Technical guidelines on Community Forest Management (CFM)

Guidelines for simple silvicultural practices in community forests in Vietnam

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1. INTRODUCTION

1.1. Concept of silviculture techniques in CFM

The differences between conventional silviculture techniques and the ones in CFM

There are differences between conventional silviculture techniques applied by State Forest Enterprises (SFEs) and forest companies and silviculture techniques applied in CFM.

Criteria for comparision	Conventional forestry	CFM
Volume of timber of one harvest	Large (based on the economic efficiency of the harvest)	Small (mainly for household needs and some for trading)
Silviculture solutions applied	Selected harvesting with large volume (all the timber increment over 20 years)	Selected harvesting of individual trees based on diameter class, small volume (based on the sustainable forest model, criteria of selecting trees for harvesting)
Harvesting cycle	Not regular ("harvesting" and "waiting")	Annually
Techniques applied	Machine harvesting and transportation	Use of local simple tools for harvesting and transportation
Impacts on the environment	High impact on the land, regenerated trees and other trees due to the use of machines and the large volume of harvesting	Low impact on the land, regenerated trees and other trees due to the use of simple tools and the small volume of harvesting
Requirement to maintain the forest after harvesting	Very high (due to high impact on forest resources)	Low (depends on the selection of the trees for harvesting and logging techniques)

Silviculture techniques applied in CFM aim at harvesting a small volume to meet the requirement needs of households (including some for trading), which can be made regularly and sustainably. Manual tools are normally used for harvesting and are appropriate with local resources. Such harvesting in CFM is considered as "low impact harvesting".

Therefore, in order to sustainably manage forests in CFM, silviculture techniques that are appropriate using local resources and local ecological knowledge should be applied. These simple guidelines will help communities to organize sustainable management of their forests.

Principles to apply silviculture techniques in CFM

In order to manage community forests in a stable manner and appropriately with local resources and needs, the following principles apply in the development of silviculture techniques for CFM.

Principles	Results
Participation of local people and communities	Improvement of community capacities in forest management Local people can apply techniques themselves
Multi purpose use of forests	CFM meets the needs of product diversification of local communities such as timber, NTFPs (food, medicinal plants, materials…) Low impact on forests as other functions of forests are maintained: production, protection, gene conservation and biodiversity
Application of local ecological knowledge and experiences	Local knowledge and experiences on the use of forest products (medicinal plants, materials, food…) are integrated to meet the needs of communities and multi purpose use of forests
Local silviculture techniques combined with scientific knowledge	Forest harvesting has low impacts on the environment and is appropriate with communities resources
Balance of supply and demand to ensure sustainability	Regularly meets the need of forest products for communities and maintains forest stock in a stable manner
Cost-effectiveness	Optimizes the use of time required and other resources so that it is appropriate with local communities

Sustainable forest model is considered as the basis for sustainable use of natural forests

The sustainable forest model is an orientation model that is used to compare with the current status of forests to identify the number of trees that can be harvested from different diameter classes in 5 years.

The basics of the development and application of the sustainable forest model for sustainable use of forests in CFM are:
 ➢ Sustainable forest model has a negative exponential curse in accordance with the increase of diameter classes. The model creates the sustainability of forests based on the diameter growth. Forest is structured to get appropriate yields for each management goal developed by local communities and is stable for each ecological zone, each forest type in different conditions. The model therefore should be developed for each ecological zone, each forest type and management goal.

 ➢ Comparing the actual number of trees in each forest block with the sustainable forest model in accordance to diameter classes. The surplus is the number of trees increased in each diameter class within 5 years. Communities are allowed to harvest and benefit from these trees while forest stock is still maintained. The harvesting of these trees will be planned by communities, which should be

appropriate with labor force, use needs and market demand.

➢ The application of sustainable forest model is simple because villagers only need to count the number of trees in different diameter classes visualized by a colored tape. Communities therefore can implement the forest inventory by themselves. The comparison between actual forests with the model is also visualized by drawing a histogram. Communities can compare the supply and their own demand to identify the harvest required whilst at the same time maintaining the forest stock for sustainable development of the forests in the future.

➢ Forest inventory is conducted every 5 years to identify the number of trees in each diameter class. It is then compared with the model to develop a 5-year forest management plan and annual plan.

➢ The sustainable forest model is developed by professional organisations; approval of a functional institution is needed for the basis of application.

In Dak Nong, a sustainable forest model has been developed. The value of diameter class is 5 cm (based on the diameter growth after 5 years which is about 5 cm). However, in order to simplify the application of the model, two diameter classes close together are combined so the value of the diameter class now becomes 10 cm (a reduction of the number of diameter classes allows a simple comparison).
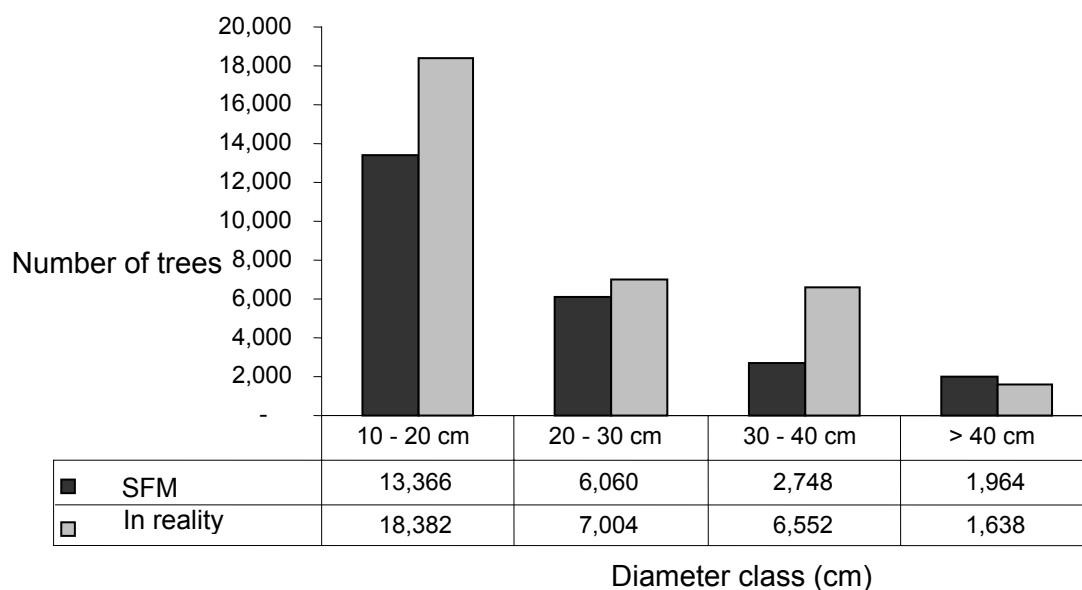
The sustainable forest model with diameter class of 5 cm
The evergreen forest in Dak Nong Province
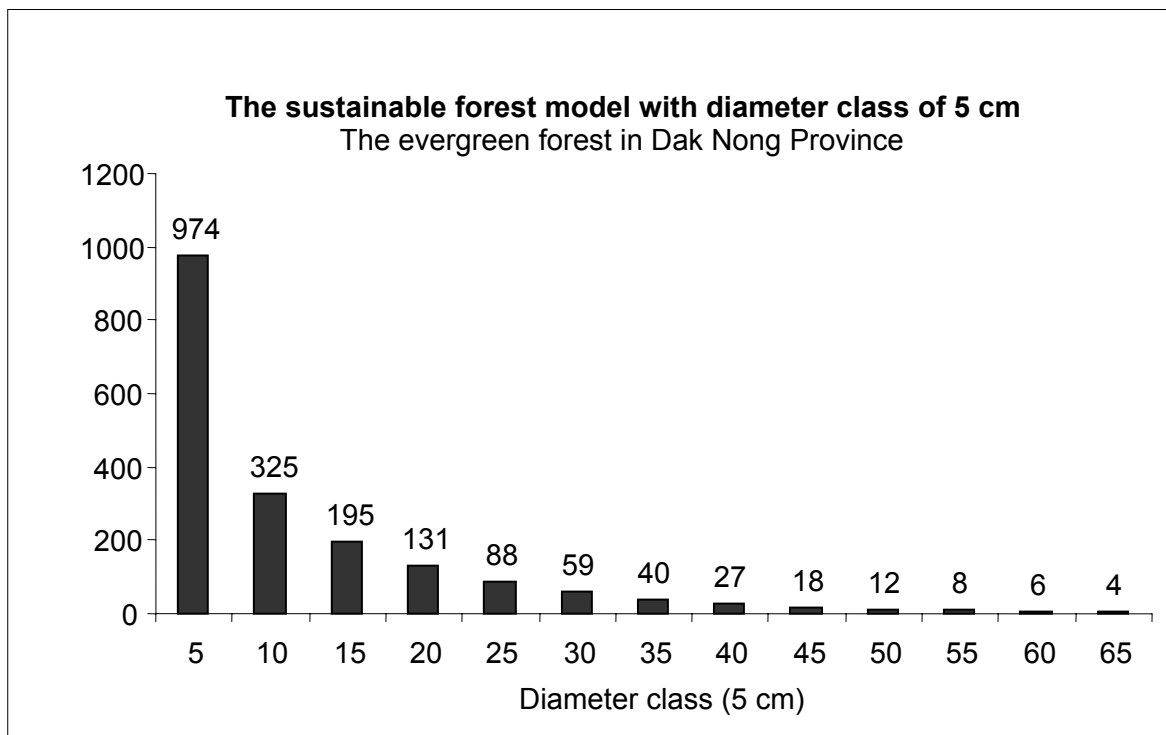
The sustainable forest model with diameter class of 10 cm
Evergreen forest in Dak Nong Province

Number of trees/ha

	10	20	30	40	> 40
■ Trees of SFM	1299	326	148	67	48

Diameter class (cm)
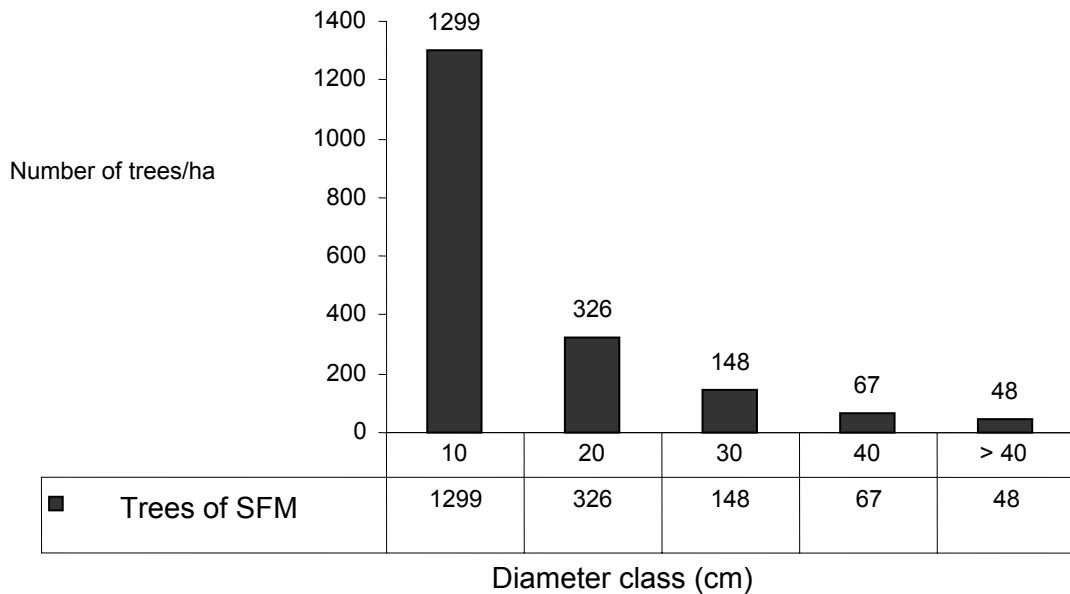
When comparing number of trees in each forest block with the model, the number of trees per ha of the model is multiplied by the area of the block. For example, when comparing Dang Ta Rlang block with an area of 41 ha with the model, the surplus trees are identified in different diameter classes (three diameter classes < 40 cm have surplus trees, the diameter > 40 cm lacks trees). The result is the number of trees that can be harvested in the next 5 years (the chart below shows the comparison of number of trees in diameter classes larger than 10 cm).

Comparison between number of trees in each block with the sustainable forest model
Block Dang Ta RLang, area 41 ha village Bu Nor, Dak R'Tik commune, Dak RLap, Dak Nong Province

Number of trees

	10 - 20 cm	20 - 30 cm	30 - 40 cm	> 40 cm
■ SFM	13,366	6,060	2,748	1,964
□ In reality	18,382	7,004	6,552	1,638

Diameter class (cm)

1.2. Objectives and target users of the guidelines

Objectives of the guidelines

➢ To provide basic principles in application and development of silviculture solutions with the participation of local people
➢ To support forestry and extension officers who provide training on silviculture to farmers
➢ To be the basis for organization and monitoring of the implementation of the annual CFM plan that has been approved

Target users of the guidelines

➢ Extension and forestry officers working with local communities in implementation and monitoring of CFM
➢ Local authorities and staff dealing with monitoring and management of CFM
➢ Forestry and extension students of universities, especially forestry students from technical high schools dealing with social forestry, community forestry and extension subjects

2. REVIEW OF SILVICULTURE TECHNIQUES IN CFM

System of silviculture solutions in CFM

The system of silviculture techniques needs to be developed based on the practical needs in CFM.
In Vietnam, special use forests are managed by state institutions. Only protection and production forests are allocated to communities, household groups and individual households for long term management and use. Therefore, silviculture techniques should be developed for these two types of forests.

A 5-year forest management plan and annual forest management plans of communities and household groups are developed for natural forests and forestry bare land.
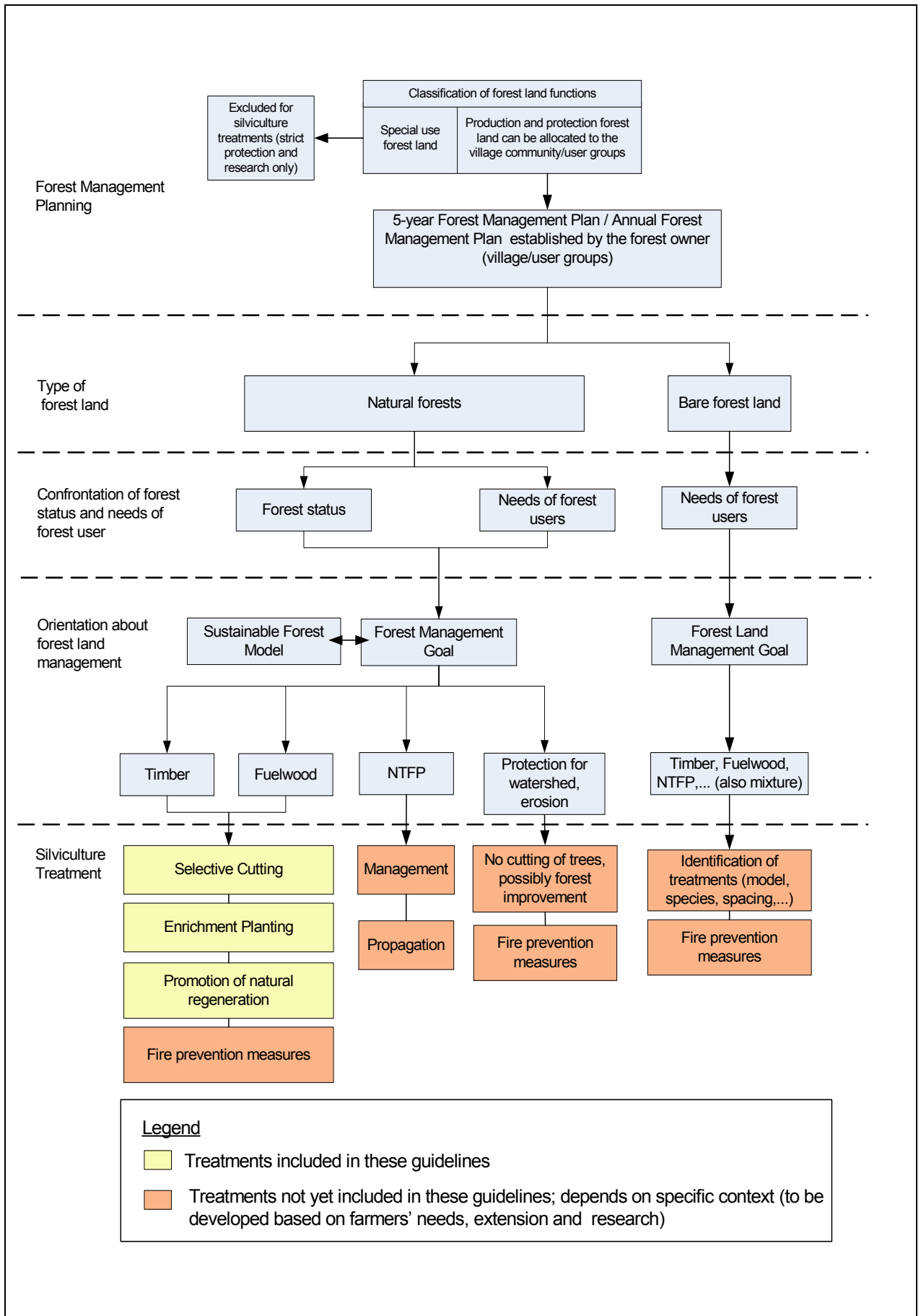
Bare land is mainly used for forest plantation or an agroforestry application. The solution chosen depends on the needs and resources of local people and specific ecological conditions of the locality. Additionally, there are now some procedures for plantation of some forestry species and guidelines for the implementation of '5 million ha of forest plantation'. When developing solutions for bare land it is recommended to make reference to these documents and apply the guidelines specifically for each locality. Therefore these guidelines do not include solutions for bare land.

For natural forests that have been allocated to communities and household groups, depending on the current status of the forests, management and use needs of local people, forests are compared with the sustainable forest model to propose silviculture techniques. The following basic solutions are:

➢ for timber and firewood: selected harvesting, forest enrichment, promotion of natural regeneration and forest fire prevention are recommended.
➢ for NTFPs: management solutions and propagation are recommended
➢ strict protection: forest protection, forest maintenance and fire prevention are recommended.

Forest blocks aiming at development of NTFPs and protection, technical solutions must be developed specifically for each locality (based on natural conditions, local needs and resources, market, available local and scientific knowledge) and these are not mentioned in these guidelines.

The guidelines focus on basic silviculture techniques applied to natural forests aiming at timber and firewood production to support life and trading activities of communities.

Forest Management Planning

Classification of forest land functions

| Special use forest land | Production and protection forest land can be allocated to the village community/user groups |

Excluded for silviculture treatments (strict protection and research only)

5-year Forest Management Plan / Annual Forest Management Plan established by the forest owner (village/user groups)

Type of forest land

Natural forests

Bare forest land

Confrontation of forest status and needs of forest user

Forest status

Needs of forest users

Needs of forest users

Orientation about forest land management

Sustainable Forest Model

Forest Management Goal

Forest Land Management Goal

Timber

Fuelwood

NTFP

Protection for watershed, erosion

Timber, Fuelwood, NTFP,... (also mixture)

Silviculture Treatment

Selective Cutting

Enrichment Planting

Promotion of natural regeneration

Fire prevention measures

Management

Propagation

No cutting of trees, possibly forest improvement

Fire prevention measures

Identification of treatments (model, species, spacing,...)

Fire prevention measures

Legend

Treatments included in these guidelines

Treatments not yet included in these guidelines; depends on specific context (to be developed based on farmers' needs, extension and research)

The three main silviculture methods to be applied for natural forests which are introduced in this handout

1. selective cutting
2. forest enrichment
3. promotion of natural regeneration
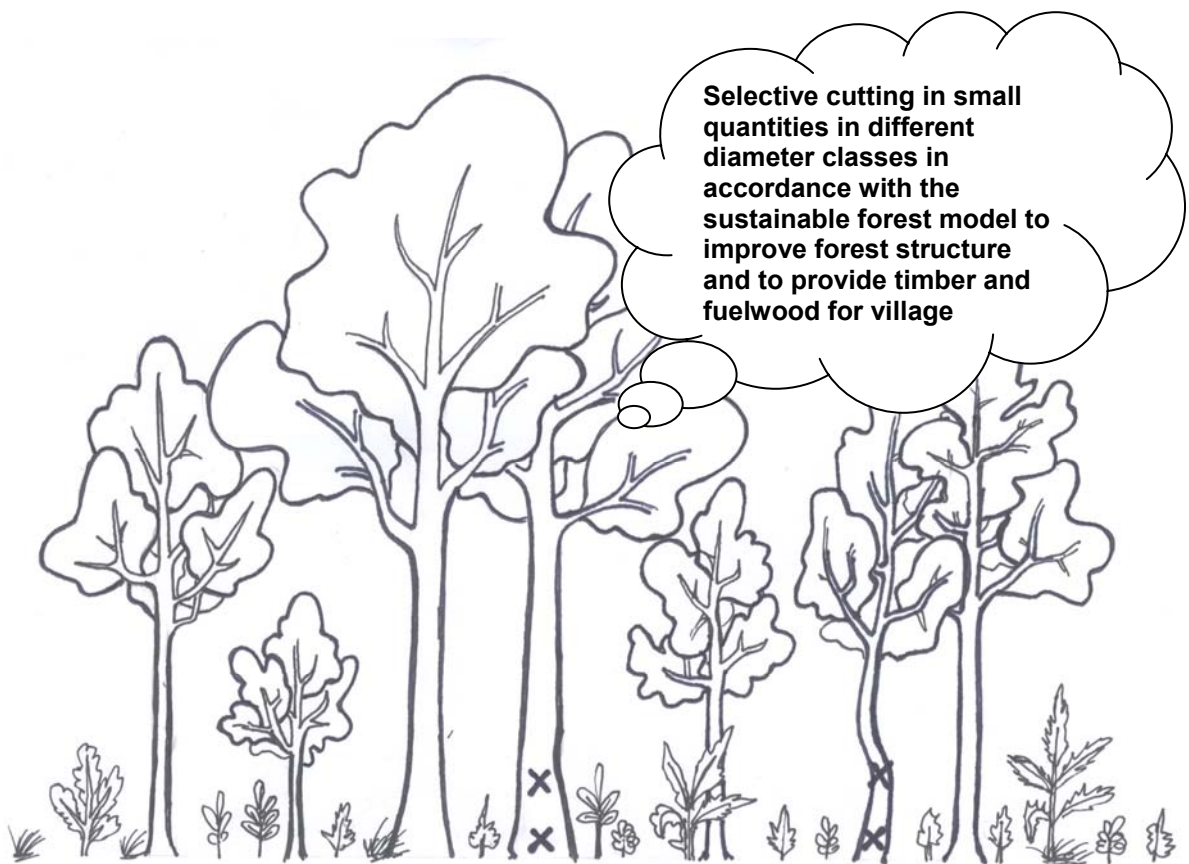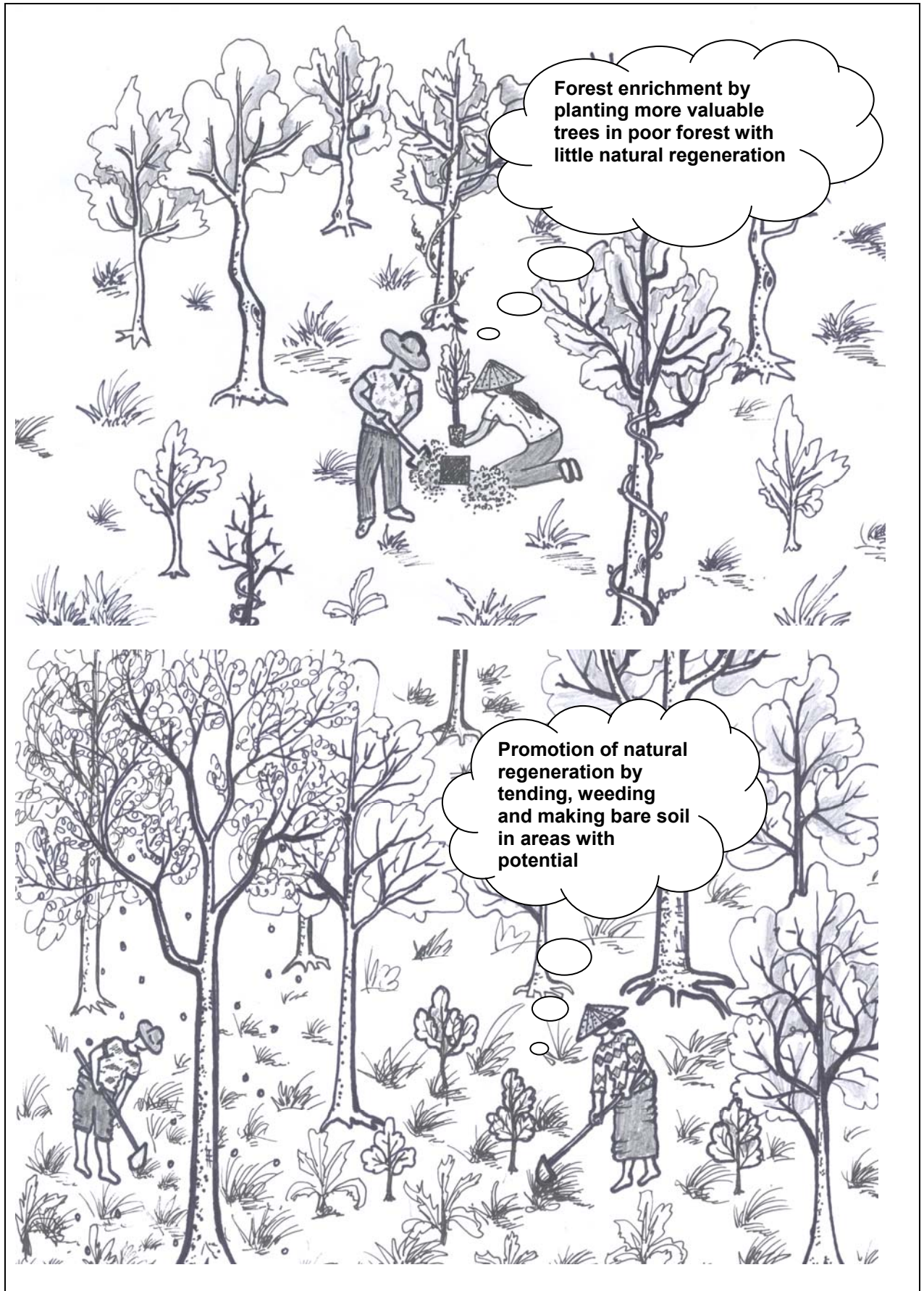
3. SELECTIVE CUTTING

3.1. Concept, goal and types of forest for selective cutting

What is selective cutting in CFM?

In CFM, selective cutting is a silviculture treatment combining 2 conventional treatments that of harvest and thinning.

In conventional forest management, selective cutting is implemented with a high volume that focuses on big timber trees, with high economic and market value whilst thinning is mainly carried out in the lower layers to improve the forest after harvesting.
CFM selective cutting combines both of these solutions. The result is that the harvest doesn't focus too much on big timber trees and at the same time cutting of selected average and smaller trees can be made for other uses.

Selective cutting in CFM includes cutting of small, average and big trees based on the sustainable forest model. This solution was developed to meet the various needs of local people such as housing, stabling for animals, fencing, firewood or selling (depending on forest status and marketing access of the local people). The harvesting is in low volume and implemented based on the approved 5-year and annual forest management plan of the communities.

Goal of selective cutting

There are two goals of selective cutting in CFM:
  ➢ Harvest a certain volume of timber and firewood of different size, species and quality for various needs of households and communities and partly use some for trade (depending on the forest status and local market)
  ➢ Step by step, adjust forest structure towards the structure of sustainable forest model, appropriately with the forest management goals of communities by low volume and regular harvesting based on the model.

Types of forests for selective cutting

In conventional forest management, selective cutting is applied to forest blocks that have rich forest stock with many trees of mature diameter classes for big timber harvesting (as per the Decision 40/2005/QDD-BNN dated 07/07/2005 on Regulations of timber and forest products harvesting of MARD). On the other hand, thinning is carried out in poor/degraded forests and forests after heavy selective cutting in order to improve the structure of the middle and low tree layers.

In CFM, forests where selective cutting can be applied include almost all natural forests such as young forests, poor/degraded forests, average and rich forests as long as the two following

conditions are met:
> ➢ the number of trees compared to the sustainable forest model give a surplus of trees in different diameter classes for harvesting
> ➢ households and communities want to harvest these surplus trees for household uses or for sale.

Selective cutting in CFM doesn't need to wait until forests reach a certain level of stocking capacity with big timber trees like in conventional forest management. For example, in young or poor/degraded forests communities can cut some small trees for fire wood and home use, and in average forests some big timber trees can be harvested for home use and selling.

Main contents of the guidelines for selective cutting in CFM

- How to do selective cutting based on the sustainable forest model and annual forest management plan and effectively support wood harvesting activities in the forests.
- How to reduce impacts from harvesting on land, near to water sources and to minimize the loss of surrounding trees and regenerated trees especially trees that would be the target trees later
- How to maximize the wood volume from the harvested trees to improve the usage efficiency
- How to ensure the safety of people who work in and nearby the harvesting area

3.2. Silviculture techniques in selective cutting

Identification of species that are not allowed to be harvested as defined by the State and communities

Before identifying trees for harvesting, it is necessary to identify species that are not allowed to be harvested that include 3 groups:
- Valuable and rare species mentioned in Red Book and the Decree 48/2002/ND-CP on the list of wild, valuable and rare animals, plants and trees.
- Valuable and rare species that are defined culturally by the communities
- Trees and species that need to be kept for propagation

Discussions need to be made with communities as to why these trees need to be protected. Based on the list of the Decree 48, a discussion with farmers will result in a list of species that are available in the locality and need protection and tabulated (see table)

Species defined for protection by the government

No	Species		The availability of these species in the locality (abundant, medium, rare)
	Common name	Local name	

Discuss with local people about valuable and rare species, valuable mother trees, species that are used not as timber but for other uses (as bark, leaves, roots, flowers, fruits, etc. for medicinal materials and food) by the communities. Tabulate them in the table below:

Species for protection as defined by the community

No	Species		The availability of these species in the locality (abundant, medium, rare)	Parts of trees for use (leaves, flowers, fruits)	Use
	Common name	Local name			

Harvesting season

Timber harvesting including selection of trees for harvesting, preparing a track for transportation, tree logging, timber cutting, transportation and post harvest clean up needs to be done in the dry season. The first activities need to be done at the start of the dry season and the last activities need to be done before the start of the rainy season. Harvesting season depends on the weather as well as the agricultural crops. Therefore, a harvesting plan should be made together with communities to make the actual harvesting time appropriate. A simple form of harvesting schedule that could be used as guidelines for discussion with local people is below.

Agenda for harvesting

No	Activity	When	Where	Person responsible
1	Selection of trees for harvesting			
2	Prepare trail for transportation			
3	Cutting			
4	Transportation			
5	Clean forest after harvesting			
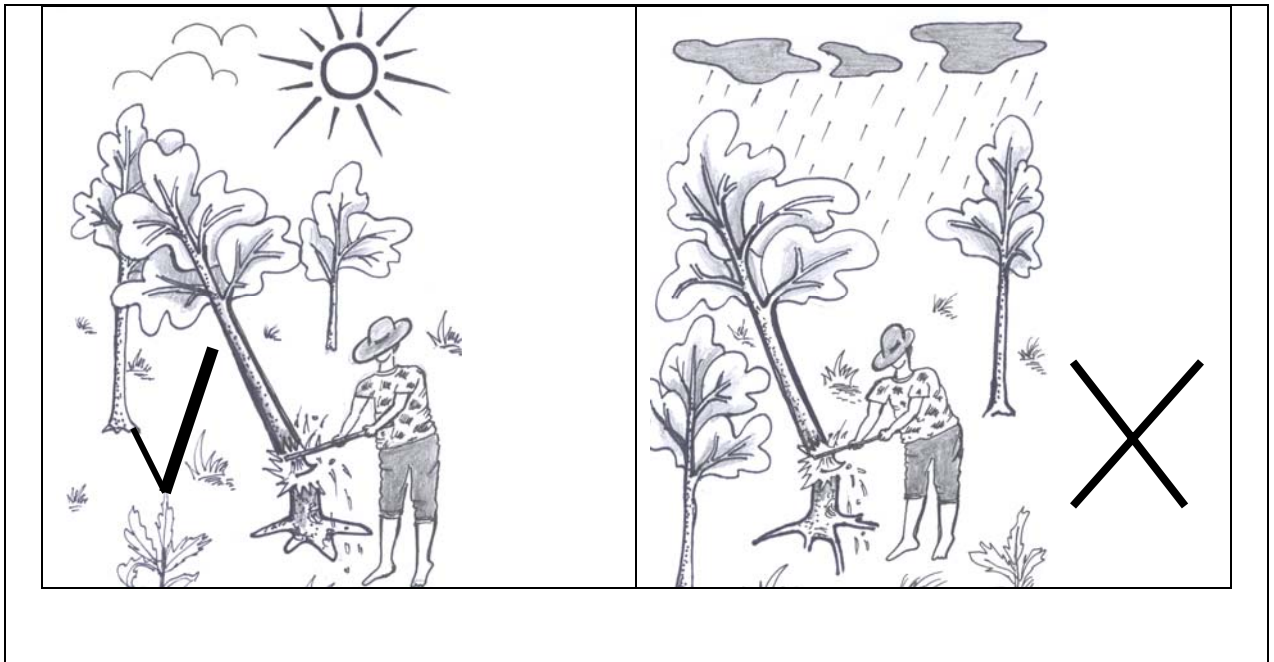
Number of trees for harvesting in each diameter class must be within the limit of the forest management plan

After the forest inventory and comparison of the data with the sustainable forest model the number of trees for harvesting must be quantified and written down on the 5 year and annual forest management plan. The annual harvesting volume in each diameter class must not be higher than the number of trees for harvesting defined in the plans. This data helps to guide the identification and appraisal of the trees that can be harvested in a specific forest block.

Number of trees for harvesting in 5 years and in 2006
(Cited from 5 year forest management plan and 2006 forest management plan of Bu No village)
Block Dang Ta RLang, area 41 ha

Diameter class (cm)	Number of trees harvested in 5 years of the block	Number of trees harvested in 2006 of the block
10 – 20	5,016	1,003
20 – 30	944	189
30 – 40	3,804	761
> 40 cm	-	-

Selection of species for harvesting

Before harvesting, it is necessary to discuss in the communities about species for harvesting for different purposes such as:
- Species for home use: housing, animal stabling, materials, tools
- Species for firewood

- Species for selling
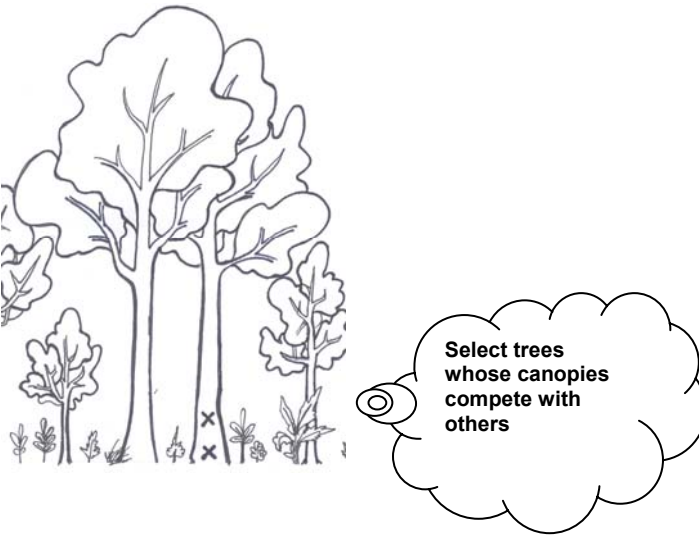
The important principle is to meet the demand of the village and simultaneously to ensure that harvesting is not concentrated on 1 or 2 species as this can result in reduction of biodiversity.

List of species for harvesting (tentative)

No	Species		Purpose of harvesting (housing, furniture, fuelwood or for sale ....)
	Common name	Local name	

Criteria for selection of other species

The selection of trees for harvesting needs to be based on comprehensive criteria since harvesting with consideration of negative impacts to the forest can provide both timber and fuelwood and help in improving the forest condition and the environment afterwards.

Criteria for selection of trees	Illustration
Canopy competition (main criteria) Select trees whose canopies compete with others. Trees that will be logged are weaker than others.	Select trees whose canopies compete with others

Harvest trees that have disease or are twisted. This reduces the potential epidemic to forests and increases forest quality afterwards.	

Cut trees, ensure that forest canopy after harvesting is not smaller than 0.5 (50%) Forest condition can be maintained since forest canopy remains at a certain level and weeds or shrubs cannot increase.	
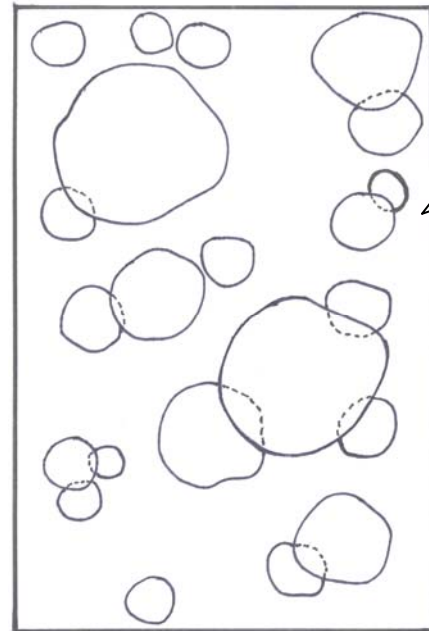
To ensure appropriate distance between trees after harvesting corresponding to each diameter class

This means that when harvesting a tree in a certain diameter class, the distance between two remaining trees in the same diameter class should not exceed a certain length otherwise erosion, weeds or shrubs might increase if the distance is large.

The appropriate distance between two trees after harvest in accordance with diameter class
(an example of evergreen forest, Dak Nong)

Diameter class (cm)	Ni/ha SFM	The space for one tree (m²/ha) (Sti)	Appropriate distance (Li) between two trees (m)
10 – 20	326	30.7	6
20 – 30	148	67.7	9
30 – 40	67	149.2	14
> 40	48	208.8	16

Ni: = number of trees/ha in certain diameter class
Sti = space for one tree in certain diameter class

The distance is bigger than the appropriate length (Li) or bigger than twice diameter of canopy

The appropriate distance between two trees that are close to each other can be calculated based on the sustainable forest model. Each region has its own different SFM, so it must be based on the regional SFM. The formulae of the calculation is as follows:

$$Sti = \frac{10^4}{Ni/ha} \quad \text{and} \quad Li = 2\sqrt{\frac{Sti}{\pi}}$$

In case, SFM is not available, it should be ensured that the open space between two trees (in the same diameter class with the trees harvested) after harvesting is not twice as big than the diameter of the canopy.

The distance between two trees is as twice as big as the canopy
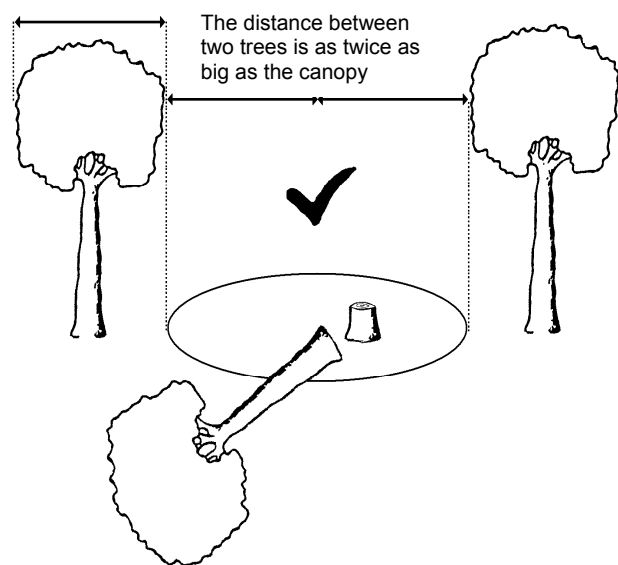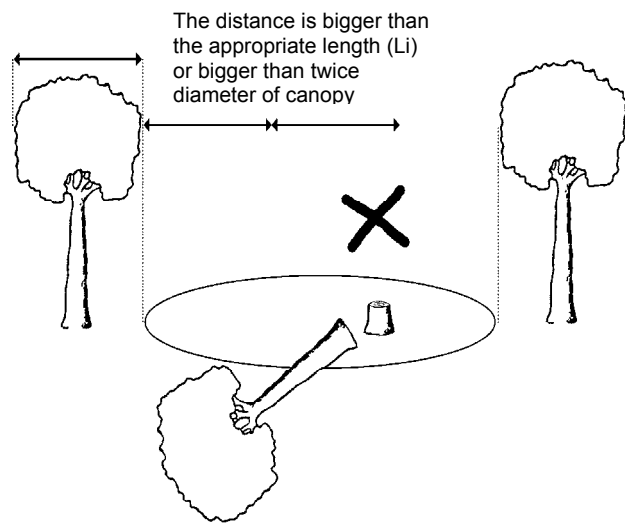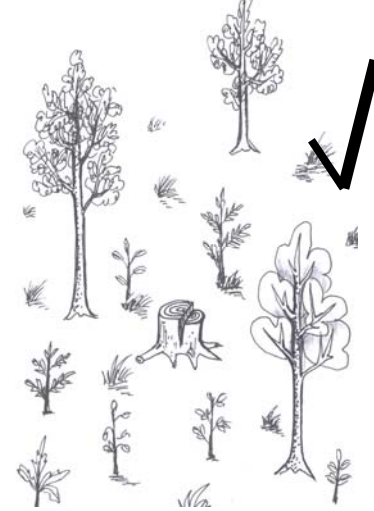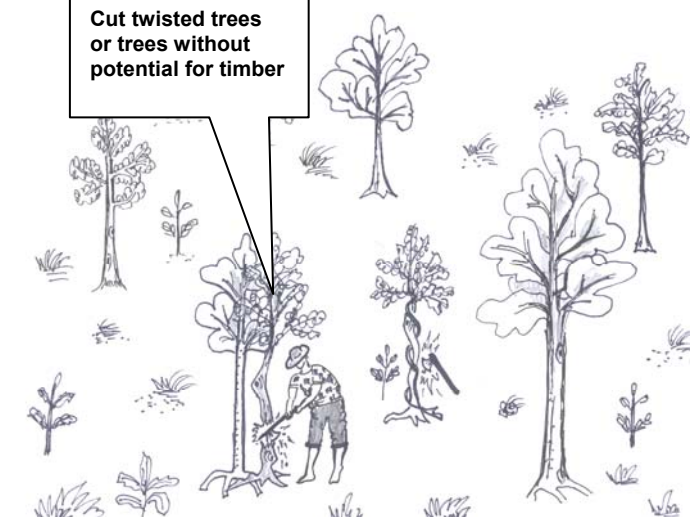
Trees harvested should not be close to streams or rivers.
This is to protect the area close to streams and rivers from erosion, and keeps water clean for living purposes.

Width of river or stream (m)	Width of area close to river (m)
< 1	*no area*
1-10	20
11-20	50
21-40	80
> 40	200

(Resource: SFDP Song Da)

Do not cut trees on a slope, steep and/or rocky topography. If harvesting of big trees could damage smaller ones downhill or has potential for erosion, trees should not be cut.	
Cut trees in areas with enough small trees or natural regeneration as the cut trees would be replaced in the future Small trees will grow and replace big trees that have been harvested. 	

Cut trees for fuelwood
 	
Priorities are given to the following trees:
 	
    ▪ Dead trees, twisted trees
    ▪ Trees that do not have potential for timber (including for domestic consumption or sale)
    ▪ Trees that are competing with valuable trees (for example canopy competition)
    ▪ Thinning
Remark: Villagers in some communities should use dead trees and dry branches instead of cutting fresh trees for fuelwood.
	Cut twisted trees or trees without potential for timber

Marking trees for harvest and then listing them

When selection of trees for harvesting is finished, marking of the trees is then conducted. Eventually a list of the marked trees is prepared.

Marking trees for harvesting Trees that are selected for harvesting will be marked with paint in two positions: one at the breast height and the other one near the stump.	

Trees marked are defined in terms of species, diameter class and then recorded in a list. This can serve as baseline data to compare the number of trees marked with the annual harvesting plan of the forest block.

The list of marked trees for harvesting
Block Dang Ta RLang, area 41 ha

Species	Number of trees marked in accordance to diameter class (cm)				Total trees harvested/block
	10 - 20	20 – 30	30 - 40	> 40	
A					
B					
C					
.....					
Total trees marked/block					
Total trees proposed for harvest in 2006 annual plan	1,003	189	761	0	1,953

Techniques for harvesting

Cut all liana and climbers

Cut climbers with diameter larger than 2 cm before harvesting. As the climber connects to other trees, so damage can increase to other trees and create potential risks to workers.
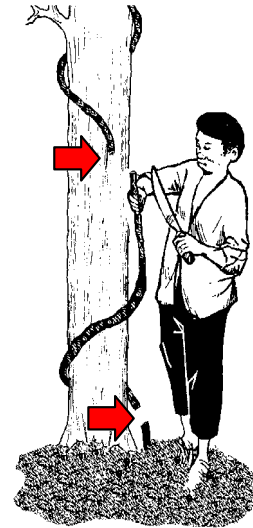

Select direction for felling

Direction for felling should be in areas without trees or in areas with small trees to avoid damage to other trees.

Do not cut trees in strong winds because it can change the direction of the falling tree and might create risks to workers and damage to other trees.
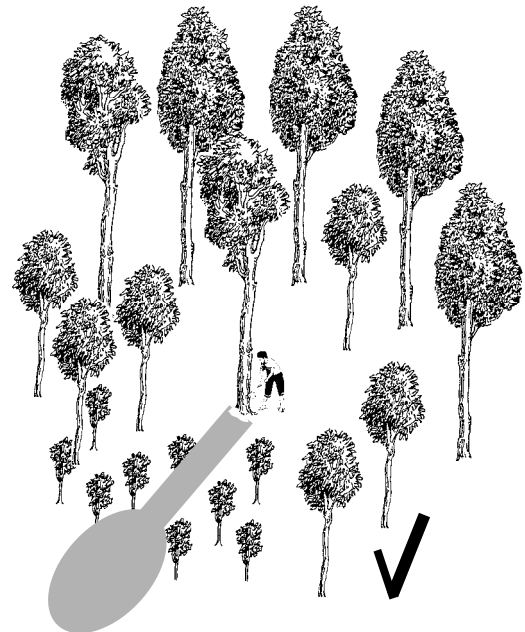
Avoid felling trees in or over bumps such as logs, depressions or inclines because they can break the timber.
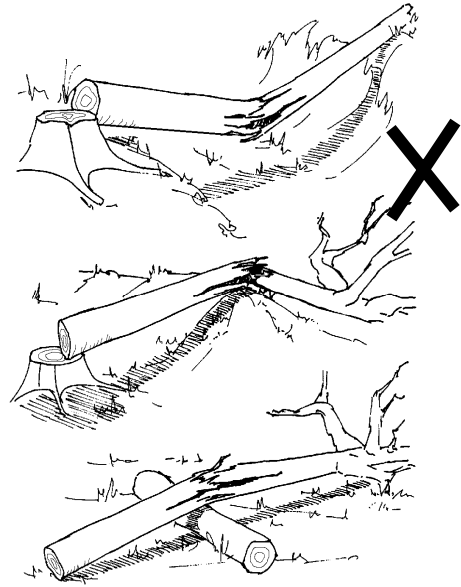
Do not fell trees on the downward slope so as to avoid damage to logs and other trees. Always fell trees parallel with terraces to minimize the damage.
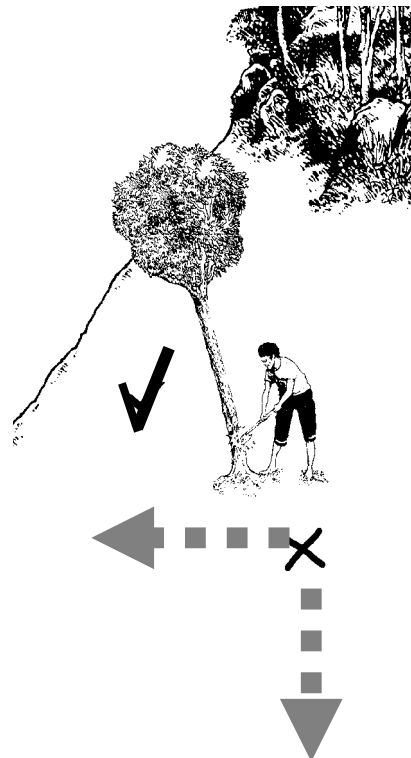
Cutting down trees

Before felling a tree, it is important to make sure that no-one is in the danger zone which is the distance twice the length of a tree to be harvested to avoid that other surrounding trees also fall on people.
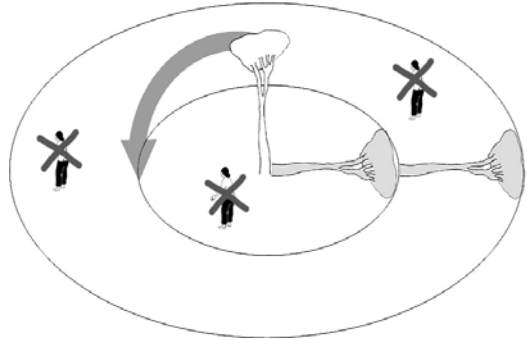
Before conducting selective cutting, it is necessary to clean all shrub and liana around stump because they might affect the harvesting process.

The first cut should be in the position on the stem as far as the length of a hand from the ground (around 30 cm)

This cut should only go into one third of diameter of the tree (1/3). A saw can be used for this task...
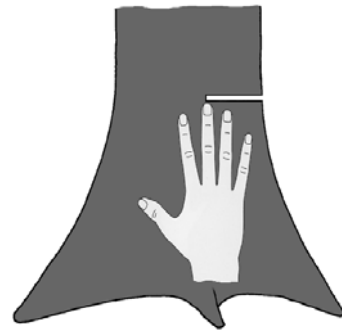
If the trees with diameter of about 30 cm, the second cut should be in the opposite position and higher than the first cut about two fingers compared to the bottom of the first cut.

Do not cut though the diameter, but stop at the point far from the first cut about two fingers. If the trees with bigger diameter, this distance should be as length as 3 fingers. We can use a wedge to avoid the saw getting stuck and making the tree falling down.
Do not stand behind the trees to avoid a kick from the stump
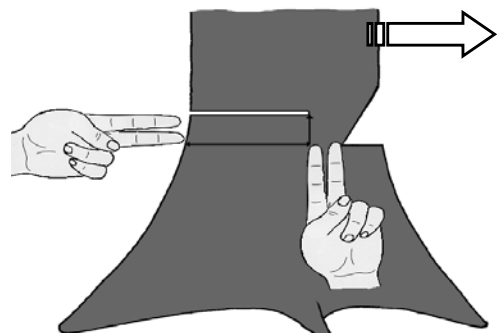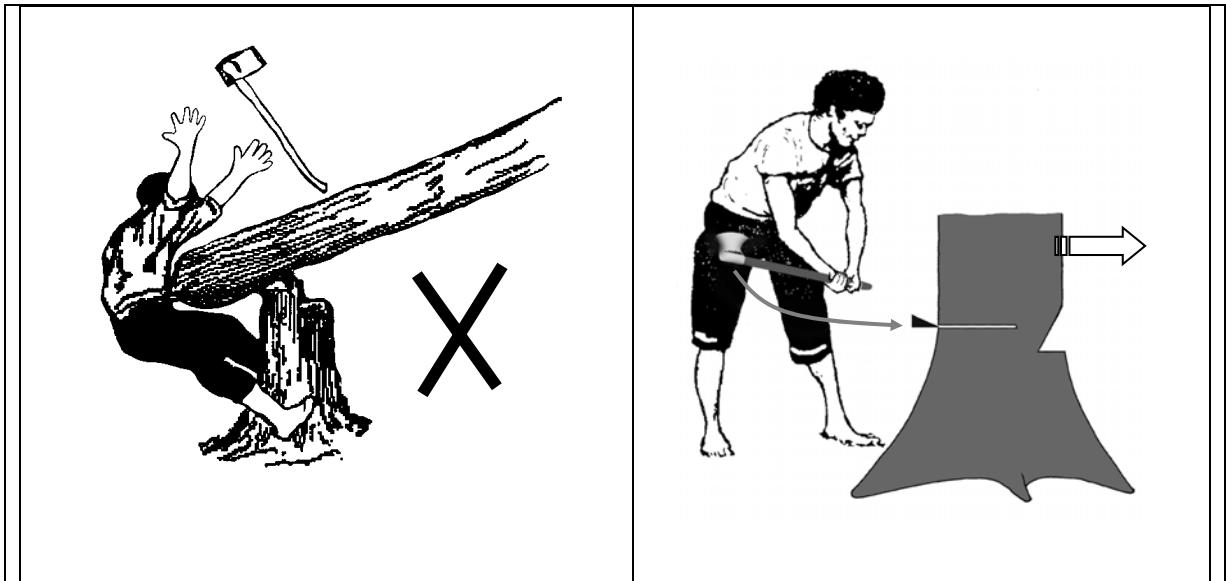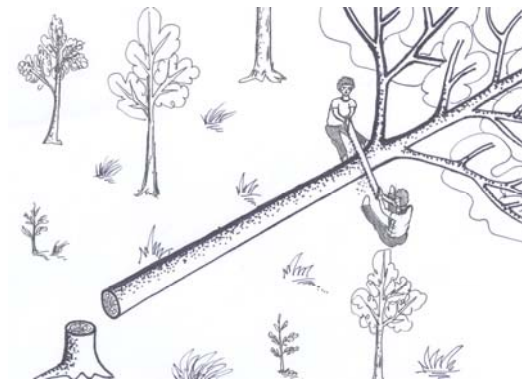
Techniques for harvesting

Cut logs into smaller ones, and clean the forest

Cut logs into smaller ones
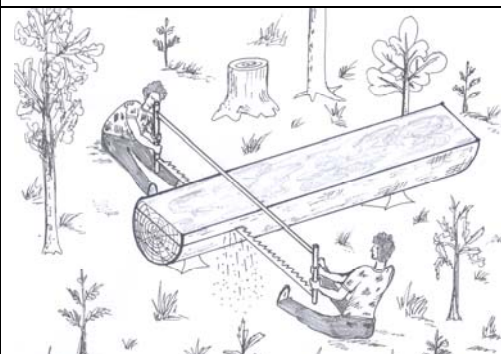
If this is not done properly, this will lead to:
- ✓ reduction of quantity or value of timber
- ✓ damaging land and rivers
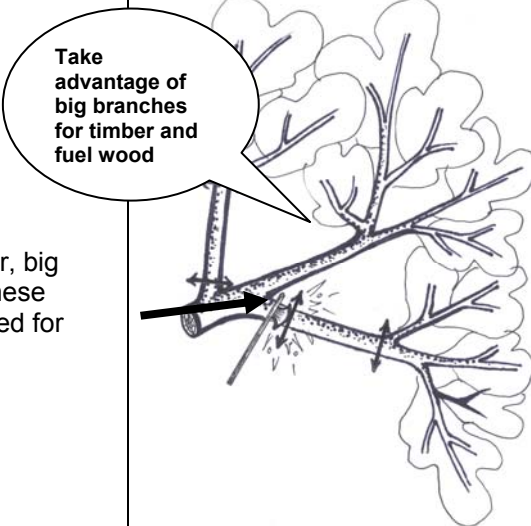- ✓ causing damage to surrounding trees

The length of logs depends on the purpose needed for use, products and transportation.
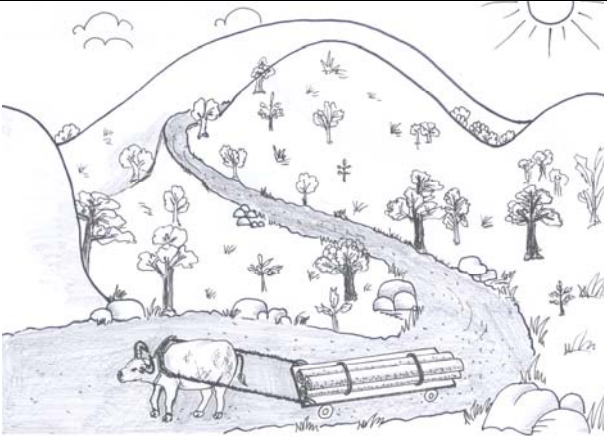

Cut log into pieces in the forest

This can reduce damage when transporting timber out of the forest. Timber can also be easily taken out of forest by cattle and workers. This normally applies when harvesting timber for housing, animal sheds or products where the required size is known.

Make use of big branches

In order to increase the use of timber, big trees normally have big branches; these branches should be cut and then used for fuelwood at the very least.

> Take advantage of big branches for timber and fuel wood

Clean forest after harvesting, leave smaller branches and bark in the area of harvesting

These materials will disintegrate to become organic fertilizer; the remaining trees will then use these substances for continued growth. However, it is not easy to take bark of the timber since this depends on the availability of labor and also on the work required whether it is easy or difficult.
Small branches should then be cut into smaller ones and spread evenly in the forest.

Transporting timber out of the forest

The principles to reduce damage to the remaining trees when transporting timber is as follows:
- Check and select suitable trails for transportation (use a map with the terraces)
- Use as much indigenous knowledge and local resources as possible (use animals, transport timber on streams or rivers)
- Other means like buffalo can increase productivity of transportation as villagers, can take a big load of timber out of the forest at one time.

4. FOREST ENRICHMENT

4.1. Definition, objectives and target groups for forest enrichment in CFM

What is forest enrichment?

Forest enrichment is an additional planting into a poor and low quality forest. It can also be carried out in an area that is lacking in natural regeneration of a certain number of species that are precious and with high economic values.
There are a number of forest enrichment methods based on different types of forest and availability of resources, including:
- ➢ Forest enrichment in a patch
- ➢ Additional planting into bare land of forest
- ➢ Forest enrichment in rows

The objectives of forest enrichment in CFM

- ▪ To increase quality and productivity of poor and degraded forest
- ▪ To meet the village's demand for timber and commercial purposes

The target group for forest enrichment in CFM

Forest enrichment requires work that is time consuming, investment in seedlings, clearing of shrubs, making rows and planting trees. Therefore, forest enrichment depends not only on the type of forest but also on local resource availability.
Forests chosen for enrichment must be:
- ▪ Young forests appearing after slash and burn cultivation, poor and degraded forest after harvesting with low quality and lack of natural regeneration or target trees
- ▪ Villages should have demand and resources available for forest enrichment as planned

4.2. Silviculture techniques in forest enrichment

Forest enrichment in patches

- Conduct additional planting in areas of at least 2,500m^2 without trees
- Density: planting trees as a quincunx (equilateral triangle), an edge of the triangle is equal to ½ the diameter of the canopy of a mature tree (tree by tree). Plant trees inside the forest 2 to 4m distance at least from the edge.

The distance between trees at least equals to ½ the diameter of the canopy of a mature tree.
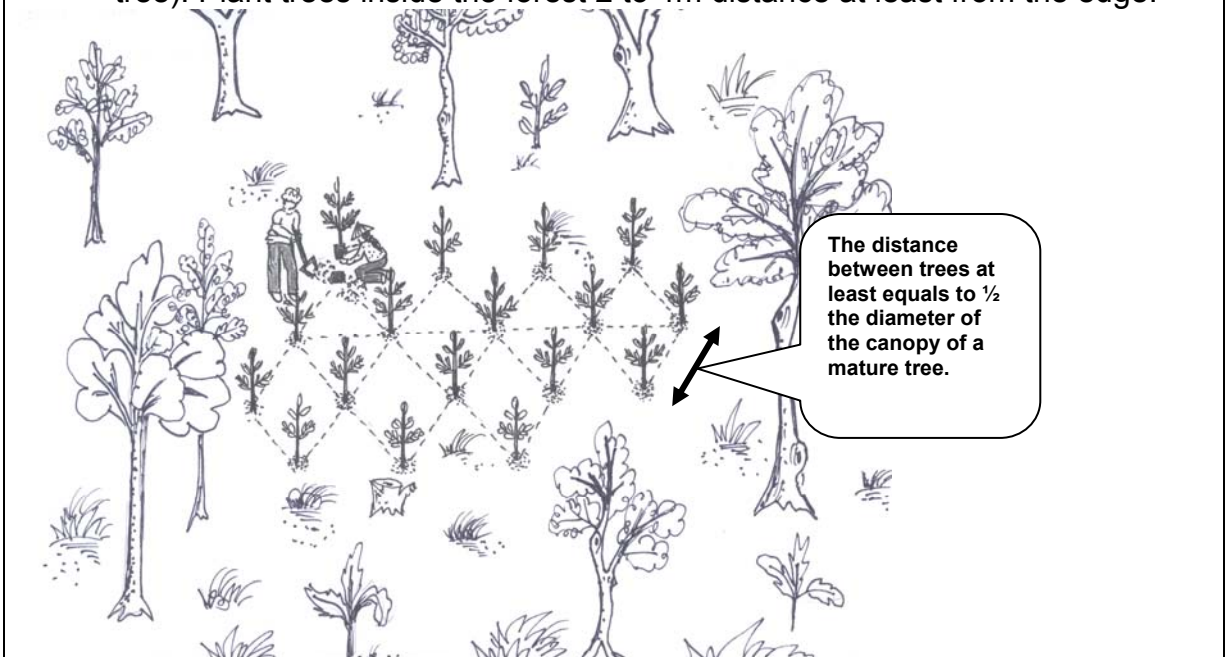
### Conduct additional planting into bare land of forest

- Carry out additional planting where the canopy is broken, the diameter of this space being twice as big than the diameter of a mature tree
- 1 or 2 trees should be planted in this area

Forest enrichment in band

This method is only applied for regeneration forests after slash and burn cultivation (young forest), it is not applied to forests with big trees such as poor forest, medium forests and old forest because there is a lack of sunlight for development of small trees in these forests.

- Make rows for planting trees: the width of rows depends on characters of each species (trees favor light or shade) and the width of the area between rows; this is to ensure sufficient sunlight for young trees. The rows should face the east-west direction to receive maximum sunlight. The width of rows normally ranges from 4 - 8m.
- The width of area between rows: this area will not be used for planting trees, weeds or shrubs should be cleared; the width is about 8 - 12m.
- The distance between trees: each row has a one row of trees only, the distance between trees usually equal to ½ diameter of the canopy of a mature tree.

The distance between trees equals to ½ the diameter of the canopy of a mature tree
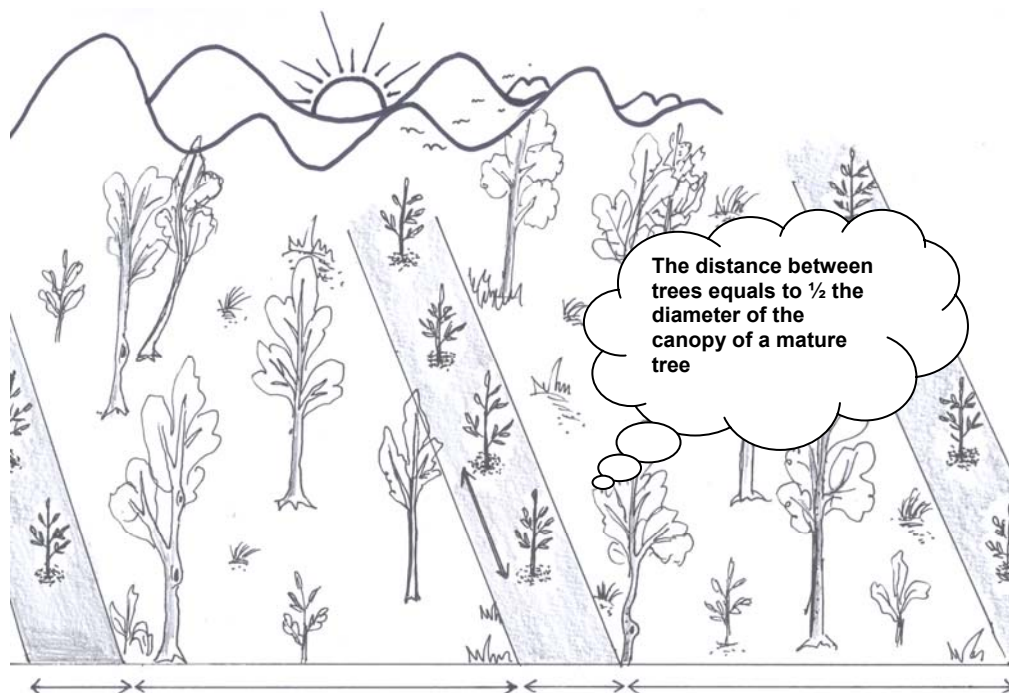
Selection of species, planting techniques and tending to trees in forest enrichment

Selection of species in forest enrichment
Criteria for selection of trees:
- Species should be local trees or originally come from the same ecological conditions with high economic value, easy to plant, and have quick growth especially in height so as to compete for light with weeds and shrubs.

Villagers should take part in selection of species for forest enrichment. Extensionists should provide information on species such as economic value, growth and ecological condition to villagers, so they can decide which species are suitable for them. PTD (Participatory Technology Development) can also be used to test new species. Information on PTD approach can be obtained from "The guidelines for Participatory Technology Development" (Bao Huy, 2003).

Planting and tending techniques in forest enrichment

Criteria of species
It depends on each species in terms of height, root system and vigorous appearance. The height should normally reach at least 0.8 to 1m to reduce the competition of weeds and shrubs.

Season for forest enrichment
The preparation for forest enrichment such as clearance of weeds and shrubs, clearing the soil is conducted in the dry season. Planting of trees is made in the rainy season. It depends on labor resources and local conditions to make the forest enrichment plan with the villagers.

Agenda for forest enrichment

No	Activity	When	Where	Person in charge
1	Seedling preparation			
2	Clearance of weeds and shrubs			
3	Making holes			
4	Planting trees			
5	Tending, weeding and adjusting canopy			

### Preparing rows, patches for planting trees
Weeds should be cleared in rows or patches, all shrubs and trees with low economic value should be cut, leaving trees that have potential for timber and NTFPs.

Preparing holes and planting trees

The size of the hole depends on each species; it is normally 40 x 40 x 40cm. The surface layer with lots of organic substances and nutrients should be used for planting.

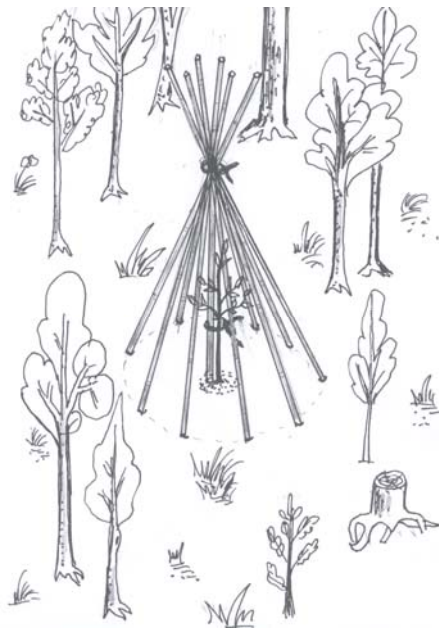Collection of litter and dry leaves should be made to put around trees.
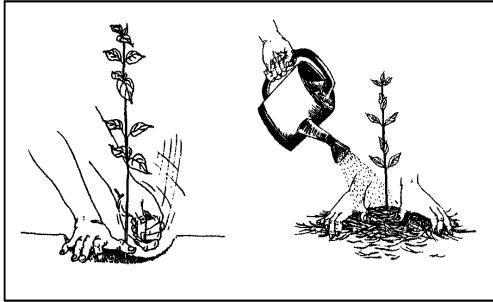
The surface layer with organic substance is used to put around the trees
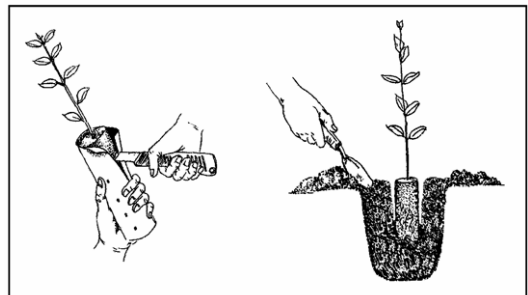
Tending young trees

Animals might eat leaves of young trees, so it is necessary to make fences around trees.

Weeding should take place regularly in the first 2-3 years after planting.

5. PROMOTION OF NATURAL REGENERATION

5.1. Definition, objectives and target groups

Definition

Promotion of natural regeneration is a silviculture method that supports the process of seedlings in nature; and trees from this process can then meet the demand and objectives of forest development.

Objectives of promotion of natural regeneration in CFM

- Increase quality and economic value of young forest and poor forests by supporting the process of promoting seedlings of potential trees (e.g. mother trees)
- Meet the demand of villages with products from this process

Target groups for natural regeneration in CFM

In CFM, forests that meet the following criteria are eligible for natural regeneration:
- Poor and degraded forests after harvesting, slash and burn cultivation with potential for growth of natural regeneration (availability of mother trees, or coppices). However, these trees are in competition with other trees like shrubs; weeds or seeds of mother trees and find difficulty in germination and establishment.
- Trees from this process meet the demand of communities and market. Communities have time and labor to organize the required work.

5.2. Techniques in promotion of natural regeneration

Clarification of mother trees for seeds

To define mother trees that can provide seed is an important element in natural regeneration.
Local knowledge and field surveys can help to clarify this matter. The result should indicate the following criteria:

Mother trees and the influence area for seedling

Species of mother trees	Number of trees	Area of influence of mother trees (forest block)	Season for seed

Based on this information, season for planning can be defined and then preparation can take place.

Defining species and the area for promotion of natural regeneration

Discuss with village and do field survey to clarify:
- Species that meet demand of the village in CFM
- State of natural regeneration: competition with other unwanted trees, invaluable trees, weeds and bamboo?
- Which forest blocks need support, and when, in term of natural regeneration?

Season for promotion of natural regeneration

Season for this process needs to be based on two important factors:
- Season for seeds
- Season for growth of seedlings and competition with weeds, bamboo and shrubs

This depends on each region and ecological characters of each species. Therefore, the participation of local villagers is important and should be flexible to local conditions and the resources of the village.

Agenda for natural regeneration

No	Activity	When	Where	Person in charge
1	Clearance of weeds, prepare soil for seedling process			
2	Weeding, cutting shrubs and bamboo that compete with seedlings			
3	Pruning and thinning seedlings			
4	Tending seedlings and young trees			
5	....			

Support to spreading of seed, seedlings and growth process

Activity	Illustration
Weeding and making soil to support germination of seed In areas with lots of weeds and shrubs limited ground cover will prevent seeds from contacting the soil and germinating. Airborne seeds with wings will normally get stuck on branches of bamboo, shrubs and weeds. When seed are already on the soil, the factors of humidity and temperature will decide the germination process. This depends on characters of each species.	
Weeding, cutting bamboo and shrubs that compete with seedlings	

Pruning and thinning seedlings

Species that provide many coppices in one stump, after one season, need to be pruned and the strongest one only kept.

There might be many young trees in the first phase of natural regeneration that might compete with each other. Therefore, thinning and then tending to strong seedlings should be carried out. In addition, young trees can also be given sufficient sunlight by cutting down unwanted trees.

6. PRINCIPLE OF TECHNIQUES NOT INCLUDED IN THESE GUIDELINES

Sivilculture methods not included in these guidelines are:
- ➢ NTFPs management and development
- ➢ Plantation, agroforestry on bare land
- ➢ Fire prevention

The necessity of these silviculture methods depends on each region, community, local resources, market experience and demand of the community. Therefore, technical staff in each region should take responsibility to develop these methods. Some of the principles to develop these silviculture techniques should be noted:

6.1. Development of Non Timber Forest Products (NTFPs)

- Carry out survey on the availability of NTFPs at present with the community to have an overview on the number of valuable species for management.
- Use results of research and local knowledge on NTFPs about planting and tending methods to develop NTFPs. In the case where there is no research and indigenous knowledge on NTFPs, PTD can be applied, to test new species in the village.

6.2. Plantation, agroforestry

- There are many references on plantations from the Ministry of Agriculture and Rural Development (MARD) and also from the Forest Science Institute of Vietnam (FSIV) on this issue such as the methods in planting species for example pinus, acacia, eucalyptus, cinnamon.
- Selection of species for plantation needs to be based on local resources, source of seedlings, market.
- Gradually develop simple guidelines on plantation for farmers including nursery gardens, planting and tending, pruning and thinning, coppicing.

6.3. Fire prevention

- It really depends on forests whether they are natural forest or plantation. For natural forest, it also depends on each type of forest such as evergreen forest, dipterocarpaceae forest, pinus forest so as to develop specific methods of fire prevention.
- Seasons and the cause of fire (slash and burn cultivation, hunting and other natural causes).
- Discuss with villagers to define and select the most suitable methods (it depends on causes, labor).
- There should be an article on fire prevention in the Forest Protection and Development Regulations if necessary.

R e f e r e n c e s :

1. Bao Huy (2005): CFM Technical Guidelines, Extension and Training Support Project (ETSP), MARD, Helvetas Vietnam.

2. Bao Huy and others (2003). 'Handbook for Participatory Technology Development' SFSP / Helvetas Vietnam, Agriculture Publishing House, Hanoi.

3. Circular number 48/2002/NĐ-CP dated 22/4/2002 on the adjustment and change of valuable fauna and flora list.

4. GTZ/GFA - SFDP project: Silviculture Guidelines in CFM in the area of Song Da watershed.

5. Ministry of Agriculture and Rural Development (MARD) (2005): Decision number 40/2005/QĐ-BNN dated 07/07/2005 v/v issued in accordance with regulations on harvesting timber and forest products.

6. Ministry of Forestry (former) (1993): Principles for silviculture techniques applied for forests that provide timber and bamboo (QPN 14-92), Agriculture Publishing House, Hanoi.