned to the forest areas and helps to maintain soil fertility

2.7 Tree planting and plantation management

There are many books available covering tree planting and plantation establishment in Nepal (see the bibliography in the Annex). Since this book is mostly concerned with natural forest management, it is not intended to cover this subject in detail. This section therefore provides some options which the FUG may wish to consider if they are considering plantations of any kind.

Why plant and manage plantations?

There are several reasons why an FUG may wish to plant trees or establish a plantation:

- To increase the area of forest available to them and as a result the quantity of forest products they can get from the community forest
- To improve or enrich highly degraded forest areas or other lands
- To improve the environment e.g. for erosion control, watershed protection, biodiversity conservation
- To produce specific products which otherwise may not be available.
- For income generation purposes

IS PLANTATION ESTABLISHMENT NEEDED?

Discuss these questions with the FUG members.

- Is there an open patch with no trees in the community forest?
- Do FUG members prefer to use this area for grass production (or grazing) or would they prefer it to be tree-covered?
- If the area is protected, will natural regeneration take place? Is there are existing rootstock?
- Are FUG members prepared to carry out the labour required to plant and protect the area?

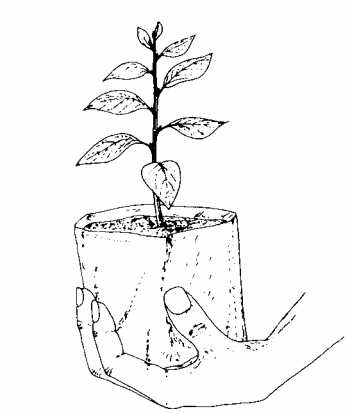
Although many FUG plantations have been established in Nepal there have been a number of problems with them. A few general conclusions which can be drawn include:

Tree planting

- Large plantations are very rarely successful. FUGs may not be able to protect large areas, and the effect on livestock owners may be serious if large areas are enclosed and protected from grazing. Normally not more than 5 ha should be established by any FUG in one year – preferably less than this.
- One of the main benefits of plantations is that large quantities of grass can be produced because of the protection. This creates a very quick benefit for FUGs, although there are also some disadvantages (see section 2.6)
- Apart from grazing, one of the main causes of plantation failure in Nepal has been the poor quality of plants used. It is

therefore better to produce a few high quality tree seedlings rather than a large number of poor quality plants.

- Another benefit of plantation establishment is that once an area is properly protected from grazing and fires, regeneration from existing rootstock or seed is often abundant. Sometimes the regeneration may be of species which are more preferred than those which were originally planted e.g. *chilaune, lankuri* and *tooni* often appear in established pine plantations once soil conditions start to improve. This creates new management options for FUGs e.g. selective thinning.



- The most successful plantations have been those where hardy and low demanding species such as khote salla; utis; khayer; have been used. This is often because plantation sites are usually very degraded with poor soils. More demanding species do not grow or survive on such sites unless special measures are taken (see Table 18 for examples).

Table 18 Management options for plantations

Option	*When and How ?*	*Advantages and Disadvantages*
Establish a village nursery	If there is a demand for a large number of tree seedlings in a village (often from a combination of private demand and plantation requirements) Sometimes DFOs can assist with the costs of this e.g. through buy back arrangements or supply of materials e.g. poly bags It is usually an advantage if the nursery is situated close to the planting area to reduce transport costs If there is going to be expense involved in establishing a village nursery, then there must be a demand for seedlings for at least 5 years for this to be worthwhile. DFO staff will need to ensure that training is given to nursery *naikies*	• Requires skilled labour and training – especially for some of the more difficult species • May only be temporary • Creates a work opportunity • Seed may need to be purchased or collected and seed supply may limit the range of species which can be grown • Equipment may need to be purchased • A reliable water supply is needed • Suitable land area is needed • Tree seedlings can be sold to other FUGs • Nurseries can diversify to also produce fruit trees, fodder trees, grasses and NTFP species • Allows the FUG to grow exactly the species they require for their own purposes

Option	*When and How ?*	*Advantages and Disadvantages*
Establish household nurseries	If there is a good demand for tree seedlings (both private and plantation requirements) A larger number of people will need to be trained in nursery activities.	• Creates opportunity for household income especially for women and poorer households • Difficult to ensure that supply of seedlings matches demand • Difficult to maintain the quality of seedlings, although sometimes very high quality plants can be raised by this system • Benefits can be spread more equally amongst FUG members
Plantation establishment with seedlings	This is the normal method of establishing plantations in Nepal with seedling production, pitting, planting and protection for a number of years. Some FUGs have built individual guards around planted trees using branches and thorny bushes. Animal manure is sometimes added to the planting pit – especially on harsh rocky sites	• Protection may be difficult to ensure especially if the area has formerly been used for open grazing, but from experience, small FUG plantations have higher seedling survival than large government plantings. • It will take several years before the plantation starts to give benefits in terms of fuelwood, timber etc. • Natural regeneration will often take place later once the site is improved by the planted trees. This is an opportunity to improve the plantation
Winter planting	Although normally plantations are planted in the monsoon season, some FUGs have successfully carried out winter planting. Seedlings are covered in leaves and leaf litter for frost protection. Shrubs and bushes in the plantation area should be kept since they also help to reduce frost damage	• Some FUGs have had good survival with winter planting. • A main advantage is that the work of pitting and planting can be done at a time of year when people are not too busy with their own farms
Enrichment planting	This has been carried out by many FUGs within areas of existing (but degraded) forest. In general enrichment planting has not been found to be successful or necessary, and it should not be done unless there is a clear reason for it.	• Can be used to introduce a new species where it does not already exist. • Often not necessary because of natural regeneration especially from rootstock which appears once the area is protected

Option	*When and How ?*	*Advantages and Disadvantages*
Taungya system (intercropping planted tree seedlings with agricultural crops)	When there is land scarcity and /or food shortage this system of allowing cultivation for food at the same time as establishing trees can be used. When protection is a problem or when land is scarce. It is essential to ensure that rules about cultivation have been agreed and written down to ensure that future problems do not arise.	• Often gives better seedling survival than normal plantations because protection is better • Taungya may not be consistent with the Forest Act which does not permit conversion of forest to agricultural crop land • It can be used to benefit landless and poor people • It is important to ensure that cultivators leave the land once the trees have been established (normally after 3 years)
Use mulch and compost for better establishment of planted tree seedlings	When soils are poor and dry they can be improved for tree planting by using mulches and compost either in the planting pit (before planting) or around the base of the planted seedling This is particularly important when demanding trees are being planted on low quality sites e.g. *Ficus* or other fodder spp. Also useful when a few valuable trees have been planted e.g. fruit trees or grafted trees.	• Gives better survival and growth of planted seedlings • Can be used to establish species which require better soils (e.g. khanyu and other fodder trees) • Expensive in terms of labour and time
Direct sowing	This technique has been used with species which may be difficult to raise in plantations (e.g. *sal*), or for which seed is readily available in large quantities (e.g. *utis*) Normally there are 2 techniques (i) planting a few seed directly into a prepared planting pit (ii) scattering seed widely over prepared ground (usually bare soil)	• Cheaper than raising plantations with seedlings • Often gives better growth than planted trees – but survival may be poor • Density of established plants may be very high
Watering planted seedlings	Watering (irrigation by hand) is sometimes used especially during the first few months after planting.	• Labour intensive and time consuming • Needs an accessible water source to the plantation • Can be used to improve survival of valuable trees, or if weather conditions are unusually dry

Option	*When and How ?*	*Advantages and Disadvantages*
Transplanting wildlings	This technique of taking wildlings from natural forests is sometimes used where seed is not available, or when it is not possible to grow certain species from seed. Some FUGs have successfully planted wildlings of fodder species which they have found on their own lands or outside the forest e.g. *Ficus* spp	• Can be damaging to the natural forest areas • Usually gives poor survival due to damage during uprooting or transport •

Plantation establishment

2.8 Bamboo management

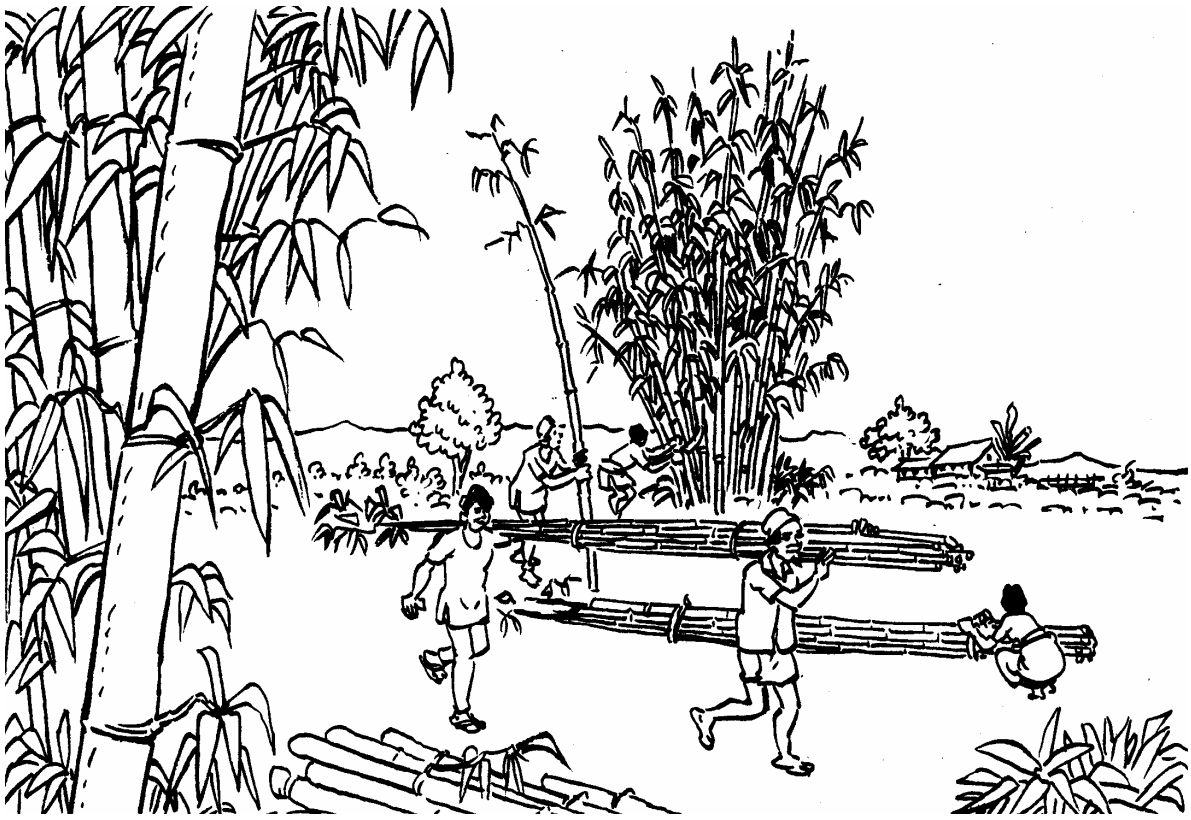
Bamboos are extremely important for rural people's livelihoods in Nepal, providing fodder, building material, cash income, handicraft materials, soil stabilisation, food and numerous small scale construction and tool uses. However, most bamboo produced in Nepal comes from private land rather than forest, and bamboo clumps in rural villages of Nepal are usually privately owned. This inevitably means that larger landowners (wealthier households) will have greater supplies of bamboo.

Despite the importance of private land compared with forest (especially community forest) for bamboo production, a number of FUGs have expressed an interest in planting and managing bamboo in their community forests.

Why manage bamboo?

There are several reasons why an FUG may wish to establish and manage bamboo inside their community forest.

- If there is a high demand for bamboo and if there is a local shortage in the supply
- If there are suitable sites within the forest for establishing bamboo – especially moist gullies or nalas
- Where bamboo is needed to control soil erosion
- Where there is a demand for income generation activities within the FUG.



Bamboo management

Table 19 Options for bamboo management

Option	*When and How ?*	*Advantages and Disadvantages*
Management of bamboo clumps	An established bamboo clump needs to be managed to maintain its productivity. If it is neglected, it will become congested and less productive. Management involves cutting 3 year old culms from the clump. It is important to protect younger culms, and ensure that culms in the centre of the clump are cut as well as those on the edges Protection form grazing is also required In addition to cutting culms, soil heaped around the clump (mounding) will stimulate the production of new culms every year by conserving moisture	• Bamboo can be very productive. A single large and well established clump can produce 10 or more culms every year with good management. • In a community forest, benefit sharing can be a problem. Some FUGs allow households to "own" their own clumps inside the forest, and harvest these as they require.
Establishment of bamboo plants	Bamboo can be raised from rhizome or culm cuttings in prepared nursery beds. After a year, they can be planted in the forest. A single culm can be separated from the clump during the winter and kept moist. It can be planted after it has started to sprout in the monsoon. 30cm long culm cuttings (with 3-7 nodes) taken from 2-year old culms can be used as cuttings and planted in a deep pit. Suitable sites for bamboo are in deep soils with some moisture – especially *nalas* Some FUGs have planted bamboo around the boundary of their community forest to mark the boundary.	• Establishment of bamboo clumps in the community forest can lead to ownership problems unless there are clear FUG rules. • Collecting rhizomes from member households needs cash for payment
Management of bamboo for fodder	Bamboo is an important fodder plant in many areas although it is better as winter season roughage rather than for increased milk production. In some FUGs it is common practice to lop all the leaves from the culms (except for the final shoots) for animal fodder.	• Bamboo managed in this way produces fodder during the season of scarcity • Regular lopping helps to stimulate new leaf growth • If done in the wrong season it can reduce culm growth)

Bamboo clump

2.9 Leaf litter, compost and fodder management

Leaf litter (*syaula*) for making compost is one of the most important products from community forests since the agricultural system is very dependent on this. In addition other products such as *sotar* (green bedding for animals) and *ghas* (fodder for animals) are also collected. For all these products, katus-chilaune and oak forests are very much more important than pine or other conifer forests.

Why manage leaf litter, compost and fodder?

There are a number of reasons why FUG members may wish to use their community forest for the production of leaf litter, leaf compost and animal fodder.

- All these products are essential to subsistence farmers for maintaining and sustaining their agricultural practices
- Leaf litter collected from the forest and applied to agricultural land (especially after composting in a mixture of animal manure) improve the fertility of the land and gives better crop yields
- Use of organic composts save the need for expenditure on chemical fertilisers for better yields, and is also less harmful to the environment

Collecting leaf litter

Table 20 Management of forest for leaf litter production, compost and fodder leaves

Option	*When and How ?*	*Advantages and Disadvantages*
Unrestricted collection of dry leaf litter from the community forest	Many FUGs allow unrestricted collection of leaf litter from their forest. Broadleaf species produce litter which is better than conifers. *Utis, okhar, chilaune and angeri* are considered as particularly good for compost making because they decompose quickly. *Sal* is not a favoured species for compost making in many places because it is slow to decompose. Use of *sal* and conifer species in compost is said to encourage termite attacks on crops in fields where this has been used Pine leaf litter is sometimes burnt in heaps and the resulting ash used as fertiliser especially for millet Leaves are collected by raking them and putting them into a large basket. This is usually done by women in the early morning They are usually mixed with animal manure for some months before being spread onto fields.	• Careless raking to gather up leaves can destroy and seedlings which have regenerated • Removal of dry leaves reduces fire risk • Fertility and structure of forest soils may decline in the longer term if leaves are continuously removed. • Removal of leaves from the soil surface may lead to an increase in soil erosion on steeper slopes –especially where soils are already compacted through grazing • Wealthier people who have more land and livestock are most likely to benefit from free leaf litter collection
Controlled collection of dry leaf litter from community forest	Some FUGs have adopted a system for controlling leaf litter collection e.g. by opening the forest at certain times of year (usually for some days during the period December-April). Leaves are not normally collected during June-October because wet leaves are difficult to collect. Sometimes, limits on the amount of litter each household can collect are imposed. Occasionally there is a fee for litter collection After fuelwood harvesting, small twigs and leaves may be left in the forest for several months (until after the monsoon). They are then collected when they have started to decompose.	• A payment system ensures that equity issues are being addressed to a certain extent. • Leaving the leaf litter inside the forest during the monsoon may assist in controlling soil surface erosion. • A fixed timetable for leaf litter collection makes supervision easier

Option	*When and How ?*	*Advantages and Disadvantages*
Collection of green bedding from the community forest	Green bedding refers to plants which are normally collected whilst green and placed in animal stalls. After mixing with manure the compost produced is put onto agricultural fields	
Fodder collection from the community forest	Several species found in community forests are suitable for livestock fodder, including kharsu, phalant, phusre, jhingano, katus. These leaves are fed directly to livestock. Many FUGs have rules on fodder collection from community forests e.g. only cut fodder from larger trees; do not remove all the fodder from a single tree in any one season; area rotation systems with certain blocks opened for fodder cutting at certain times of year; fee payment systems	• Excess fodder lopping can reduce seed production which may then reduce the amount of natural regeneration occurring. • Similarly, excess fodder lopping may reduce tree growth • Control and distribution of fodder from community forests can be a problem because different households may have different requirements for fodder.
Establishment of fodder trees in the forest	There are many fodder species which are scarce in forests, but occur mostly on private lands. Some FUGs have started to plant these inside their community forests. Some FUGs have dug very large pits, filled them with compost and good soils, and have planted fodder species in these with some success.	• Fodder trees generally need good soils – often the sites available for planting or poor and infertile. • To produce the maximum amount of fodder, a large crowned tree is needed. Therefore forest management for fodder production should have widely spaced trees which can develop big crowns.

Annex 1 – Glossary of Nepali names

Nepali Name	**Botanical name**
Alaichi	*Amomum subaltum*
Allo	*Girardinia diversifolia*
Amala	*Phyllanthus emblica*
Amliso	*Thysanolaena maxima*
Amp	*Mangifera indica*
Angeri	*Lyonia ovalifolia*
Argeli	*Edgeworthia gardneri*
Badahar	*Artocarpus lakoocha*
Barro	*Terminalia bellirica*
Bayer	*Zizyphus mauritiana*
Bel	*Aegle marmelos*
Bhimal	*Grewia optiva*
Chilaune	*Schima wallichii*
Chiraito	*Swertia chirata*
Chiuri	*Aesandra butyraceae*
Chutro	*Berberis asiatica*
Dhangre salla	*Taxus baccata subsp. Wallichiana*
Dhupi	*Juniperus spp.*
Harro	*Terminalia chebula*
Hattibar	*Agave sp.*
Jamun	*Syzygium cumini*
Jatamansi	*Nardostachys grandiflora*
Jhingano	*Eurya acuminata*
Kafal	*Myrica esculenta*
Katahar	*Artocarpus heterophyllus*
Katus	*Castanopis spp.*
Khanyu	*Ficus semicordata*
Kharsu	*Quercus semecarpifolia*
Khayer	*Acacia catechu*
Khote salla	*Pinus roxburghii*
Koiralo	*Bauhinia variegata*
Lankuri	*Fraxinus floribunda*
Lapsi	*Choerospondias axillaris*
Lokta	*Daphne bholua; D, papyraceae*
Machhino	*Gaultheria fragrantissima*
Mahuwa	*Madhuca longifolia*
Majitho	*Rubia cordifolia*
Malu	*Bauhinia vahlii*
Nagbeli	*Lycopodium clavatum*
Neem	*Azadirachta indica*
Nigalo	*Arundinaria falcata*
Okhar	*Juglans regia*
Phalant	*Quercus glauca*
Phusre	*Lindera pulcherimma*
Ritha	*Sapindus mukorossi*
Rudraksha	*Elaeocarpus sphaericus*
Sal	*Shorea robusta*
Sunpati	*Rhododendron anthropogon*
Suntala	*Citrus sp.*
Tej pat	*Cinnamomum tamala*
Tendu	*Diospyros malabarica*
Timur	*Zanthoxylum armatum*
Tooni	*Cedrella toona*
Utis	*Alnus nepalensis*

Nepali	***English***
Achar	Chutney
Bhag	Block (division of the forest)
Bari	A headload (e.g. of fuelwood or fodder)
Ghas	Fodder
Kami	Blacksmith
Katha	Cutch (extracted from Acacia catechu)
Kharbari	Land used for grass production
Khet	Irrigated land
Lauro-palo	A system for rotating forest watchers
Mana-pathi	A payment system based on giving foodgrain
Naike	Nursery operator
Nala	Gully or stream
Sotar	Green bedding leaves
Syaula	Dried leaves
Tole	Hamlet

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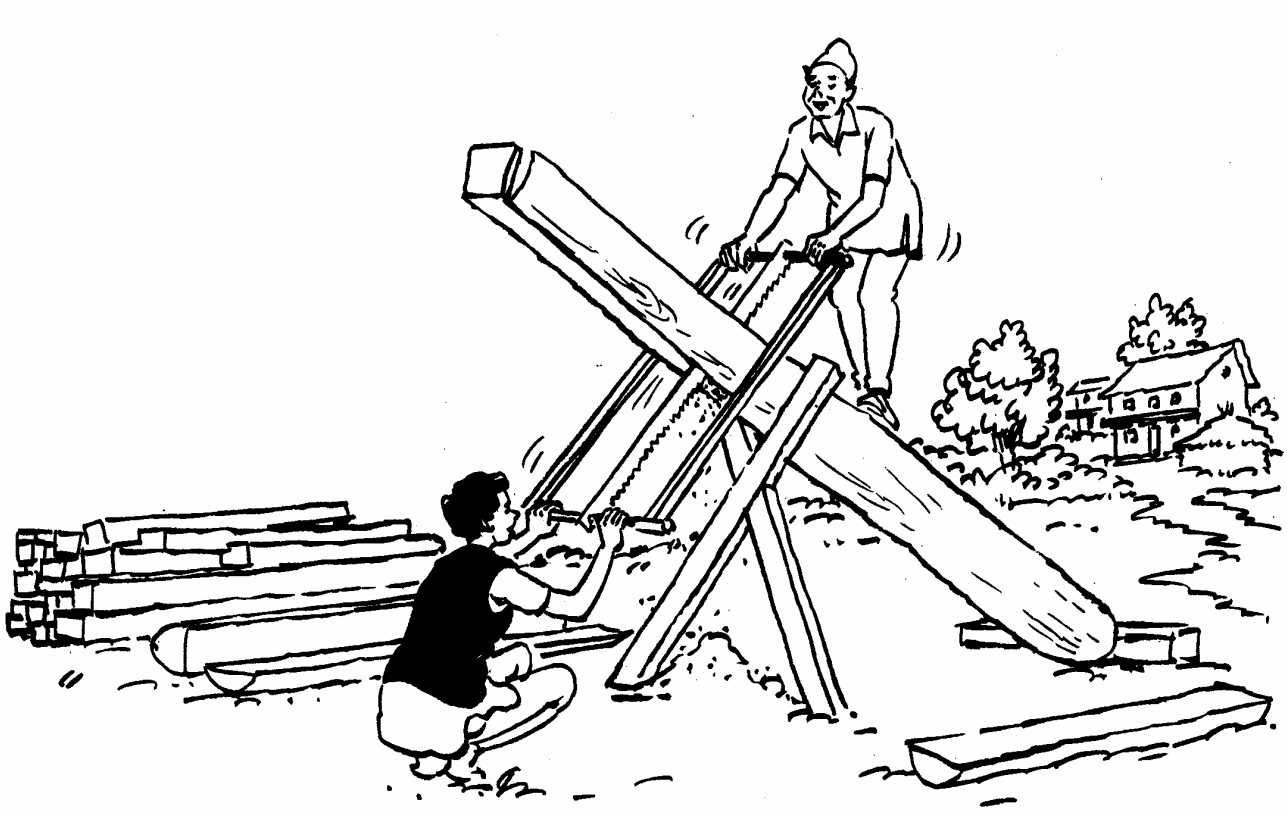

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