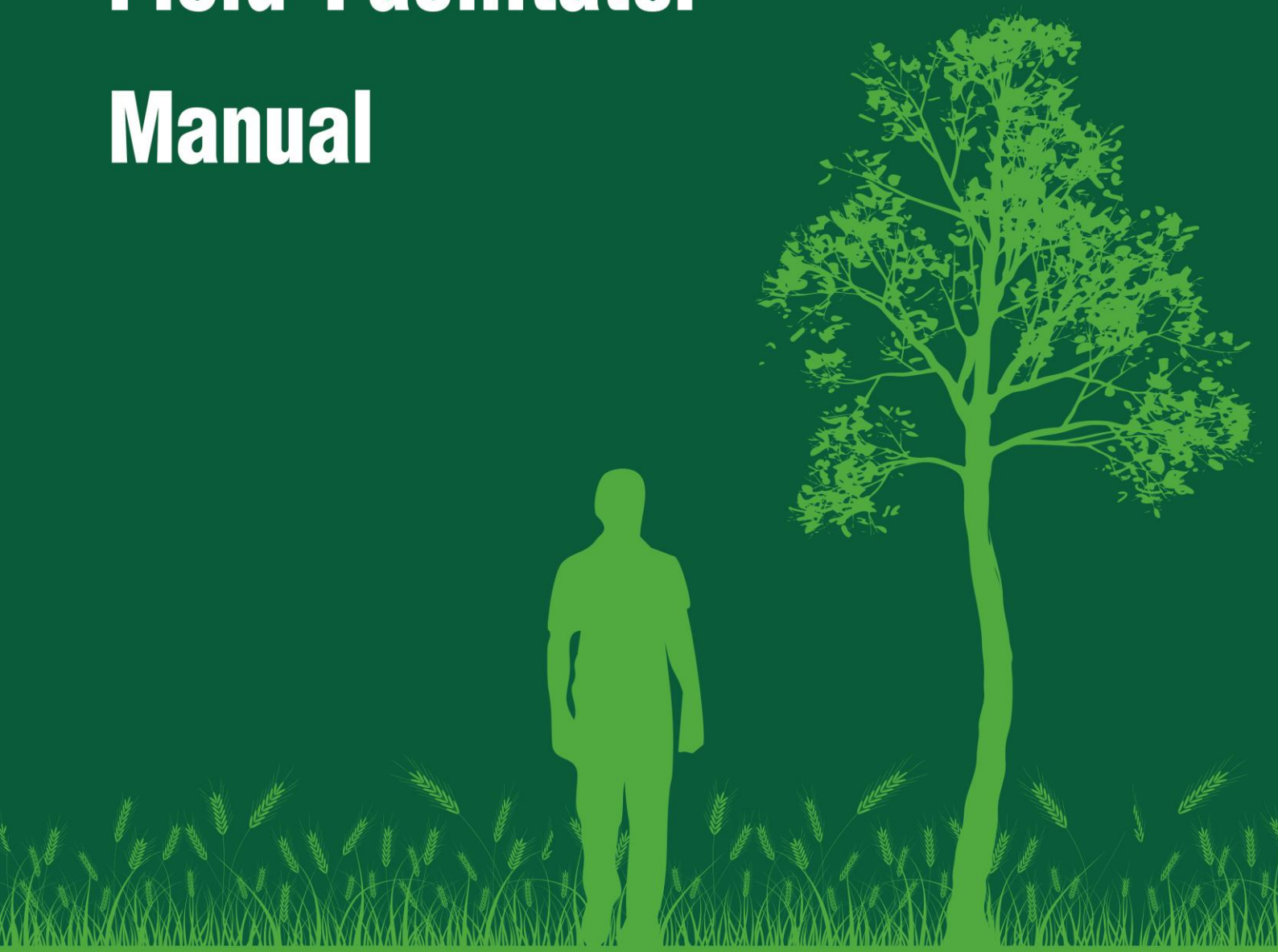
Farm Forestry Field Facilitator Manual



DANISH FORESTRY EXTENSION

Farm Forestry Field Facilitator Manual

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About Danish Forestry Extension

Danish Forestry Extension (DFE) works in partnership with local communities and local and international organisations to support the development of sustainable forest and natural resource management across the globe.

DFE is the international department of the Danish Forest Owners Associations, in Danish, *Skovdyrkerne*, which is owned and governed by small scale forest owners/farmers in Denmark. Skovdyrkerne have practiced extension work among Danish forest owners based on advocacy and participatory principles since 1904. Established in 1992, DFE's international engagement was prompted by the fall of the Soviet Union and the therewith associated denationalization of services. DFE was invited to the Baltic States to assist with the establishment of community based forest owners associations. The foundation of the forest owners associations in Latvia and Lithuania was to a very large degree facilitated by DFE. Eastern Europe, including Poland, Romania, Belarus, Estonia, and Russia, was a core geographic region for DFE in the 90s. Since then, our expertise has spread throughout the world and today spans over 30 countries in Europe, Africa, and Asia.

Facilitation of education and dissemination of information on responsible natural resource management is one of DFE´s core competences. Thus, the organization has documented experience in formal as well as informal adaptable education from more than 20 countries in Europe, Asia, and Africa. In Poland, for example, DFE has facilitated the establishment of nature schools as well as developed a curriculum for civil servants appointed to undertake tasks in connection to NATURA 2000 issues. In Nepal, DFE has been working with its local partner on environmental education in schools. Here, one major achievement has been the successful collaboration with the Department of Education in developing local curricula in two districts of Nepal on the environment, nature, and conservation for students at the primary level.

DFE has also been involved in establishing farmer field schools and developing training materials for farm forestry in Vietnam and Mozambique. In Vietnam, this manual is one of the outputs. In addition, a new curriculum for training future agricultural advisors with a specialization in farm forestry was developed and has been adopted on a national level. In Nepal, India, and Mozambique local forest owner associations have been established, which have the objective of providing extension on responsible forest and natural resource management to forest users. In addition, several employees lecture at the forestry faculty of Copenhagen University, participate in the development of curricula, and sit on different committees at the Centre for Forest and Landscape (Center for Skov og Landskab).

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FORESTRY FARMER FIELD SCHOOL SCHEDULE

Week	Contents
1	Opening of Farmer Field School (FFS)
2	Solutions for income improvement from forests Criteria for selecting forest tree species
3	Field preparation before planting trees Planting techniques of bamboo for bamboo shoots purpose
4	Planting techniques for forest trees Planting techniques of Acacia for sawn timber purpose
5	Nursery techniques Planting techniques of canarium and dracontomelum duperreanum
6	Techniques for afforestation care Planting techniques of Rattan
7	Pruning techniques Planting and management techniques of hybrid Melia azedarach
8	Thinning techniques Planting and management techniques of Chukrasia tabularis
9	Calculation of forest inventory Assessment of wood quality Planting techniques of Morinda officinalis
10	Pest and disease management Forest fire prevention and suppression
11	Marketing timber products Planting techniques of Eucalyptus urophylla
12	Agro-forestry and agro-forestry models
13	Harvesting techniques for afforestation Planting of snowbell
14	Forest Law Maintenance of hedgerows and intercropping in agro-forestry models
15	Costs and Profits of Afforestation Making a forest production and business plan
16	Closing of FFS

ORGANIZING AND SELECTING A LOCATION FOR A FFS

Prior to planning a FFS in the commune, facilitators have to collaborate with local leaders and conduct a survey around the area, considering all subjective and objective factors based on criteria and principles of silvicultural techniques.

Some of the main things to consider:

- Do the local farmers want to improve their incomes from forests?
- Is the plantation area big enough for studying?
- Are the inputs for production such as seedlings and nurseries available?

Selecting a demonstration forest

- The forest should be close to the training classroom to ensure the training time and contents are fulfilled.
- The forest should be around 1-3 years-old or newly planted.
- The forest owner must be a participant of the FFS.
- Convenient for participants' travel.
- Having a minimum area of 0,5ha.
- The forest owner must be a participant.
- Topography and soil quality of the demonstration forests must be similar and representative of the local topography.
- Silvicultural techniques in the forests will be performed by the class on a weekly basis and be based on their analysis of the current status of forest growth. The forest owner will implement the decisions together with the class.

Selecting a FFS classroom

- Near the demonstration forest.
- Near participants' transportation routes and options.
- Having enough space for effectively group activities.
- Having favourable facilities for leaning (board, chairs etc.).

Facilitators, in cooperation with Commune Farmers Union (CFU) staff, check the proposed location for organizing a FFS, paying attention to production features and conditions of the area, and the local people's concerns on crops.

Steps to select participants of a FFS

Inform the commune leaders about the objectives and advantages of a FFS and the selection criteria of FFS participants.

As the FFS's learning approach is participatory, meaning learning – doing – sharing under the facilitation of farmer facilitators, the selection of its participants must be done in close cooperation between the facilitators and the Commune Farmers' Union to make sure the FFSs can achieve the best results possible. The selection of FFS participants should follow the criteria below:

- Participants should have an afforested area, have a planting plan for afforestation, or have an area of natural forest.
- Participants should be the person in an household who can make decisions on the farm (however, family members can also participate in case the number of participating households is not enough to reach 25 participants).
- Participants are interested in farm forestry development and want to improve his/her incomes from forestry by cooperation and group activities as well as the linkages among group members.
- Age between 18 and 60.

- Can arrange his/her time to participate in a group.
- Open and be willing to share information with others.
- Should be able to read and write.
- Could be an illiterate person, but the total number of illiterate participants in the class should not exceed 5 people.
- The number of female participants should account for 60-70% of total participants of the FFS.
- Eager to learn new skills.

SESSION 1: OPENING CEREMONY OF FARMER FIELD SCHOOL (FFS)

Objective

To define the steps involved in an opening ceremony for a farm forestry FFS and to conduct the ceremony properly.

Duration

120 minutes

Materials

Papers, loudspeakers, radio set and sign board.

Steps

1. Preparation

The preparation is done at least two days before the opening day.

Facilitators should have a meeting with the CFU about organizing the FFS opening ceremony. The main contents which should be agreed upon at the meeting are:

- Opening ceremony's venue, time and its program.
- Participants: commune leaders, DFU, PFU, and farmers.
- Invitation letter for the guests and participants.
- Preparation of the title and advertisement board.
- Selection of Master of Ceremonies (MC) (normally commune staff who is in charge of the cultural sector).

2. Conducting the Opening Ceremony

- Facilitators should come earlier to check all arrangements such as meeting hall, sign board, setting up of tables and chairs, etc.
- MC invites guests and participants to get into the meeting hall.
- Welcome speech and announcement of the scheduled program.
- MC invites a representative leader from the local authority to declare the purpose and open the ceremony.
- MC invites a facilitator to introduce the contents, the methodology, the duration and the requirements of a FFS.
- MC invites a representative farmer to talk about his/her expectations for the FFS.
- MC sums up the presentations and declares the end of the ceremony.
- MC invites the facilitators to start up activities with the participants.

3. Arrangement of class

- Discuss and agree on rules/regulations of the FFS.
- Vote for a class management board (should be done according to local custom).
- Divide the class into small study groups, normally divided into 4-5 groups.
- Deliver learning tools and materials.
- Define participants' expectations and ideas for FFS experiments.

- Conduct pre-test.
- Agree on the weekly meeting and the next session.
- Closing.

SESSION 2: SOLUTIONS FOR INCOME IMPROVEMENT FROM FORESTS

Objective

After the session, the participants will be able to:

- Define various means for improving their incomes from forests.
- Analyse means, solutions and methods to improve their incomes from forests.

Duration

60 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Warm up: Facilitators introduce a game/ice breaker.

Start the session: Facilitators introduce the name of the session and its objectives.

Facilitators raise questions for the whole class:

- Can you list different ways to improve incomes from forests?
- Which ways among those listed above are the most suitable to implement in your area? Why?

Divide the class into small groups and request them to discuss the above questions and write down their results on A0 paper. Time for group discussion is 20 minutes.

Facilitators observe and facilitate the group discussion.

Facilitators facilitate the presentation of groups results.

Invite 1-2 groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about the result and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

Means to improve incomes from forests

- Plant and manage trees with proper techniques
- Intercrop
- Afforestation in combination with breeding

Plant and manage trees with proper techniques:

- Clear vegetation, digging correct size holes and applying basic fertilizer before planting.
- Weeding and applying additional fertilizer for 1-2 year old trees.
- Pruning and thinning to make sure trees are growing well.
- Harvesting at the right time, avoiding selling trees, which are still in the development stage.

Intercrop:

- Intercropping agricultural crops, while trees are still small, to increase incomes.
- Planting a fence to protect the afforestation such as rattan, bamboo and big sized bamboo.
- Planting crops under the canopy like herb medicines, lemon grass, ginger, to earn income in the short-term in order to invest for the longer-term.

Combination with breeding:

- Combine afforestation with raising bees, chickens, goats, deer, etc.

SESSION 3: CRITERIA FOR SELECTING FOREST TREE SPECIES

Objective

After the session, participants will be able to:

- Specify criteria for selecting forest tree species.
- Analyse each criterion in detail and make use of them in selecting suitable forest tree species for their area and the market's needs.

Duration:

90 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators introduce the name of the session and its objectives.

Facilitators raise questions to the class and divide the class into four groups for group work for 20 minutes:

- What are the standards/criteria we should rely on to be able to select a correct forest tree species?
- Why should we rely on those standards/criteria?

Facilitators facilitate the presentation of group results.

Invite 1-2 groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about the result and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

Criteria for selecting forest tree species are:

- Market conditions.
- Conditions of climate and soil.
- Situation of grower and his or her family.
- Characteristics of the species.

Reasons to rely on these criteria:

- Market conditions:
    - Types of product market demands: size, category, price, etc.
    - Middlemen, companies.

    - The availability of seed/seedlings.
- Conditions of climate and soil:
    - Are these species suitable to the local climate?
    - Is it possible to produce these species in our area?
- Situation of grower and his or her family:
    - Available capital.
    - Availability of labour force.
    - Technical qualifications.
- Characteristics of species:
    - Requirements of soil and weather conditions.
    - Favourable shadow or light trees.
    - Possibility to plant in a concentrated area such as a forest or scattered planting over an area.

SESSION 4: FIELD PREPARATION FOR PLANTING TREES

Objective

After the session, participants will be able to:

- Define needed tasks to prepare fields for planting trees.
- Select suitable treatment methods for vegetation clearance for sustainable cultivation.
- Dig holes according to technical standards of each type of tree species.

Duration

90 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators introduce the name of the session and its objectives.

Facilitators raise questions for group discussion. Divide the class into small groups and request them to discuss for 20 minutes:

- Do we need to design plot roads and surrounded roads for the plantation? Why?
- How will cleared vegetation normally be treated at your locality? Should it be burned? Why?
- Which size of the hole do you normally dig at your local areas? Why that size?
- Which sources of information should you rely on when digging holes for planting trees? Why?

Facilitators facilitate the presentation of group results.

Invite 1-2 groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about the result and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

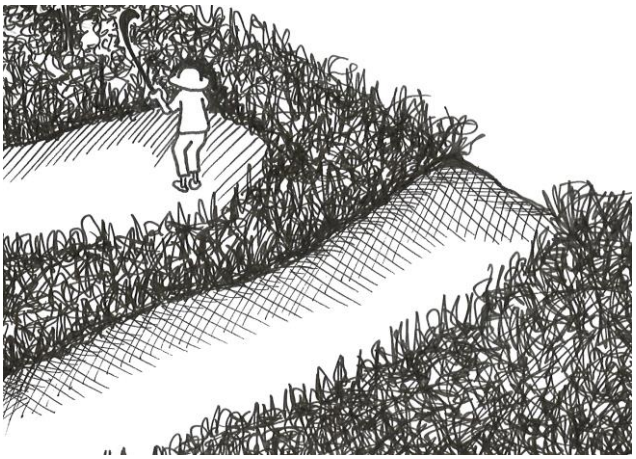
Facilitators' Notes

Things to consider before planting trees in the field:

- Reducing the competition for light, water and nutrients.
- Having favourable conditions for moving around in the field to plant and maintain trees easily.
- Minimize the compacting of soil and enhancing root growth.
- Minimizing the risks of forest fires.
- Adding nutrients to soil by basic fertilizer application.

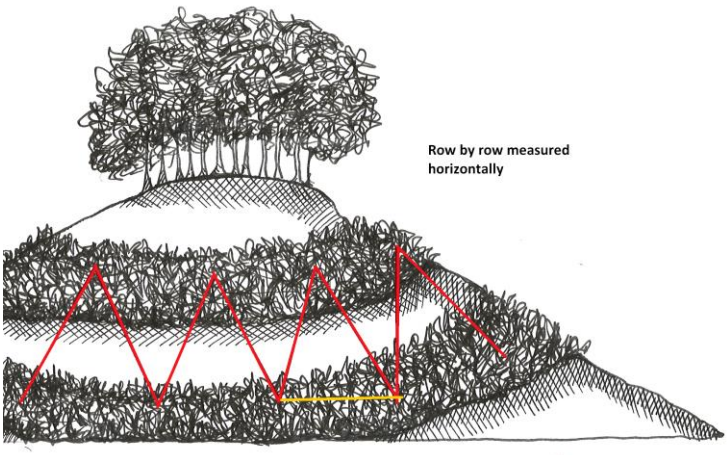
Vegetation clearance

- Clear completely or partly the vegetation about 1-2 months before planting.
- Clear all lianas, shrubs and other weeds. Hack as close to the soil surface as possible and only keep the rest less than 10cm tall. High economic value trees and protected flora species should be maintained.
    - Those places with a slope of 15° or less can all be cleared (plant the whole area). If sloping land is large and over 200m, a 3m wide contour band should be established at least every 100m. If slope is from 16° – 20°, vegetation can be cleared along to the contour lines and the grass in between the planting band can be kept.
    - If the slope is over 20° – 25°, vegetation will be cleared partly around holes which should be allocated along the contour lines.

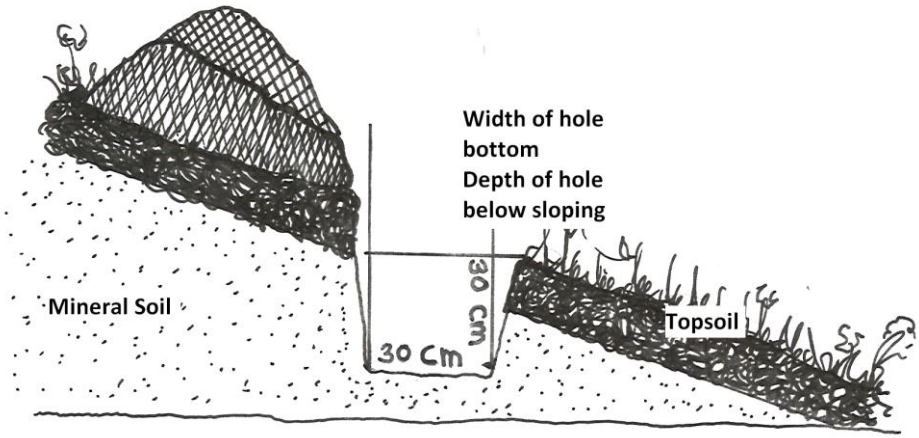


Dig/hoe holes

- A steady distance and planting density can be kept by marking holes with sticks before digging. Use a measuring tape or a long rope to measure the desired distance and space.
- Dig holes in all cleared areas. Where the slope is between 16° – 25°, dig alternate holes along the contour lines (use the quincunx arrangement when joining rows).

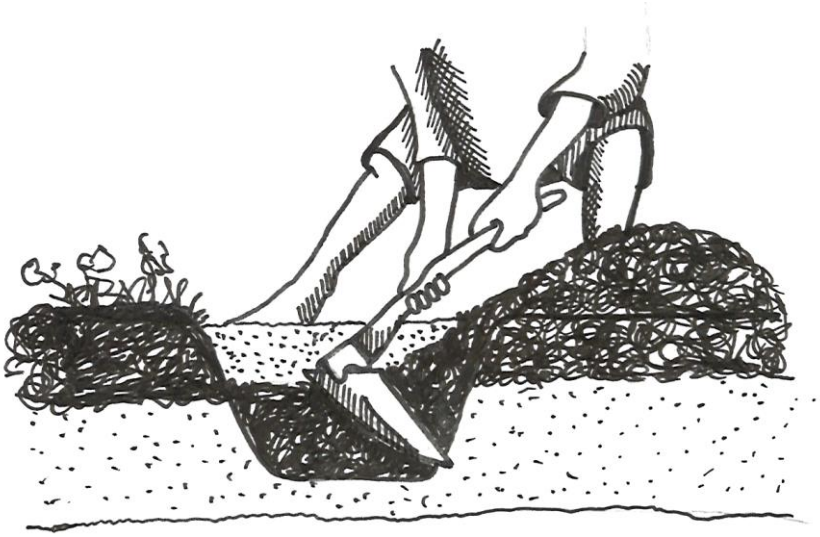


- For Acacia and Eucalyptus, the size of the planting hole should be minimum 30cm x 30cm x 30cm.
- When digging holes, cultivated top soil and mineral soil should be kept separate.
- Complete the hole digging at least 1 – 2 weeks before planting.



Basal fertilizing application and hole filling

- Fill in $^{2}/_{3}$ of the hole with top soil.
- Apply fertilizers and mix well with the soil inside the hole. Select one of the below optional applications for each hole: 1. 200g bio-organic fertilizer, or 2. 100g NPK 16 – 16 – 8, or 3. 2kg composted manure.



Treatment of cleared vegetation

- Collect the cleared vegetation and disperse it along the contour lines, which can help reduce soil erosion and washing out, as well as add nutrients to the soil.
- The cleared vegetation should not be burnt since it can cause fires in the surrounding forest plantations, or it can make the soil dry leading to soil erosion and washing out at the start of the plantation.

SESSION 5: PLANTING TECHNIQUES OF BAMBOO FOR BAMBOO SHOOTS PURPOSES

1. Objective

After the session, participants will be able to:

- Point out the value of planting bamboo and bamboo for bamboo shoots purposes.
- List out planting and management techniques of bamboo for bamboo shoots purposes.
- Know how to intercrop bamboo in the plantations to increase income.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt pen, adhesive tape.

Steps

Facilitators introduce the name of the session and its objectives.

Facilitators ask the class about the value of planting bamboo and take notes of participants' answers and sum up opinions.

Facilitators provide discussion questions for the class. Divide the class into small groups and request them to discuss for 30 minutes (There should be 4 groups - group 1 discusses question 1 and 2; group 2 discusses question 3 and 4; group 3 discusses question 5; group 4 discusses question 6).

<u>Group discussion questions</u>

1. Which bamboo species do you normally plant in your area to get bamboo shoots?

2. To have more bamboo shoots appear, what types of soil is best for bamboo? Should you plant bamboo for shoot purpose on top of a hill? Why?

3. Do you know how many ways there are to propagate bamboo? What are the qualifying standards for seedlings or branches for transplanting into the fields?

4. What is the suitable planting distance and the size of holes for bamboo when planting it for the purpose of getting bamboo shoots?

5. To have more bamboo shoots appear, how should you take care of the bamboo after transplanting? Do you need to apply top dressing fertilizer annually? What types of fertilizer should you apply? What is the appropriate fertilizer dose and when should you apply it?

6. Are there any kinds of pests and diseases that will damage bamboo when producing bamboo shoots? How do you control and prevent them?

Facilitators facilitate the presentation of group results.

Invite 1-2 groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about the result and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

The values of bamboo

- Used as food.

- Used as materials for housing and building materials.
- Used to make household goods and handicrafts (e.g. toothpicks and baskets).

Location for planting bamboo for bamboo shoots purposes:

- Fertile soil, thick soil layer, underground water level is below 1m.
- Near rivulet or stream and where there is high humidity.
- Bamboo for bamboo shoots purposes should not be planted on top of a hill, because of its uprooting characteristics.

Propagating methods for bamboo

- Split them from a bamboo grove
- Provine
- Cuttings

SESSION 6: PLANTING TECHNIQUES OF FOREST TREES

Objective

After the session, participants will be able to:

- Identify the standards for qualified seedlings for transplanting.
- Select a suitable season for planting.
- Understand planting steps of forest trees.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, brochures of seedlings.

Steps

Facilitators introduce the objective of the session.

Standards for seedlings

Facilitators stick 2 pictures of seedling standards on the board so all participants can see it and bring up questions:

- Which picture will you choose? Why?
- Should we select seedlings with a grass green colour for planting? Why?
- Which qualified standards should the seedlings meet to be ready for transplanting?

Facilitators divide the class into 4 groups and request them to discuss the above questions for 20 minutes, and then write down the results of their discussion on a big paper.

Facilitators facilitate the presentation of group results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about the result and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Planting techniques

Facilitators stick a case study (see below) on the board and request the groups to discuss the case study for 30 minutes and to write down the results of their discussion on a big paper.

Facilitators facilitate the presentation of group results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about the result and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Case study

At a group meeting on the planting techniques of forest trees in Ban Da village, the group management board brought up the topic of planting techniques for group discussion. Group members discussed very excitedly. There were 2 different points of view and both views were defended as the correct way of doing things. The group management board did not know how to solve the problem. The following are the two different points of view:

Content	**Viewpoint 1**	**Viewpoint 2**
Planting season	Spring and autumn season.	Each geographical region has its own planting season. Spring season is March and April, autumn season is August and September, in other areas planting should be done during the rainy season.
Planting time	In the morning or in the afternoon, both are ok.	It is best to plan trees the day after it has been raining and it is best to plant in the afternoon.
Transport of seedlings	Put seedlings into plastic bags, bundle them together and take them up to the hills.	Put seedlings into baskets then carry them up to the hills.
Planting methods	Carry the seedlings to the planting holes, tear the seedling pot cover, take the soil around to fill in the hole, and use both hands to compact the soil. Fill the hole with soil up to 2cm under the edge of the seedling pot.	Carry and lay the seedlings close to the planting holes, take the seedling pot into your hand, holding it straight up. Use your other hand to take the seedling out of the pot cover and lower it into the hole. Cover with soil. If the land is sloping, fill the whole with soil until the seedling pot is covered. If the land is flat, fill the hole with soil and make sure that the root neck is slightly lower than the natural soil surface (about 2cm).
Management after planting	Cover the roots of trees. Replanting after first growing season.	Remove dead plants after 2 weeks of planting and replant with new ones.

Suppose that you are participating in the group discussion, which viewpoint will you support or what is your own viewpoint? Why do you support that point of view?

Facilitators' Notes

Standards for a qualified seedling ready for transplanting:

- The seedling vigour is good and its leaf canopy is equilateral.
- The height of the seedling is between 25- 30 cm.
- The seedling should have 1/3 of its stem turned into hardwood.
- The seedling should not have any sources of diseases.

Planting techniques

Planting season:

- In the northern region: normally plant in the spring season (March-April) and autumn season (August-September).
- In the central region: planting in the rainy season (October -December).

Planting time:

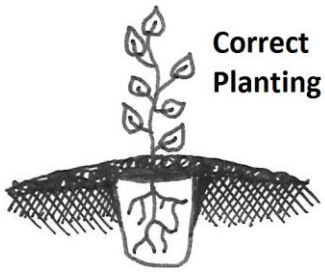
- In the afternoon, after a rainy day.

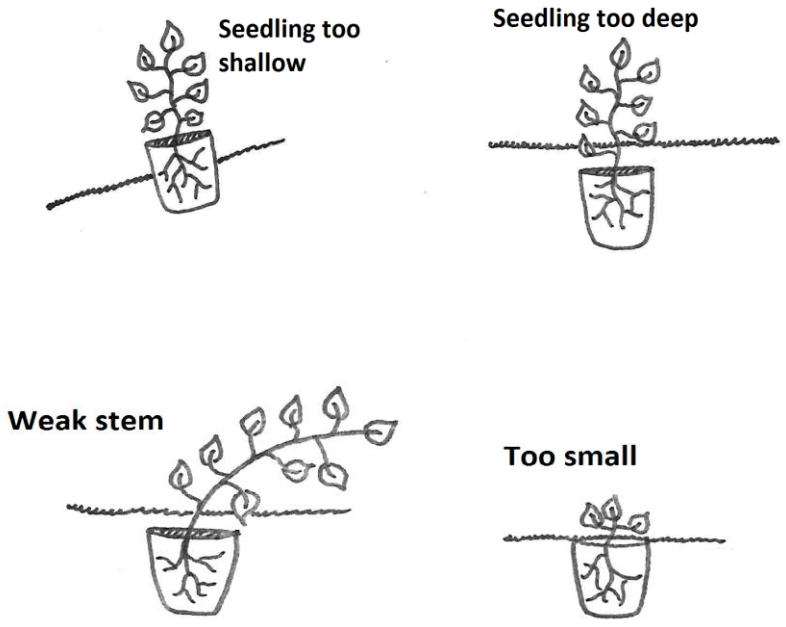
Transport of seedlings:

- Seedlings should be put into a suitable transport container such as a basket, tray, bamboo lattice basket, etc.
- You should not bundle the tops of seedlings into a bunch to carry up to the hills.

Planting method:

- Before planting, remove seedlings from the polybag. When removing the polybag, pay attention not to break the bag and avoid harming the root system.
- Use a razor blade or a sharp knife to open the side of the polybag and gently remove the plastic part. You also can keep the seedling upside down so that the roots are between your forefinger and middle finger, with the inside part of the bag located in the palm of your hand, which allows you to then slowly take the bag off completely.
- Use a hoe or a trowel to make another hole 15cm deep in the middle of the hole prepared before. Place the seedling which has been removed from the polybag neatly into the hole.
- The seedling should stand straight in the middle of the hole and its root neck should be slightly lower than the natural soil surface (about 2cm). Slowly fill soil into the hole until full. Use your hands to firm soil around seedlings and add more soil if needed.





Monitoring and supervision of the planting process is a prerequisite to make sure the proper planting techniques are applied.

SESSION 7: PLANTING TECHNIQUES OF ACACIA FOR SAWN TIMBER PURPOSE

Objective

After the session, participants will be able to:

- Present different steps of planting procedures of acacia for sawn timber purpose.
- Select a suitable planting season.
- Make use of the knowledge gained for planting techniques of acacia for sawn timber purpose to apply for their plantation at home.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators introduce name of the session and its objectives.

Facilitators divide the class into four groups, and request them to discuss the following questions for 20 minutes, and then write down their group discussion results on a big paper. (Groups 1 and 2 discuss question 1, 2, and 3; groups 3 and 4 discuss question 4 and 5).

1. Which acacia species do you often grow? At which age do you harvest the trees from your acacia plantation?

2. What is the planting density? What are the management methods you apply for your plantation after transplanting?

3. What kinds of pests and diseases appear in your acacia plantation? What did you do to control them?

4. When planting acacia for sawn timber purposes, what should be the hole size and planting density?

5. What should you do to make acacia trees produce as much wood with the least knots as possible? Specifically, how should you do it?

Facilitators facilitate the presentation of group results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about the result and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

Standards of qualified seedlings

Seedlings geminated from seeds should be:

- 2.5 – 3 months old and 25 – 35cm high; diameter of root collars should be 2-3mm; seedlings are developing well.

Seedlings from propagate cuttings (hybrid acacia) should be:

- 3 – 4 months old from after the cuttings have been planted. Height should be 20cm or higher. Roots well developed, should not be curved, have a well-developed crown, and show vigorous growth. Seedlings have been re-potted, roots should be pruned, and plant should not have any pests or diseases.

Planting density

Spacing 2.5m x 3m or 2.5 x 2.5m equals 1300 - 1660 seedlings/ha.

Planting hole

Planting hole size is 40cm x 40cm x 40cm, apply 200g bio-fertilizer + 100 gram NPK per hole or 200 gram NPK per hole (the amount depends on soil fertility).

Management after planting

Replanting: after 2 weeks of planting

Management in the first year:

- First time, 1 – 2 months after planting: cutting liana, clearing vegetation areas, weeding and loosening the soil around the bottom of trees in a ca. 80cm wide circle.
- Second time, in Oct. – Nov.: completely clear vegetation, weeding and loosening the soil around the bottom of trees in a ca. 1m wide circle, pruning branches up to 1m high.
- Third time, in Oct – Nov: clear vegetation around the bottom of trees 1m wide.

Management in the second year:

- First time in March-April: follow the same first time steps as in year one. Apply top dressing of 200 gram NPK or 500 gr microorganism organic fertilizer per tree.
- Second time, in July-August: clearing vegetation in the entire area, weeding and loosening the soil around the bottom of trees, and pruning braches up to 1m high.
- Third time, in Oct-Nov: clearing vegetation around the bottom of trees in a 1m wide circle.

Management in the third year:

- First time in March-April: clearing vegetation in the entire area, pruning branches up to 1.5 - 2m high. Weeding around the bottom (in a 1m diameter), create 40 – 50 cm wide furrows around the tree trunk and apply the same dose of top dressing fertilizer into the furrows.
- Second time in July-Aug: clearing vegetation in the entire area, thinning, pest and disease control, weeding around the bottom of the trees.

Pest and disease control

- Termite control.
- White powder disease.

SESSION 8: TECHNIQUES FOR NURSERY ESTABLISHMENT AND ACACIA SEEDLING PRODUCTION

Objective

After the session, participants will be able to:

- Present the steps for establishing a nursery.
- List the necessary tasks for producing seedlings from seeds.
- Use the proper techniques for seed soaking and treatment.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, untreated acacia seeds, some pre-treated acacia seeds with a cracked hard coat, 20 ready filled pots, sticks, plastic basket, boiling water, Extension Services Leaflet hand-out (from ToT Technical Manual).

Steps

Facilitators introduce the objectives of the session.

Facilitators present steps of nursery establishment.

Ask the class: At your locality, who among you has ever produced seedlings by sowing seeds?

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper. (Groups 1 and 2 discuss questions 1 and 2; groups 3 and 4 discuss questions 3 and 4).

1. Should we sow the seeds in the seedling pots or directly in beds on the ground? Why?

2. From which layers of soil should we take the soil to make seedling pots for sowing? Why?

3. Which standards should the soil meet before it can be used for making seedling pots? Which types of fertilizers should we put into the mixed media of the seedling pots? What is the best mixed media rate to make saplings grow well?

4. What kinds of pests and diseases often appear in the nursery? How can they be controlled?

Facilitators facilitate the presentation of group results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about the result and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators introduce methods of seed treatment and how to put seeds into seedling pots.

- Facilitators demonstrate how to treat acacia mangium seeds.
- Facilitators demonstrate how to sow the seed into the seedling pot.
- Facilitators invite 1-2 participants to practice putting seeds into seedling pots.

Facilitators' Notes

Choice of location for a nursery

- Flat land with good drainage.
- Near the roads and convenient for transport.
- Close to a water source.

Essential characteristics of a nursery

- Soil is ploughed and made into beds.
- Established irrigation system.
- Shade frame and material storage.
- Prepare a place for a power generator.
- Divide different areas and plots for various species.
- Seedbeds should not be in the direct sun but rather in a shady spot.

Soil preparation for potting

- Take soil after digging 30cm deep, hill soil with yellow-red color.
- Soil sifted and winnowed from all weeds, roots and small stones.
- Mix soil with fertilizers at the ratio of 90 % soil, 9% compost, 1% melted phosphate. Soil and fertilizers are mixed well together and covered before potting.

Seed treatment and sowing

- Seeds should be bought from certificated seed producers.
- Check the germination rate of the seeds: Spreading about 1kg of seeds on a big paper, select random seeds from five different parts and inspect the seed embryos. If the selected seed embryos are all white, the germination of the seeds is guaranteed.
- Carry out the seed treatment by soaking them in boiling water at 100^0C for 5-10 minutes, take the seeds out and rinse them with cold water, put them in a cloth bag is visible, the seed is ready for planting.
- Use a stick to make a 1cm deep hole in the seedling pot and place the seed inside the whole. Use the stick to to cover the seed with soil.

Sapling management in a nursery

- Water the seedlings frequently.
- After 7 days of sowing, the seedlings can be replanted.
- Sprinkle insecticides around the sowing beds to prevent ants and termites carrying the seeds away or biting the saplings.
- Spray Boocdo fungicide regularly to prevent white power disease and rotten root collars for saplings.

SESSION 9: PLANTING TECHNIQUES OF CANARIUM ALBUM

Objective

After the session, participants will be able to:

- Present planting and management techniques of canarium.
- Select a proper season for planting canarium.
- Analyse essential techniques in growing canarium.

Duration

90 minutes

Materials

A0, paper A4 paper, felt-pen, adhesive tape.

Steps

Facilitators introduce the objective of the session.

Facilitators warm up the class by asking the question "What is the economic value of canarium?"

Facilitators sum up participants' opinions and write the economical values of canarium on the board.

Facilitators present planting and management techniques of canarium covering the following contents:

- Seedling standards for transplanting.
- Requirements of soil and climate for planting canarium.
- Planting season.
- Planting density and hole size.
- Plant management after transplanting.

Facilitators ask the class:

- Can we grow canarium in this area? Why or why not?

Summary and wrap up of session.

Facilitators' Notes

Different Varieties of canarium are distributed widely in Son La, Cao Bang, Lang Son and Hoa Binh provinces.

It quite often appears in natural forests with an annual average rainfall of 1500-2000mm, at an altitude of 100-700m.

It likes light, grows fast and generates seeds and buds strongly.

Seedling standards for transplanting

- Should be at least 12 months, the diameter of the root collar should be 0.5cm, height 40-50cm.
- It is well developed without pests and diseases. A seedling with multi-strain growth should not be transplanted.

Planting and management techniques

Conditions

- Soil: forest soil, more than 0.5m thick, drained.
- Temperature: 23-24^{0}C, rainfall 1500-2000mm/year.
- Topography: altitude 600-700m, slope < 15^0.
- Planting season: Winter-Spring, Spring-Spring Summer.

Planting method

- Mixed with other indigenous species (1200-1600 plants/ha), canarium should account for 50% of total trees.
- When planting in patches or in bands there should be 550-600 trees/ha.

Soil preparation

- Size of planting hole: 40x40x40cm, dig holes one month before planting, and cover the holes 15 days before planting.
- Apply fertilizers of 6-7kg compost + 0.25kg phosphorus.

- Management and protection: For four continuous years, clear vegetation and loosen the soil around the bottom of the trees.

SESSION 10: PLANTING TECHNIQUES OF DRACONTOMELUM SPP.

Objective

After the session, participants will be able to:

- Present planting and management techniques of dracontomelum.
- Select the proper season for planting dracontomelum.
- Analyse essential techniques in growing dracontomelum.

Duration

90 minutes

Materials: A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators introduce the objectives of the session.

Facilitators ask the class:

- Who among you has ever grown dracontomelum?
- What are the economical values of dracontomelum?

Facilitators sum up participants' opinions and write the economical values of dracontomelum on the board.

Facilitators present the planting and management techniques for dracontomelum, covering the following contents:

- Seedling standards for transplanting.
- Requirements of soil and climate for planting dracontomelum.
- Planting season.
- Planting density and hole size for dracontomelum.
- Plant management after transplanting.
- Pest and disease control for dracontomelum.
- Harvesting different products from dracontomelum.

Facilitators ask the class: Can we grow dracontomelum in this area? Why or why not?

Facilitators wrap up the session.

5. Facilitators' notes

Seedling Standards for transplanting

- 12 – 18 months old and 80 – 100cm high
- Root collar diameter should be >= 1cm, well developed, straight, no damages by pests or diseases.

Planting season

The most suitable planting season is from April – May and from Oct - Nov.

Planting methods

The planting method applies to potted seedlings:

- Use the potted seedling for scattered planting along roads and canals.
- Vegetation treatment: clear vegetation thoroughly one month before planting.
- Planting density: 1.250 trees/ha (4m x 4m).

- Soil preparation: prepare soil at least 15 days before planting. Prepare holes the size of 40cm x 40cm x 40cm for concentrated and scattered planting. Cover the holes five to six days before planting.
- Planting: choose a shady day to plant. Remove soil in the middle of the holes, remove pots and put seedlings straight into the middle of the hole and then cover with soil.
- 20 – 30 days after planting, replace any dead plants with new ones to maintain planting density.

Management after planting

- In the first year, two to three months after planting: weed, loosen the soil around the bottom of trees in a ca. 80cm - 1m wide circle. After five to six months, weed, loosen the soil and clear liana.
- In the second year, around April – May: weed, loosen soil, clear vegetation, trim buds, and prune. The second time, around September – October: weed, loosen soil, trim buds, clear vegetation and liana.
- In the third year, follow the same management plan as in the second year.

Note: In order to encourage trees to grow and develop with a wide diameter and long stems, it's necessary to follow the management process closely and carry out pruning when trees are 1,5 - 3 years-old. After that age, do not prune any longer because its branches will be big enough. The trees in the plantation also need to be protected from fires, buffalo, cows and damage caused by people.

Harvesting and processing

After 6 -7 years, fruit can be harvested and sold. When the plantation is between 15-30 years-old, it is possible to harvest its main products of wood and it can be expected to obtain 120-150m^3/ha. For Dracontomelum, the time for harvesting should be based on the market price of timber, rather than volume in order to maximise the income for growers.

SESSION 11: TECHNIQUES FOR AFFORESTATION CARE

Objective

After the session, participants will be able to:

- Know what tasks need to be done in afforestation care.
- Analyse various steps in afforestation care.
- Know how to apply fertilizer, do weeding and mulching.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators stick a proverb on the board, e.g.: "Planting is an investment in the future. Weeding is maintenance and securing your investment."

Ask the class: "What does the proverb imply?"

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper.

1. What should you do to make a forest plantation grow and develop well?

2. Why do you need to do weeding and mulching for trees during the first years after planting? What methods will you use?

3. Do you need to apply fertilizers for a forest plantation which has been established in an area with poor soil? How much fertilizer should you apply and when should you apply it?

Facilitators facilitate the presentation of group results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

Weeding and mulching as part of afforestation care have the following effects:

- Reduce the nutrient competition between weeds and trees.
- Create moisture in order for the trees' root system to develop.
- Supply more nutrients to trees.
- Reduce soil erosion.

Methods to be used

First year. Do weeding and mulching twice, the first time one to two months after planting: clearing liana, clearing vegetation in the entire area, weeding and loosening the soil around the bottom of trees in ca. 80cm wide circles. The second time is in Oct-Nov: clearing all vegetation in the entire area, weeding and loosening the soil around the bottom of trees in a ca. 1m wide circle.

Second year. Do weeding and mulching twice, the first time in March-April: follow the steps as in the first year. In addition, apply top dressing fertilizers of 200g NPK or 500g bio-fertilizer per tree. The second time in July-August: clearing vegetation in the entire area, weeding and loosening the soil around the bottom of trees in a ca. 1m wide circle.

Third year. Do weeding and mulching twice, the first time in March-April: clearing vegetation in the entire area, weeding around the bottom of the trees in a ca. 1m wide circle, create 40 – 50 cm wide furrows around the tree trunk and apply the same dose of top dressing fertilizer into the furrows as in the second year. The second time in July-Aug: clearing vegetation in the entire area, thinning trees damaged by pests and diseases, weeding around the bottom of trees in a ca. 1m wide circle.

From the fourth year on: cut liana, clear vegetation. When crown closure is complete, it is no longer necessary to clear vegetation.

SESSION 12: PLANTING TECHNIQUES OF RATTAN

Objective

After the session, participants will be able to:

- Present the value of planting of rattan.
- List planting and management techniques for rattan.
- Identify the proper planting method for rattan to increase income.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, pictures of rattan plants.

Steps

Facilitators start session by presenting a picture of rattan to the class and asking: "What plant is this?"

Facilitators introduce the objectives of the session.

Facilitators divide the class into four groups and request them to discuss the following questions for 30 minutes and then write down the results of their discussion on a big paper. (Group 1 discusses questions 1 and 2; group 2 discusses questions 3 and 4; group 3 discusses question 5; group 4 discusses question 6).

1. Which economic value can planting of rattan bring?

2. Which soil and light conditions are most suitable for rattan?

3. What are the qualifying standards for seedlings for transplanting?

4. What is the most suitable spacing and hole size for rattan?

5. What types of pest and disease can damage rattan? What should you do to control it?

6. When should you harvest rattan? How do you harvest it?

Facilitators facilitate the presentation of group results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

The value of rattan

- Used to make household goods and handicrafts (e.g. baskets, furniture etc.).
- Used as an intercropping crop.
- Used as fencing material to protect forest plantations.

Conditions of soil and light

- At a young stage, rattan grows and develops well in areas with diffused light.
- Fertile and moist soil.

Seedling standards for transplanting

- Rattan should be at least 1 year old.
- It should be 20 cm tall and have at least 3-4 leaves.
- It is growing and developing well.

Planting method for rattan

- Planting season: early rainy season (August-September) or after the rainy season (Dec – Jan).
- Planting method: plant under the canopy of natural forests or afforested areas, which have a shadow rate of 0,4 – 0,5, or plant as enrichment planting in a forest that has been logged, or plant in the garden under other trees' shadows.
- Planting density: 3.300 plants/ha (1x3m) or 2.500 plants/ha (1x4m) or 1.650 plants/ ha (2x 3m).
- Planting hole size: 15 x 15 x 15 cm or 20 x 20 x 20 cm.

If resources are available, apply basal fertilizer into the holes: 200 – 300g bio-fertilizer or 1–2 kg compost or 100 gram NPK (16 – 16 – 8)/per hole.

Plant management after transplanting

- Applying additional fertilizer for rattan after one year, do it twice: first apply top dressing 100 gram NPK (16-16-8)/per plant, weed and loosen soil around the bottom of trees between

Feb. and March. Second, apply top dressing 100 gram NPK (16-16-8)/per plant, weed and loosen soil around the bottom of trees between Aug-Oct.

- Annually, clear liana and shrubs to have sufficient light for rattan.
- You should not plant the seedling too deeply, since it will effect its ability to produce multiple stems.

Harvesting rattan

- In areas with favourable soil, rattan can be harvested for the first time three to four years after planting. If rattan is planted under the canopy of a forest, it will take longer before it can be harvested (ca. 5-6 years). Harvesting rattan one by one, selecting those trees which have withered ocreae at the bottom and appear green with ivory white fibres.
- Cut the stem 10 cm above the ground, taking it out first then taking out the ocreae; it should be dry and processed to avoid mould.
- A harvesting cycle can be 1 to 2 years.

SESSION 13: PRUNING TECHNIQUES

Objective

After the session, participants will be able to:

- Present the advantages of pruning.
- Identify trees' age and dimension that need pruning.
- Implement correct pruning techniques.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, afforested area, which is 3 – 4 years old.

Steps

Facilitators warm up the class by asking: "What should we do to make a newly planted forest trees grow straight up and limit the number of knots as much as possible?"

Facilitators introduce the objective of the session to the class.

<u>Theoretical Part</u>

Facilitators provide discussion questions to the class, divide the class into small groups and request them to work in their groups for 30 minutes.

Group discussion questions

1. Why do we prune branches?
2. Which tools should we use for pruning?
3. Which principles should we comply with while pruning? Why should we do that?

Facilitators observe and facilitate groups discussions, followed by facilitating the presentation of group results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Practical Part

Facilitators gather the participants in the forest where they will practice pruning trees. Before starting, ask:

- How big should the trees be (height, dimension) before we can prune off their branches?
- How high should we prune?
- How far from the branch collar should the cut be made? Why?

Facilitators demonstrate pruning a tree to the class. The whole class observes and then appoints four participants to practice pruning under the supervision of the facilitator. Facilitators supervise and support, correcting if necessary.

Facilitators then divide the class into four groups, and request the four participants who conducted the pruning to be the head of the group. Each group is assigned to prune $100m^2$.

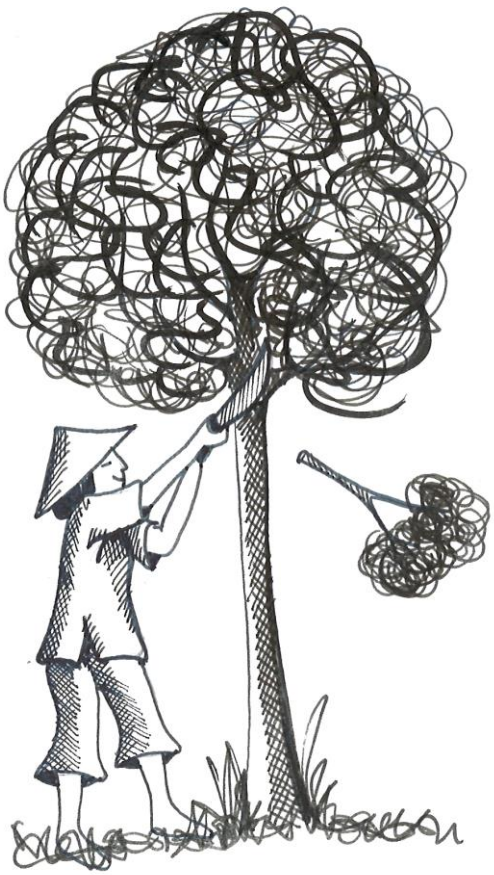
Facilitators observe and facilitate the pruning.

Facilitators gather the class and evaluate the pruning exercise.

Facilitators' Notes

Principles of Pruning

PRUNING



WHAT IS PRUNING?

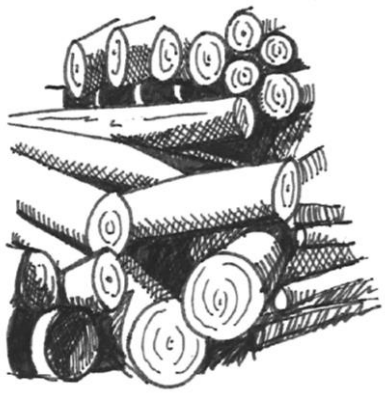
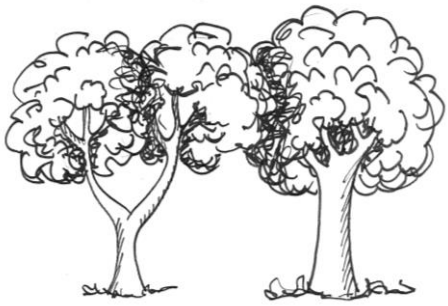
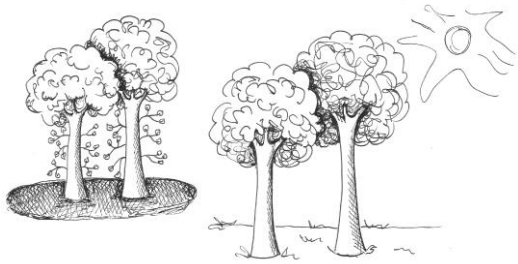
Pruning is cutting of branches close to the stem of the tree

The aim of pruning is to obtain good quality timber in the future

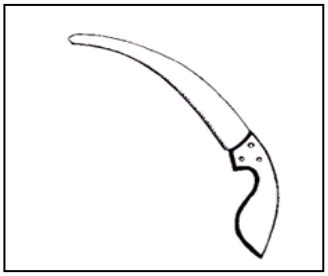
Pruning has to be done using the correct technique

Wrong pruning is worse than no pruning!

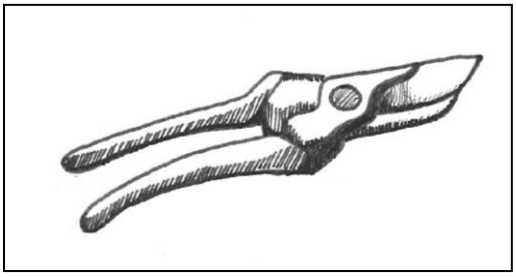
Why do pruning?

The increase the quantity of knot-free timber: 	To provide for a variety of useful products: 
To improve the stem form of trees: 	To reduce shade from trees: 

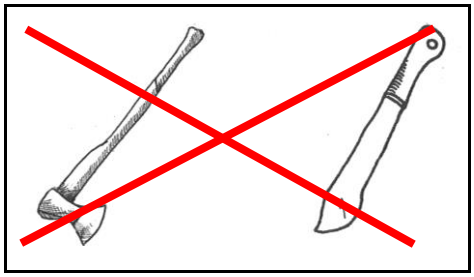
Tools for Pruning



Pruning Saw



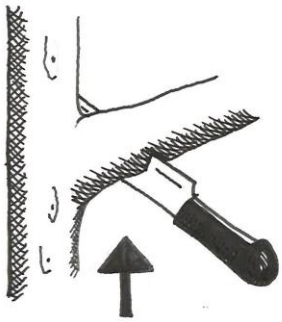
Pruning scissors



Axes and machetes are unsuitable

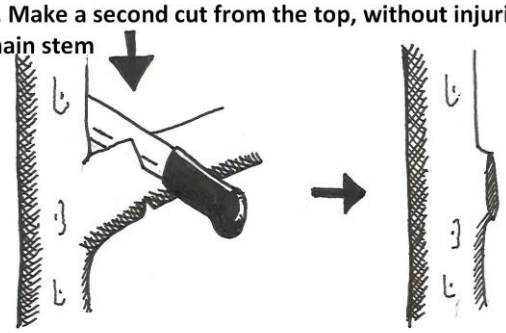
- A pruning saw can be mounted on a shaft to reach high branches.
- Pruning scissors are used for low branches.
- Axes or machetes will damage the tree and should not be used for pruning.

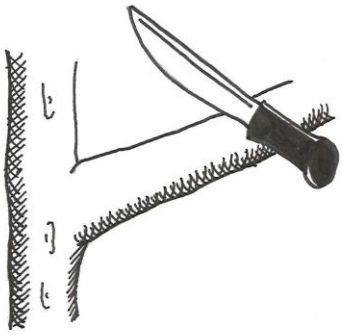
How to do pruning?



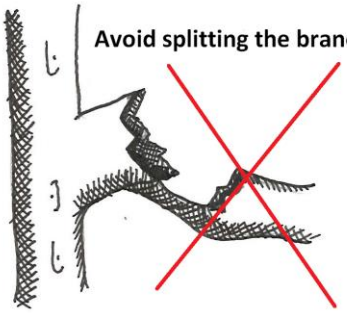
1. First make an undercut through the bark through at least one quarter of the wood

2. Make a second cut from the top, without injuring the main stem

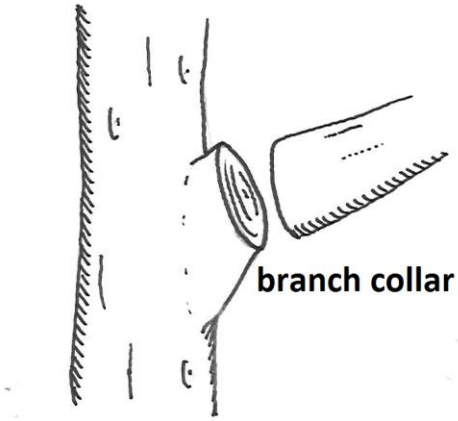




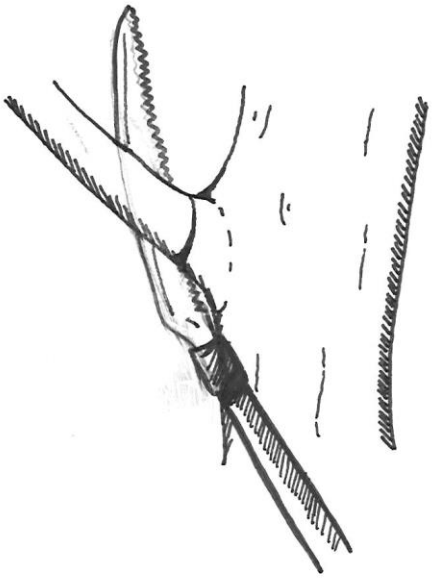
Use only sharp tools to make a neat cut



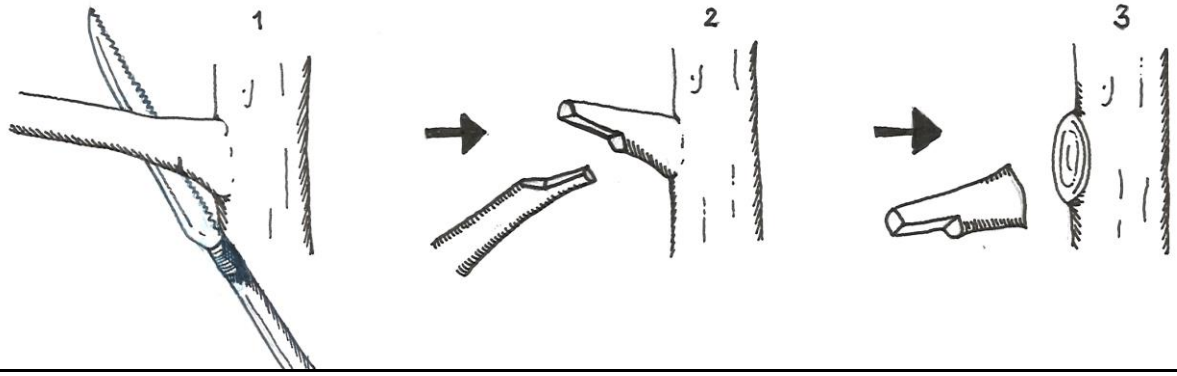
Avoid splitting the branch collar



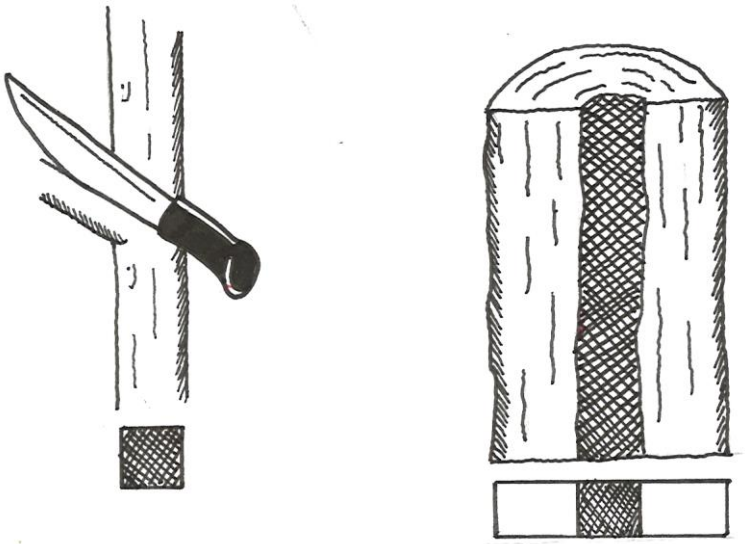
Make the cut clost to the stem but without damaging the stem collar



Heavy branches with enlarged collars are cut in 3 steps:

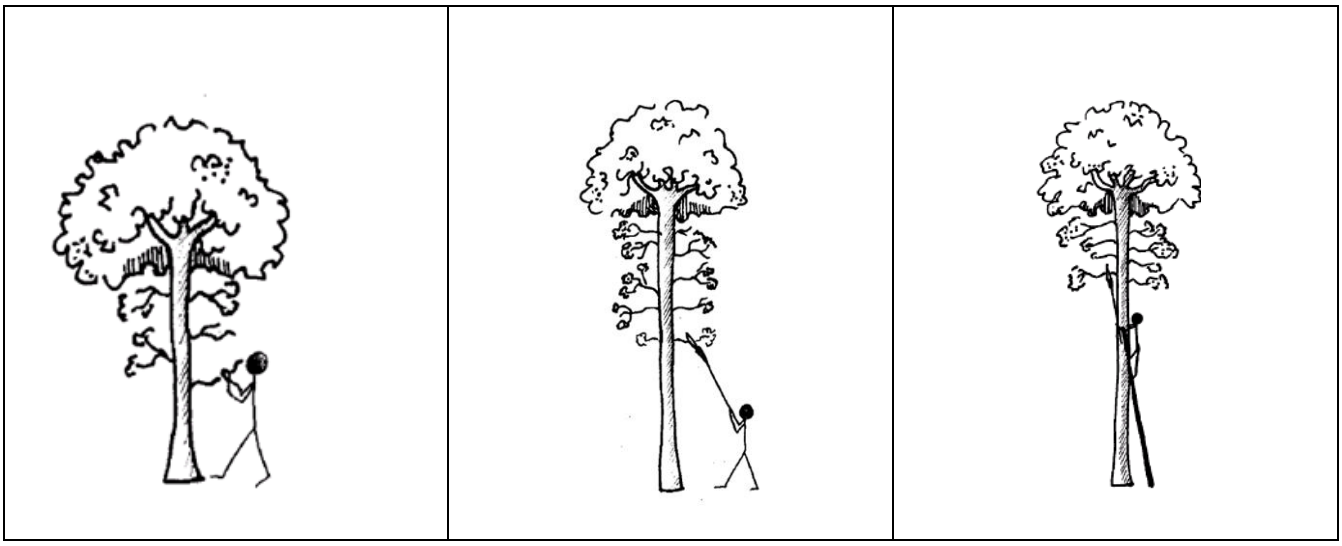


When to start pruning?



- Start pruning while the diameter of the branches are 3 cm or less. A bigger branch gives a wound, which is difficult to heal.
- The diameter of the tree at the pruning height should not exceed 10 cm in diameter. A bigger diameter means less knot-free wood.
- The growth of the tree can be reduced if the pruning is too intensive.
- Do not prune at heights, where the diameter of the tree is less than 5cm.
- Do not prune higher than to maximum 2/3 of the height of the tree.

Planning the Pruning



1. Prune up to 2m when the trees have a height of 4m, using pruning scissors.
2. Prune up to 4m when the trees have a height of 8m, using a pruning saw on a shaft.
3. Prune up to 6m when the trees' height is 10m, using a pruning saw on a shaft and a small ladder.

Forestry: Which tress to prune?

In forestry, not all trees will normally mature to high value timber trees. Thus, there is no need to prune all trees.

How many trees to prune?
Prune trees with a distance of 10 time the expected diameter in breast height when clear cut (if you expect to cut timber trees at 40cm, then select trees with a distance of 4m x 4m for pruning).

Which trees to prune?

Single out the trees, which are:

- Straight;
- Healthy;
- Without forks;
- With few of small branches; and
- With a well-developed crown.

Selection of trees for pruning

- Select the trees for pruning at a height of 7 – 9m. At this height, you can see if the future saw log is straight.
- Mark the trees for pruning with a painted ring around the stem, then it is easy to recognize and protect the trees in the future.

SESSION 14: TECHNIQUES OF THINNING

Objective

After the session, participants will be able to:

- Present advantages of thinning.
- Define principles of thinning.
- Identify which trees should be cut as part of a thinning operation.

Duration

150 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, afforested area that is around 5 – 7 years old, a drawing of a high density forest plantation.

Steps

Facilitators start the session by showing a drawing that illustrates a thinning regime and ask the class: "What does the drawing illustrate?" Based on participants' answers facilitators shape the contents of the session and introduce the main objectives of the session.

<u>Theoretical Part</u>

Facilitators divide the class into groups and request them to discuss the following questions for 30 minutes and then write down the results of their discussion on a big paper.

1. Why is thinning necessary for a forest plantation?
2. When should thinning for a forest plantation be carried out?

3. Which principles of thinning do we have to comply with? Why?

4. Which trees should be taken out?

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Practical Part

Facilitators take the participants to the forest and ask them before beginning the practical part:

Which trees should be taken out in this plantation? Why do you choose those trees?

Facilitators listen to participants' opinions, then sum up and present the identification of trees needed to be taken out for thinning.

Facilitators demonstrate how to identify selected trees for thinning.

Facilitators divide the class into four groups, give them colour plastic strings and request them to mark the selected trees for thinning. Those trees that for sure are for thinning will be marked with red string and those uncertain will be marked by green string. Each group will mark trees for thinning in a 1000 m^2 area.

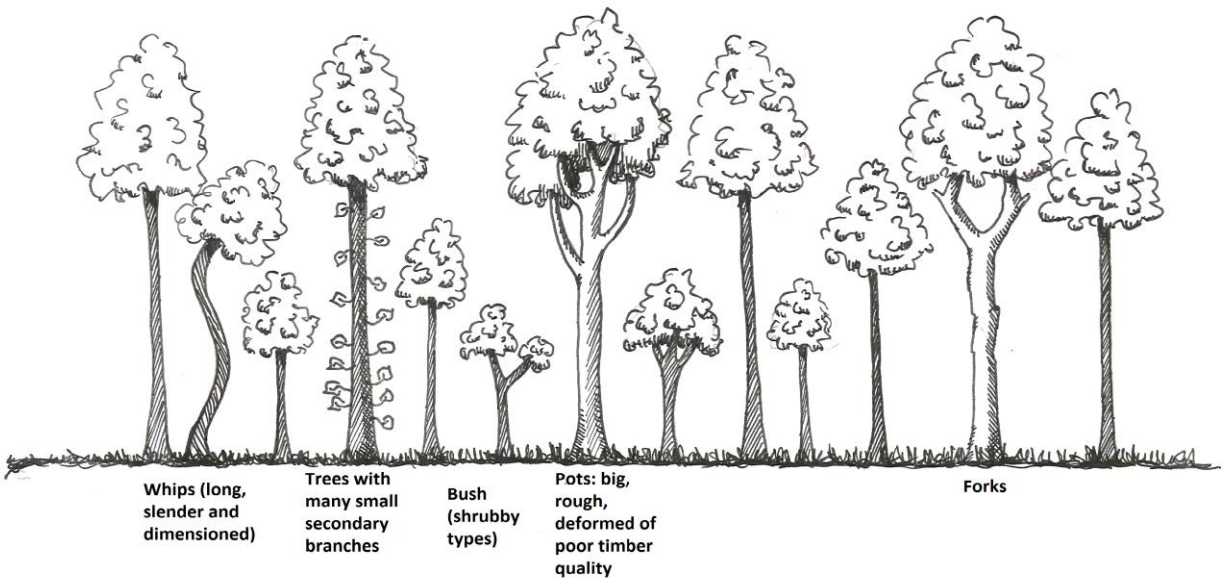
Facilitators observe and facilitate groups in conducting the marking of trees for thinning.

Facilitators gather the class again and evaluate the practical part.

Facilitators' Notes

Thinning

Individual trees in a stand tend to develop differently but in characteristic types, which are given different nicknames



What is thinning?

- Thinning means removing some of the trees in a densely stocked forest or patches of forest.

Why Thinning?

- To improve the growth rate and diameter of the remaining trees in the stand (reduce competition).
- To improve the final timber crop by removing deformed tree stems not suitable for timber.
- To open the canopy and allow more light to reach the under story e.g. for coppice growth.
- To harvest smaller dimensions for e.g. poles, fuel wood, fencing material etc.

When thinning?

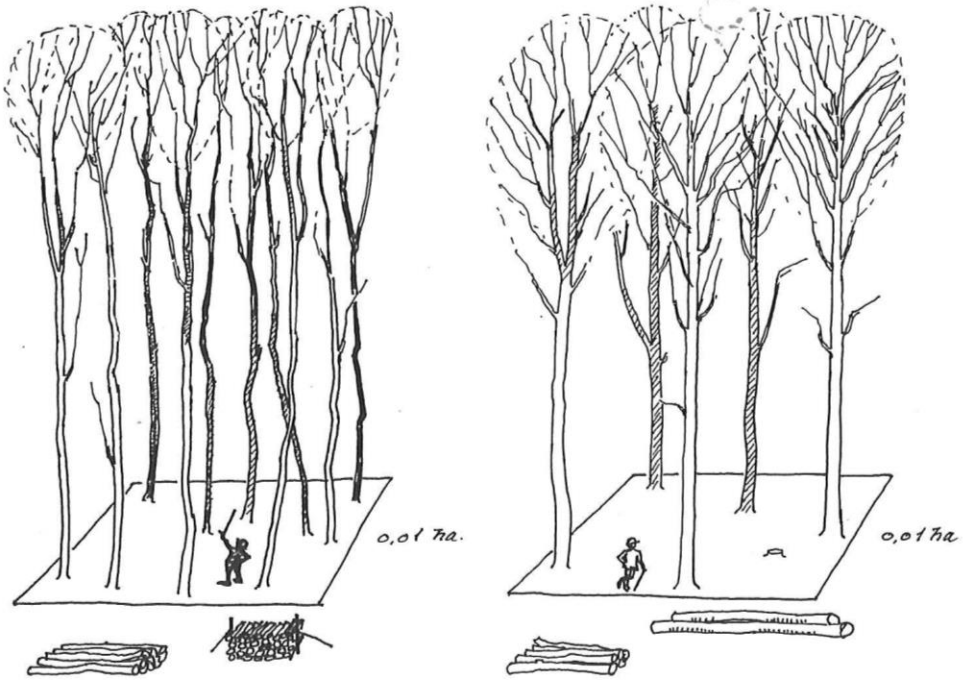
- As soon as the canopy closes, it is time to consider the first thinning.
- Regularly and often.
- The more vigorous the youth growth of the tree species are, the earlier thinning is needed.

How to do thinning?

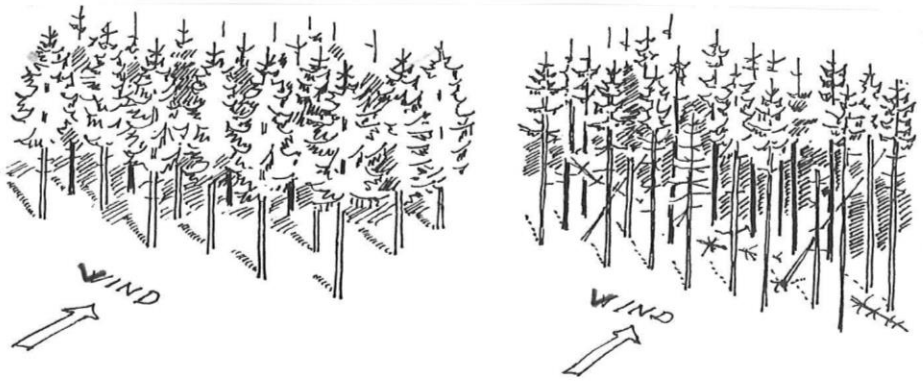
- During a single thinning, you can remove up to 25% of the trees (growing stock), depending on the actual stock.
- The best spacing to aim for with the thinning depends on the age and size of the trees and what is predicted to be the final product in the stand e.g. quality saw logs.
- Mark trees before thinning.
- Remove poor quality tress and trees that will bother future trees.

Thinning is a way to improve stand quality and speeding up increment on the trees of highest quality and growth. The black trees in the picture should be removed in the thinning operation.

Well thinned stands produce higher quality wood in bigger dimensions.



Well thinned stands are more stable and wind resistant.



SESSION 15: PLANTING TECHNIQUES OF HYBRID MELIA AZEDARACH/ WHITE MELIA AZEDARACH

Objective

After the session, participants will be able to:

- Present planting and management process of melia azedarach.
- Select a suitable planting session and good seedlings.
- Identify an appropriate time for harvesting melia azedarach.

Duration

90 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators start the session by asking: "Who has experience with growing hybrid melia azedarach/white melia azedarach at their locality?"

Facilitators introduce the objectives of the session.

Facilitators ask the class: "What economic value does melia azedarach have?"

Facilitators sum up different opinions from participants and write down the economic values of melia azedarach on the board.

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper. (Groups 1 and 2 discuss questions 1,2, and 3; groups 3 and 4 discuss questions 4 and 5).

1. What are the standards for good seedlings of melia azedarach?
2. If melia azedarach is planted in a forest plantation, what is the correct planting density? Why do we have to plant it with that particular spacing?
3. Which month of the year is the most suitable for planting melia azedarach?
4. How should melia azedarach be managed in order to grow straight and develop well?
5. When can melia azedarach be harvested and why should it be harvested then?

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

5. Facilitators' notes

Seedling Standards

- 9 – 12 months-old, 1.5 – 2m high, 2-3cm root collar diameter, well developed, straight, no damages by pests or diseases, new young leaves have not yet sprouted.

Planting season

- The most suitable planting season for bare root seedlings is the late winter season, from Dec. to Feb., before the new, young leaves have sprouted.
- The most suitable planting season for directly sown seeds is the early rainy season, and can also be sown in the spring or autumn.
- The most suitable planting season for potted seedlings is spring or autumn.

Planting methods

For potted seedlings:

- Use the potted seedling for intensive planting of only one species on potential farmland. Intercrop with short-term agricultural crops.
- Use the potted seedling for scattered planting along roads and canals.
- Vegetation treatment: clear vegetation thoroughly one month before planting.
- Planting density: 2.500 trees/ha (2m x 2m) or 1.600 trees/ha (2.5m x 2.5m).
- Soil preparation: prepare soil at least 15 days before planting. Prepare holes with a size of 30x30x30cm for concentrated planting of one species, and with a size of 40x40x40cm for scattered planting. Cover the holes five to six days before planting.
- Planting: choose a shady day to plant. Remove soil in the middle of the holes, remove pots and put seedlings straight into the middle of the hole and then cover with soil.
- 20 – 30 days after planting, replace dead plants with new ones to planting density.

For bare root seedlings:

- Apply mainly to scattered forest plantations.
- Planting density: 3m x 3m.
- Soil preparation: hole size of 40x40x40cm.
- Planting: choose a shady day to plant and plant in the early morning or late afternoon when the sun has set.
- Select qualified seedlings, shorten the tap root to about 20-25cm. Remove soil in the hole, put seedlings straight into the middle of the hole and then cover with soil.
- 20 – 30 days after planting, replace dead plants with new ones to maintain planting density.

For direct sowing:

This is the main method that people in the mountainous areas normally apply for pure melia azedarach plantations. It is often intercropped with short-term agricultural crops for 1-3 years on sloping land or on land that has been cultivated.

Planting formula as following:

Fallow land after cultivating 5 - 8 years → grow melia azedarach and a short-term agricultural crop 5 – 6 years → melia azedarach 7 – 8 years → harvest melia azedarach (when its diameter reaches 35 - 40cm and its height reaches over 10m) → grow melia azedarach /bud regeneration and short-term agricultural crops.

Technical application:

<u>Method 1:</u>

Clear vegetation in the entire area. Dig 30x30x30cm size holes.

Sowing seeds: Sow 3-4 treated seeds per hole, cover seeds by a soil layer of 3-4cm. 15 – 20 days after sowing, the seeds will germinate. One month after sowing, remove the weak and bad saplings and keep only one strong sapling per hole.

Method 2:

After clearing the area, use a hoe to loosen up the soil in the areas where you will plant the seedlings. Sow 3-5 seeds per hole, cover with soil and organic litter. Set fire to the litter. The seed coats will be damaged by the heat, and water and air will be able to get to the seeds easily, enabling them to germinate fast and at the same time.

One to two months after sowing, remove the weak and bad saplings and keep only one strong sapling per hole.

Management after sowing

- In the first year, two to three months after sowing: weed, loosen the soil around the bottom of trees in a ca. 80cm - 1m wide circle, make sure there is only one sapling per hole. After five to six months, weed, loosen the soil and clear liana.
- In the second year, around April – May, weed, loosen soil, clear vegetation, trim buds, and prune. The second time, around September – October, weed, loosen soil, trim buds, clear vegetation and liana.
- In the third year, follow the same management plan as in the second year.

Note: In order to encourage trees to grow and develop with a wide diameter and long stems, it's necessary to follow the management process closely and carry out pruning when trees are 1.5 - 3 years-old. After that age, do not prune any longer because its branches will be big enough. The trees in the plantation also need to be protected from fires, buffalo, cows and damage caused by people.

Harvesting and processing

For agro-forestry plantations: during first 5 - 6 years, it can be intercropped with pineapple, tea, bean and ground nuts to increase incomes. After 7 – 8 years, the bigger trees can be selected and harvested for domestic timber use. Leave some trees to spread seeds. In combination with stumps, this will help the forest to regenerate.

For single species plantations for a wood and firewood business: Remove bad trees. Conduct a thinning operation when the plantation is 5-6 years-old, and only maintain 1.000 - 1.500 trees/ha. When the plantation is 10-12 years-old, it is possible to harvest its main products of wood and one can obtain 120-150m^3 /ha.

Local experience has shown that trees derived from the stumps normally produce more straight and solid timber than those derived from direct seed sowing. A combination of stumps that regenerate and direct sowing makes for a good start of the second rotation.

SESSION 16: PLANTING TECHNIQUES OF CHUKRASIA TABULARIS

Objective

After the session, participants will be able to:

- Present the planting and management techniques for chukrasia tabularis.
- Select the proper planting season for chukrasia tabularis.
- Select the suitable planting method according to the realities on the ground.

Duration

90 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators start the session by asking a question to direct the class to the contents of the session: "Who has grown chukrasia tabularis in this area?"

Facilitators introduce the objectives of the session.

Facilitators ask the class: “What economic value does chukrasia tabularis have?”

Facilitators sum up participants’ opinions and write the values of chukrasia tabularis on the board.

Facilitators present planting and management techniques of chukrasia tabularis, covering the following contents:

- Standards of a qualified seedlings.
- Requirements of soil and climate conditions for growing chukrasia tabularis.
- Planting season.
- Planting methods of chukrasia tabularis.
- Planting density and size of planting holes.
- Tree management after planting.
- Pest and disease control.
- Harvesting.

Facilitators ask the class: “Is it possible to grow chukrasia tabularis in this locality? Why or why not?”

Facilitators wrap up the session.

Facilitators’ Notes

Seeds should be sourced from trees that are at least 15 years-old, which are well grown and developed, have straight stems, few branches and sub-branches, a symmetrical dense crown, and have no damage caused by pests and diseases.

After harvesting, fruits are dried in the light sun and then smashed in order to get the seeds out. Dry seeds for two more days or until they are completely dry. They can be stored in glazed terra-cotta jars, sprinkled with a thin layer of ashes on the surface. However, the seeds cannot be preserved for a long time.

14-15kg of fruit can produce 1kg of seeds, consisting of 60.000-62.000 seeds.

Sapling cultivation/nursery

Soil for sowing: Top soil should be 30 – 40cm deep silt soil. It should be winnowed before sowing.

Sowing bed: 0.8 - 1m wide and 15 - 20cm high.

Mix compost into the soil ca. 3-4kg/ 1m^2.

Sowing season: late Jan. - early Feb.

Seed treatment: Soak seeds in warm water at 35-40°C for 6-8 hours, take them out and rinse them with water. Keep seeds warm for 6-7 days (e.g. by placing them in the sun) until seed coats crack. Each day, rinse seeds 2-3 times.

Sowing method: Scatter 1 kg of seeds over an area of 120-150m^2, cover by a thin, fine soil layer of ca 0.3-0.5cm. Then mulch the area with sterilized straw, which will help keep the moisture. Water the area every day. When seeds germinate, the straw should be removed. When removing the straw, be careful not to damage the new sprouts. Make a shade frame to eliminate 30-40% of the light.

The saplings should be moved into pots when they are about 7 – 10cm high and have 5 – 7 leaves. This is normally 60 – 80 days after sowing. The pot size is 8 – 12cm.

The mixed media for the pots should consist of: 89% soil, 10% compost, and 1% of phosphorus.

Keep a frame to shade the saplings, water every day.

Nursery management

Water plants regularly, soil should always be moist and weed regularly. Saplings often get rotten roots disease, caused by a fungi, which results in saplings dying in patches. The nursery needs to be monitored frequently and if you detect a fungal disease stop watering immediately. You can spray Benlat or Boocdo as an antifungal.

The saplings should have their roots pruned 1 – 2 months before transplanting.

Planting and management techniques for afforestation

Topography: preferable altitude < 100m and slope < 20^0.

Climate: preferable temperature between 20-27^0C and average annual rainfall 1700-1800mm/year.

Soil: preferable is a thick, moist and well-drained soil layer and intercropping under the forest canopy.

Standards of a qualified seedling: 7-8 months, 50-70cm high and root collar diameter of 0.5-0.6cm. Plant should be growing well, no pests and diseases, symmetric and dense development.

Planting season: During spring and autumn. Choose shady and light rainy days to transplant.

Field preparation

Normally, prepare fields by cutting belts: clear belts with a width of 3m, keep belts of a width of 10m.

Size of planting holes: 40x40x40cm.

Basal fertilizer application: 3-4kg compost or 200gNPK, digging holes 1 month before planting, applying basal fertilizer and covering the holes 10-15 days before planting.

Planting density: 700-800 plants/ha. Spacing in rows is 3m and between rows 10m (can also be planted in patches or scatted around the fields).

Management: In the first year, clear vegetation, loosen the soil around the foot of trees in a 1m wide diameter. In the second and third year, clear vegetation and prune to create straight stems.

SESSION 17: ASSESSMENT OF FOREST INVENTORY

Objective

After the session, participants will be able to:

- Answer the question of why it is important to do forest inventories.
- Apply the formula calculating volume of a log and a single tree to calculate forest inventory.
- Practice to assess foresty inventory in a simple way.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, 7-8 year-old forest, calculator.

Steps

Facilitators start the session by asking: “Who among you here can calculate your own forest inventory?”

Facilitators introduce name of the session and its objectives.

Calculating volume of a log

Facilitators present a case (show a drawing of a lying log) and request the class to calculate the log’s volume with the information that the log is 4m long and has a 60cm girth in the middle of the log.

Facilitators sum up different ways of participants’ calculation and present the formula to calculate the volume of a lying log.

Facilitators provide two more examples for calculating log volume for practice.

Calculating volume of a single tree

Facilitators show a drawing of a single tree with its parameter of 5m high and 60cm girth and request participants to calculate how many m^3 of timber this tree has.

Facilitators present the way to calculate the volume of a single tree and ask participants to calculate the volume of that tree.

Facilitators give another example for them to apply.

Calculating forest inventory

Facilitators present methods to calculate forest inventory:

- Establishment of a standard lot.
- Calculation of the volume of all trees in five lots.
- Formula.

Practice to calculate forest inventory

Facilitators take the participants to the forest, divide the class into 5 small groups and request each group to define one standard lot with the size of 100 m^2, and then conduct an inventory of that lot.

Facilitators observe and facilitate groups' calculations.

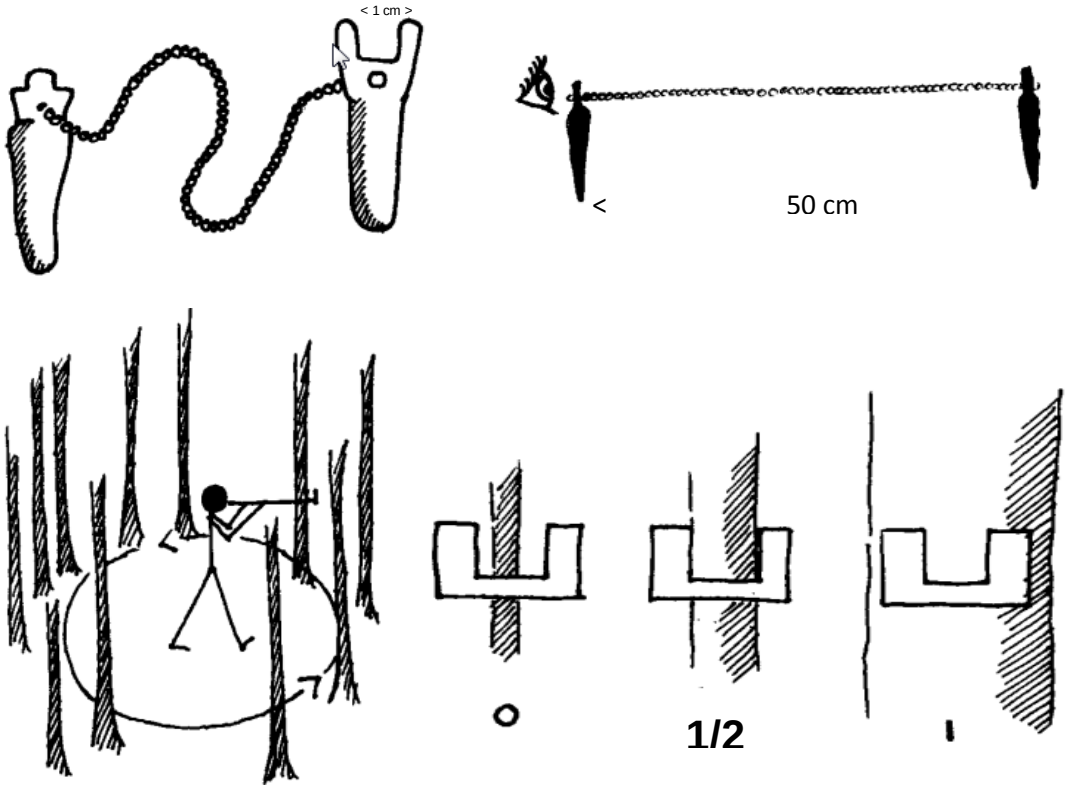
Facilitators gather the groups at the end of the forest to agree on the results of the five standard lots and use that information to calculate the volume of the entire fores area.

Facilitators evaluate the practical part and conclude the session.

Facilitators' Notes

m^2 * Height * Form factor (conifers approx. = 0.5 broadleaves = 0.6) = m^3 / hectare

a. m^2 count by relascope (in 1.3m height of the tree)



b. Height measuring by altimeter – average sized tree (or trees) are measured.
c. Calculation of standing volume (Example: Count by relascope: 32.5 – height from altimeter: 20.5 m - form factor 0,6 for broadleaves - area of stand 1.2ha. The standing volume can be estimated as 32.5 m^2/ha * 20.5 m * 0.6 *1.2 ha = 480 m^3).

Home-made “thumb”-relascope

Instead of a real relascope, you can use your thumb and arm length to calculate m^2.

A correction factor has to be used, because the scale between thumb width and arm’s length is not 1:50 as for the relascope.

The correction factor (F) can be calculated as: F = 2500 * (width of thumb * width of thumb)/(length of arm * length of arm).

Example: Width of thumb: 2,2 cm; arm length (length from eye to thumb, when the arm is fully stretched out) 71 cm. The correction factor is then: F = 2500*(2,2*2,2) /(71*71) = 2,4003.

Number of trees counted with the “thumb”-relascope: 11.5. Corrected m^2-count = 11.5 * 2,4003 = 27,6.

Inventory based on number of trees

Often the farmer knows the number of trees in the stand.

The standing volume can be calculated by determining the volume of the average tree multiplied with number of trees.

m^2 per tree * Height * Form factor (conifers approx. 0.5 broadleaves 0.6) * Numbers of trees = m^3 in stand.

m^2 per tree is estimated as the mean from some trees which are identified as average trees – or as the mean of a number of random identified trees.

m^2 is calculated as: m^2 per tree = (G*G) / (4*∏) where G is the girth in meters and ∏ for practical use is 3.14.

Example: One tree has been measured in a stand of 303 deciduous trees. The girth at breast height is 0.95m and the height is measured as 18.5m.

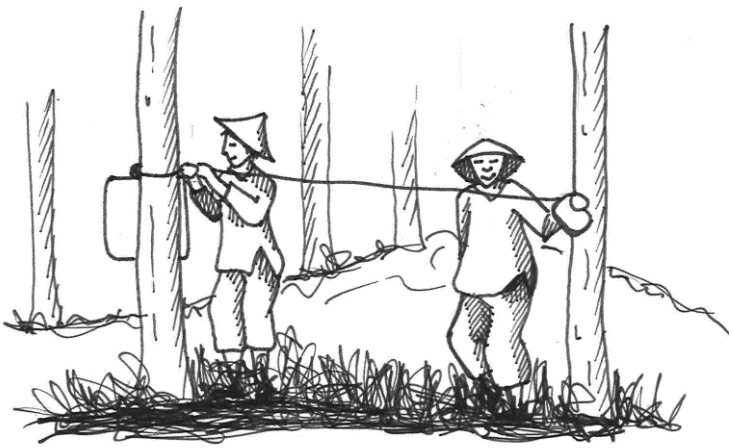
m^3 in stand = [(0,95 m * 0,95 m) / (4*3.14)] * 18.5 m * 0.6 * 303 = 240 m^3.

Errors on the estimation

- The measured height is not the average height in the stand.
- The measured girth is not the average girth in the stand.
- The form factor used is not correct.
- The used numbers of trees are not correct.

Establishing a standard lot

Select a standard lot representing the afforestation plot: the size of the standard lot is usually 10mx10m. Based on the measurement of the standard lot’s height and diameter or girth the basal area can be calculated.



The basal area of the entire forest plot can be calculated from the basal area of a standard lot (if you know the area of the forest plot).

For example:

- The area of the forest plot is 1.5 ha.
- Set up two standard lots (size of each standard lot is 10m x 10m): Average basal area of each standard lot calculated as 1.2 m^2.
- The standing volume of the forest plot will be: (15000/100)*1.2 = 180 m^2.

SESSION 18: ASSESSMENT OF TIMBER QUALITY

Objective

After the session, participants will be able to:

- Present assessment objectives of timber quality.
- Identify criteria for assessment of timber quality.
- Practice assessing quality of some logs.

Duration

90 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, different samples of timber.

Steps

Facilitators show some timber samples and ask participants "If you were a buyer, which logs would you want to buy?"

Facilitators introduce the objectives of the session.

Facilitators divide the class into four groups and request them to discuss the following questions for 30 minutes and then write down the results of their discussion on a big paper.

1. To make an assessment on the quality of a log, which criteria should you base your assessment on? Why?

2. In order to have a good log, what management methods need to be applied in the forest plantations? Please specify these methods.

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

Assessing Quality and Quantity of Forest Products

Quality of logs and timber depends on:

- Curvature.
- Twisting.
- Knot size, placement and number.

- Cracks.
- Size.
- Colour/Discolouration.
- Root and other damages.

Methods you should apply to obtain good timber products:

- Pruning.
- Thinning.
- Harvesting by correct techniques.
- After harvesting, timber should be kept in good condition and not exposed to the air for too long.

SESSION 19: PLANTING TECHNIQUES OF MORINDA OFFICINALIS

(Vietnamese: BA KÍCH)

Objective

After the session, participants will be able to:

- Present planting and management techniques for morinda officinalis.
- Identify a suitable location for planting morinda officinalis.
- Select suitable planting methods for morinda officinalis.

Duration

60 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape**.**

Steps

Facilitators direct participants to the topic of the session by asking: “Who is familiar with the tree morinda officinalis?

Facilitators introduce the objectives of the session.

Facilitators present planting and management techniques of morinda officinalis, covering the following areas:

- Seedling standards
- Planting season
- Planting methods
- Management after planting
- Pest and disease control
- Harvesting morinda officinalis

Facilitators ask the class: “Is it possible to grow morinda officinalis in this area? Why or why not?

Facilitators wrap up and conclude the session.

Facilitators’ Notes

Seedling standards

- Producing cuttings: Take a cutting from the mother plant at the age between 3 – 7 years.
- Each cutting should be 25 - 35cm in length, with a diameter of >= 3mm.
- Sow the cutting 10cm deep directly into the seedling bed. The distance between rows should be 30 cm.
- Keep the cuttings in the shade at least 20 days or until they have formed new leaves.
- After 3 -4 months in the nursery, the cuttings are ready for planting.

Planting Season

The best time to plant is in the spring or autumn. Choose a shady day with light rain.

Method and planting density

There are several different methods and places where morinda officinalis can be planted:

- In bands, where bands should be 1 – 2m wide, spacing between bands should be between 3 - 4m, and spacing between trees on the band should be 2 – 3m.
- Scattered planting under the canopy of a natural forest, where the space between trees should be no less than 1.5m.
- Planting under the canopy of an acacia or cinnamon plantation, 1 – 2 years after establishment. Spacing between trees should be no less thean 2m.
- Planting in a home garden under the canopy of fruit trees such as jackfruit, litchi, longan, etc. Make sure the distance between the trees is no less than 2m.
- If planting on bare land and in open spaces it is necessary to plant other plants for shade first, such as fallopia japonica, cassia tora L. Spacing between row and row and tree and tree are 2 – 3m and 1.5 – 2m respectively.

Planting

- Site preparation: on flat land, the seedlings should be planted in beds to avoid flooding. On sloped land, the seedlings should be planted in holes with 50cm x 50cm x 50cm dimensions.
- Fertilizer: basal fertilizing: 5 kg of cattle manure + 300g of NKP for each seedling. Use a hoe to mix it all with soil and to fill it into the hole.
- Planting: choose a shady day to plant. Remove the soil in the middle of the holes, use a sharp knife to remove the seedling pots and put the seedlings straight into the middle of the hole. Cover with soil.
- 20 – 30 days after planting, replace any dead plants with new ones to maintain planting density.
- Place bamboo sticks by the seedlings on which the plant can climb.

Plant management after transplanting

- For the first two weeks, the seedlings need regular watering until green leaves start sprouting.
- For the first two years, weed regularly and apply 300g of NPR fertilizer for each seedling once a year.
- Shading should be 30-50%.

Pest and disease prevention

There are very a few diseases with Morinda officinalis. However, some diseases could be Rhizoctonia solani. For treatment, use Bordaux with a concentration of 0.5% and/or combine with Benlat C, 0.1%. Spay it on the leave and stump for disease prevention purposes. Lime powder can be used for preventing ants, crickets, etc.

Harvesting and raw processing

- Can be harvested after 3 – 5 years. The suitable time for harvesting is winter. The products are its roots.
- Roots should classify into three types: Type A: with diameter >= 1.2 cm; Type B: diameter 0.8 - 1.1 cm; Type C: diameter < 0.8 cm.

- After harvesting, the roots should be washed before storing.

SESSION 20: PEST MANAGEMENT FOR NURSERIES AND AFFORESTED AREAS

Objective

After the session, participants will be able to:

- Present steps for pest management for nurseries and afforested areas.
- Identify some common pests and diseases in nurseries and afforested areas.
- Choose effective methods to control pests and diseases.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, pictures of disease damage in a nursery and afforested area.

Steps

Facilitators introduce the objectives of the session.

Facilitators present different kinds of nursery pests and diseases .

1. Pests
   - Brown worm.
   - Ants .

2. Diseases
   - Powdery mildew.
   - Damping off.

Contents of presentation
- Damages.
- Recognized features.
- Control methods.

Facilitators present different kinds of afforestation pests and diseases

- Pests and diseases on acacia
- Pests and diseases on pine

Facilitators wrap up and conclude the session.

Facilitators' Notes

Common problems in nursery

Feature	Possible reason for poor growth
 **Leaves twisted**	Aphids attacking plants? Leaf eating ants? Leaf damage earlier by drought or insects?
pale colour	Soil lacks nutrient(s)? Nutrients unbalanced? Insufficient light? Natural feature of new leaves – colour develops later?
very small	A feature of the species or provenance? Young tree has branched a lot? Not enough shade?

	Previous water stress? Shortage of nutrients?
prone to wilt	Shade reduced too quickly? Soil too rich and leaves too big? Roots damaged during potting or transplanting? Roots had not enough time to grow into new soil? Roots attacked by pest or disease? Sudden changes in weather?
fall of early	Sudden change in environment? Too rapid hardening? Pots too small? Watering problems? Too much fertiliser? Plants attacked by pest or disease? Drought, hail and white frost?
have holes	Caterpillars or leaf-miners? Leaf-cutting ants?
torn	Large, soft leaves damaged by wind? Careless handling of plants?

Common problems in forest plantations

Feature	**Possible reason for poor growth**
Stems spindly	Plants too close to each other?
bent	Genetic characteristic of the species? Temporary feature of young shoots? Edge plant with one-side foliage? Not enough shelter from wind?
growth stopped	The species grows in height by periodic flushing? Soil unsuitable? Plants short of nutrients? Watering problems? Environment too shady?
die-back of tip	Soil waterlogged? Previous severe water stress? Insect attack?
broken tip	Careless handling? Severe storm, hail? Stem-boring insect? Livestock, e.g. buffalo, cow, goat, or chicken in nursery?
forking	Natural feature of the species? Birds attack buds? Response to previous die-back or breakage?

Feature	Possible reason for poor growth
Roots pot-bound	Container too small? Tree too long in the container?
few seen	Damage when putting seedlings into a pot? Unsuitable pH of potting mix or bed? Most roots are in the ground beneath the pot?
many dead	Soil poorly aerated or waterlogged? Root disease? Nematodes or other pest damaging them?
small clusters along roots	Beneficial nitrogen-fixing modules? Root aphis or similar pest?
Whole Plant stunted	Container became too small? Different potting mix required? Shortage of a nutrient? Altered shading required?
trees dying	Unsuitable species or provenance? Unfavourable nursery environment? Insufficient care of young trees? Disease or pest?

SESSION 21: FOREST FIRE PREVENTION AND SUPPRESSION

Objective

After the session, participants will be able to:

- Identify principles of forest fire prevention and suppression.
- Choose an effective method of forest fire prevention and suppression for specific circumstances.
- Identify a suitable method of forest fire prevention and suppression for individual family conditions.

Duration

90 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, timber samples and matches.

Steps

Facilitators introduce the objectives of the session.

Facilitators make a demonstration, asking the participants to observe carefully: Facilitators strike a match, put it in a glass vase, and use a piece of paper to cover the vase.

Facilitators ask the class “What lessons can you learn from the demonstration?”

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big piece paper.

1. What are the basics of forest fire fighting?

2. What principles do you need to comply with during forest fire fighting?

3. What are the causes of forest fires?

4. What do you do to prevent and how do you fight forest fires? What are the methods to apply?

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

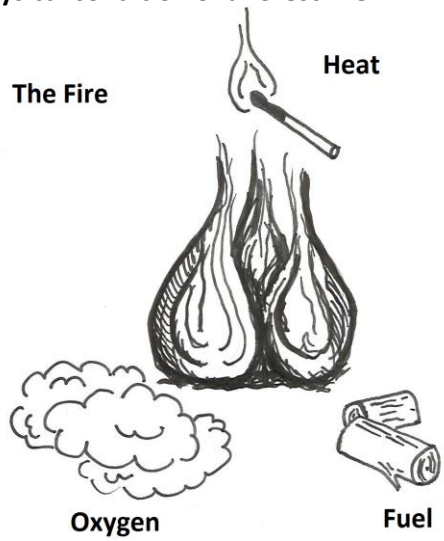
Basics of forest fire fighting:

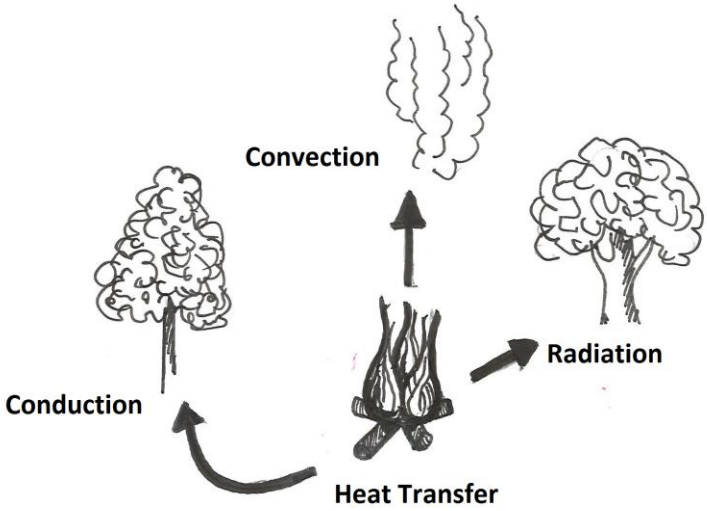
- Reduce the oxygen source, because flame and oxygen are causes of fires. For instance, the above demonstration showed that covering the glass prevented oxygen from coming into the vase and the flame extinguished.
- Remove inflammable materials.

Prevention and Suppression

Wildfires are one of the main natural hazards affecting Vietnam. Some thousands of hectares of forest are lost due to forest fires causing great damage.

Physical condition of a forest fire





Three major components form the 'fire environment triangle'

- Fuel - for instance wood, tree leaves or plants on the forest floor. Dead and dry material is easier ignited and burns faster. If there is a lot of dead wood, dry leaves and plants on the forest floor, the risk of a forest fire increases.
- Oxygen – oxygen must be present for a fire to take place. Oxygen is always in the air, but if it is windy the fire is provided with more oxygen and will develop faster.
- Heat – to start a fire, there must be sufficient heat to ignite the fuel – for instance, from an open fire or from a dropped cigarette.

Spreading of a fire takes place by heat transfer – the fuel is ignited in neighbouring areas.
The heat transfer occurs in three ways: conduction (the fire transfers because the different pieces of fuel are in contact with each other), convection (sparks are transported by the wind), and radiation.

A forest fire is a fire occurring in forests, causing negative impacts.

- The economic loss is mainly connected to the damage of timber, growing stock and to the costs associated with regeneration.
- Nature can be damaged when wildlife and plants are harmed.
- Gas- and particle emissions pollute the environment.

Forest fire prevention

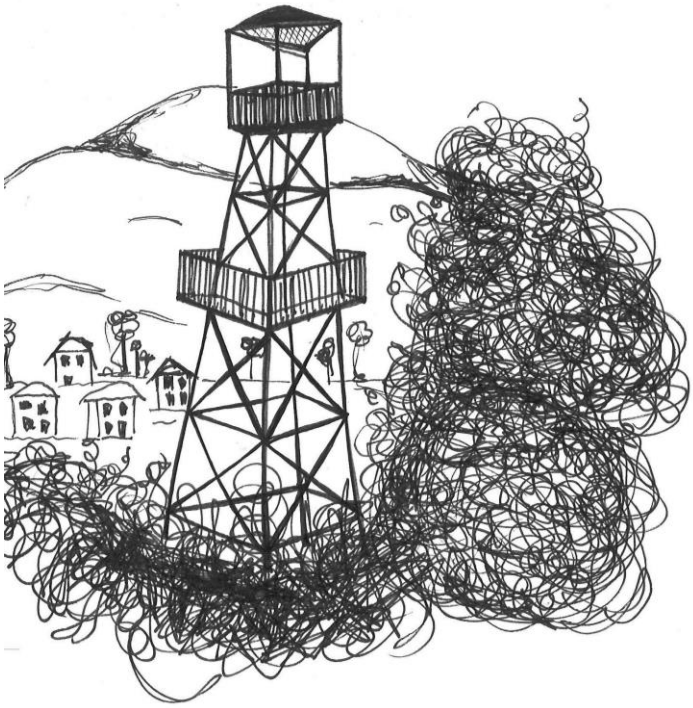
- Taking measures to prevent the start of a fire.
- Detecting a fire quickly so that it can be extinguished while it is still small.
- Preventing the forest fire from spreading.

Preventing the start of a forest fire

Sign boards: Most forest fires are caused by humans. Raising awareness among forest users can reduce the risks. One example is putting up sign boards about the risks of forest fires.
Reducing inflammable materials: Dead and dry wood is potential fuel for a forest fire. Removal of this wood before the dry season begins can lower the risk of forest fires.

Early detection
Early detection gives the best possibility to fight a forest fire effectively. In farm forests located close to villages, forest fires are normally detected early. For adjacent areas and in bigger forests early detection can be difficult.

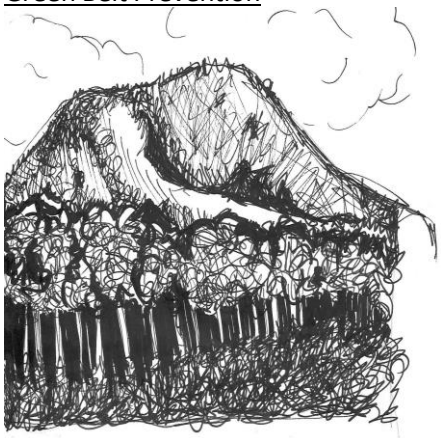
For bigger forest areas, the use of fire watchtowers during the dry season can be the only way to ensure early detection. A strong organisational structure is a precondition for the use of watchtowers.



Information about fire watchtowers

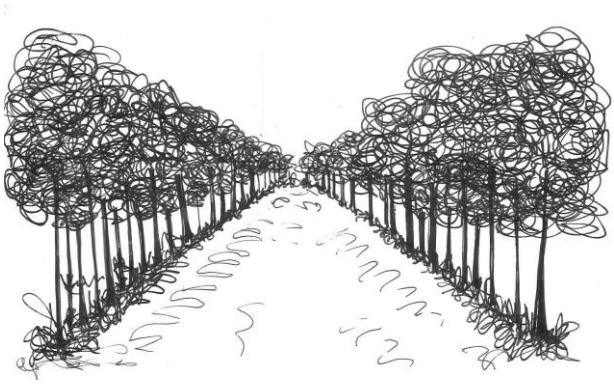
- For optimal view, the watchtower should be at least 15 - 20 m high and if possible, located on top of a hill.
- From any one tower, two or three other towers should be clearly visible. Any one area in the forest should be visible from at least two, if possible three towers, in order to aid in the exact location of the fire site.

Green Belt Prevention



Green belts planted with mixed trees with various leaf canopy structures. Fire-resistant species are selected for plantation and the belts are divided into stands to limit fire expansion. Such belts can prevent both, surface and canopy fires.

Bare belt prevention



Bare belts are strips of land where trees and grass have been cleared or ploughed in order to prevent fires from expanding on the earth surface of the forests.

Forest fire fighting

Forest fire fighting shall adhere to the following three principles:

- Extinguish the fire quickly to reduce spreading.
- Ensure that the fire is completely extinguished. Check the area for sparks or hidden fire in order to prevent the fire from rekindling.
- Ensure the safety of people, transport means, and of the fire fighting equipment and facilities.

Simple tools and machines for fire fighting:

Direct fire fighting: this measure calls for the use of all instruments, ranging from manual to mechanical tools, from hoes, shovels, rakes, long-handled sickles, fresh twigs, watering buckets, shoulder-water containers, to ploughing machines, crawlers, water pumps, fire engines and sometimes planes emitting chemicals in order to directly suppress the fire. This measure is usually applied to small fires with a less than 1-ha area for both surface and crown fires.

Indirect fire fighting: this indirect measure is to mobilize man power to create anti-fire belts in order to prevent the fire from spreading; this measure is usually adopted to limit conflagration on an more than-1-ha forest area or the remaining large forest area with the aim to control a forest fire.

SESSION 22: MARKETING TIMBER PRODUCTS

Objective

After the session, participants will be able to:

- Answer: What is marketing and what is a value chain?
- Identify various tasks of marketing that need to be done for forest products.
- Know agencies who sell forest products.

Duration

120 minutes

Materials:

A0 paper, A4 paper, felt-pen, adhesive tape, case studies.

Steps

Facilitators direct the class to the session by asking: “We often hear and talk about marketing, but do you know what marketing is?”

Facilitators introduce the objective of the session.

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper.

1. Why do you need to do market research?

2. What information should be collected when conducting market research for forest products? How do you collect this information?

Facilitators facilitate the group discussions and the presentation of the groups’ results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators present a case study to the class:

A few companies would like to buy timber products and timber-related products in your area. They want to buy unlimited quantities. The task is to discuss how to approach these companies to negotiate and advertise products for sale.

Facilitators divide the class into six groups, of which five represent the producers and one group plays the buyers. The groups discuss with each other for 10 minutes and then have 5 minutes to meet the group that represents the buyers.

Facilitators facilitate the groups' discussion and discuss with the group of buyers their buying strategy.

Facilitators ask groups to start the meeting with the group of buyers, group by group, marketing their particular products.

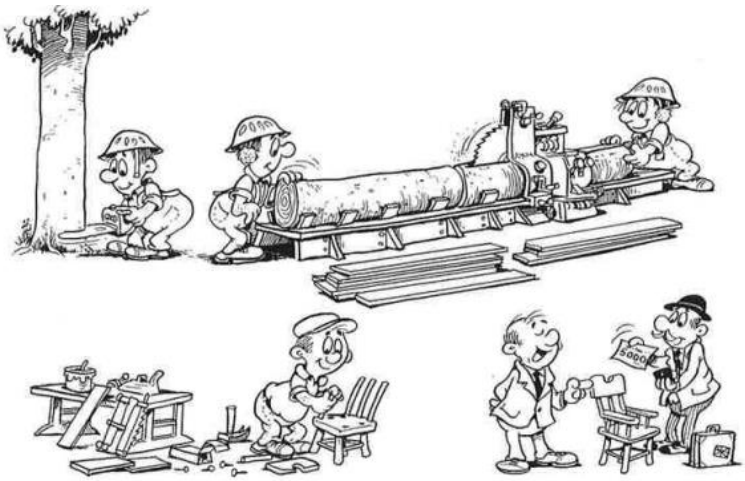
Facilitators ask the group of buyers: "From which group will you buy the products? Why did you choose their products?"

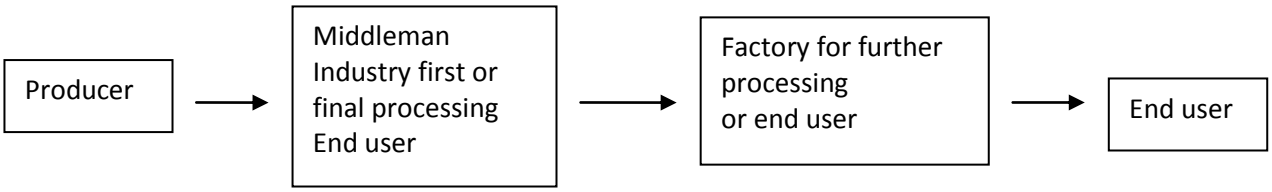
Facilitators wrap up opinions and make conclusion on advertising and selling products.

Facilitators sum up and conclude the session.

Facilitators' Notes

The Sales Chain





The route from producer to end user is often a long one that involves handling and processing of the primary product several times. Looking at a saw log as input to what will in the end become a chair, probably less than 20% of the volume of it is used as material in the chair. 80% ends up as cut-off, saw dust and other products of less quality, each following their separate routes to the end user through other sales chains involving new middlemen, wholesalers and retailers.

The Value Chain

The more processed the wood, the more value has typically been added to it. If you want to sell your wood as firewood, you can add value to it by e.g.:

- Cutting it into smaller pieces, making it easier to transport and use in the stove.
- Chopping the firewood further to make it easier to handle and it also will dry faster.

- Drying your firewood before selling it. Then the calorific value per volume unit is higher and so should the price be.

Whenever you add value to a product you can charge more for it. But remember, in order to make a profit, your effort in adding value should be at a lower cost if you also want to make a profit.
An example of an industrial value chain is illustrated below. 1) Lower quality and smaller dimensions of e.g. pine or eucalyptus sold by a roadside near the forest. 2) Transport to a pulp factory and turned into pulp. 3) Processed to paper at the paper mill. 4) Printed upon and sold as newspapers.

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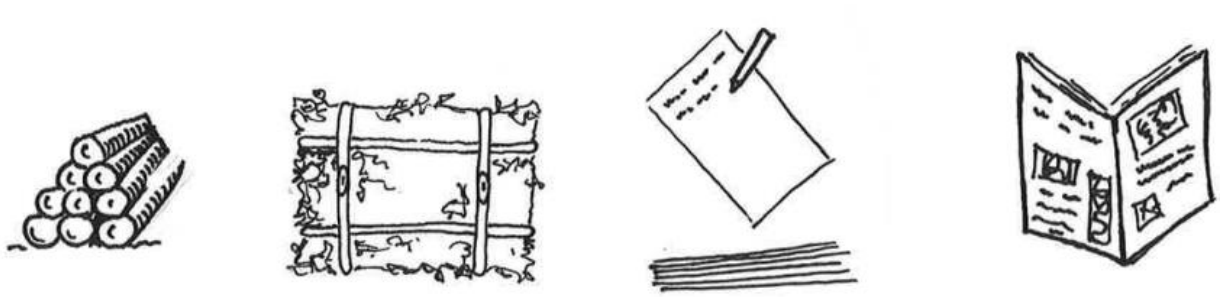


Facilitators ask participants to draw up their own value chain.

When and how to sell
Standing trees: The producer collects a stumpage fee and has no further influence on the quality and price further down the value chain.
Products delivered at roadside: The producer can charge for harvesting and transport to roadside.
Sorting of products: The producer can charge for the different quality / grading of the products.
Sale to industry processing factory or end user: The producer will earn what the middleman has calculated as his commission fee.

Price depends on

- Quantity
- Quality
- Services delivered
- Willingness to take risks
- Knowledge about the market
- Knowledge about the products
- Competitors
- Bargaining power

=_____

Principles in Marketing

AIDA principles:

A – Attention (Awarness): attract the attention of potential customers.
I – Interest: raise customer interest, showing advantages and benefits of product.
D – Desire: Convince customers that they want the product and that it will meet their needs.
A – Action: Lead customers to take action and make a purchase.

SESSION 23: PLANTING TECHNIQUES OF EUCALYPTUS UROPHYLLA

Objective

After the session, participants will be able to:

- Present planting and management techniques of eucalyptus urophylla.

- Identify a suitable planting season and management methods for eucalyptus urophylla.
- Choose a suitable harvesting method for eucalyptus urophylla.

Duration

60 minutes

Materials:

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators direct participants to the session by asking: "Who has ever grown eucalyptus urophylla in this area?"

Facilitators introduce the objectives of the session.

Facilitators present planting and management techniques of eucalyptus urophylla with the following contents:

- Standards of a qualified seedling
- Planting season
- Spacing and planting density
- Harvesting

Facilitators ask the class: "Should we grow eucalyptus urophylla in this area? Why or why not?
Facilitators wrap up and conclude the session.

Facilitators' Notes

Seedling Standards

- 2.5– 3 months-old, 20 – 30 cm high, 2mm root collar diameter, well developed, straight, no damages by pests or diseases.

Planting season

The most suitable planting season for both bare root seedlings and potted seedling is from April – May, and from October - November.

Planting methods

For potted seedlings:

- Use the potted seedling for intensive planting of only one species on potential farmland. Intercrop with short-term agricultural crops.
- Use the potted seedling for scattered planting along roads and canals.
- Vegetation treatment: clear vegetation thoroughly one month before planting.
- Planting density: 2.500 trees/ha (2m x 2m); 2,000 trees (2m x 2.5m) or 1.600 trees/ha (2.5m x 2.5m).
- Soil preparation: prepare soil at least 15 days before planting. Prepare holes with a size of 30cmx30cmx30cm for concentrated planting of one species.
- Planting: choose a shady day to plant. Remove soil in the middle of the holes, remove pots and put seedlings straight into the middle of the hole and then cover with soil.
- 20 – 30 days after planting, replace dead plants with new ones to maintain planting density.

For bare root seedlings:

- Use in low investment plantations.
- Planting density: 2.500 trees/ha (2m x 2m); 2,000 trees (2m x 2.5m) or 1.600 trees/ha (2.5m x 2.5m).
- Soil preparation: hole size of 30cmx30cmx30cm.

- Planting: choose a shady day to plant and plant in the early morning or late afternoon when the sun has set.
- Select qualified seedlings, shorten the tap root to about 20-25cm. Remove soil in the hole, put seedlings straight into the middle of the hole and then cover with soil.
- 20 – 30 days after planting, replace dead plants with new ones to maintain planting density.

Harvesting and processing

- For a short rotation, trees can be harvested after 6 - 8 years. The product will mainly be for producing pulpwood.
- For medium rotation, trees can be harvested after 9 – 14 years. The products can be pulpwood and plywood production, or housing.
- Average production is between 15 - 20m^3/year/ha.

SESSION 24: AGROFORESTRY

Objective

After the session, participants will be able to:

- Present the concept, the different models of agro-forestry and its advantages in sustainable cultivation on sloping land.
- Identify the steps for designing an agro-forestry model.
- Practice designing an agro-forestry model on paper.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, pictures of agro-forestry models.

Steps

Facilitators invite one participant to come to the front of the class and face the class. Facilitators write Agroforestry on the board behind the volunteer's back and then request the participants to call out various questions and statements which relate to agroforestry, without saying the word itself. The participant in front of the class has to try to guess the topic of the session.

Facilitators introduce the objectives of the session.

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper.

1. Do you understand what agroforestry is? What is the purpose of agroforestry?

2. How many types of agroforestry do we have? What are they?

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?

- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Methods to reduce soil erosion and washout

Facilitators ask the class:

1. What are causes of soil erosion and washouts?

2. Are there any methods to reduce soil erosion and washouts? Specify how to do it?

Facilitators request groups discuss the above questions for 15 minutes and write their discussion results on a big paper

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up the results and present clearly the different ways to reduce soil erosion and washed out soils such as:

- Plant hedgerows.
- Dig ditches.
- Make stone fences.
- How to determine contour lines to implement the above methods.

SESSION 25: HARVESTING

Objective

After the session, participants will be able to:

- Present steps of harvesting timber.
- Practice drawing the steps for harvesting timber.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, leaflets on harvesting timber.

Steps

Facilitators invite one participant to come to the front of the class and face the class. Facilitators write Harvesting on the board behind the volunteer's back and then request the participants to call out various questions and statements which relate to harvesting, without saying the word itself. The participant in front of the class has to try to guess the topic of the session.

Facilitators introduce the objectives of the session.

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper.

1. What do you have to do to harvest timber from plantations?

2. What are the steps in felling a tree? Among these steps, to what should you pay attention?

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

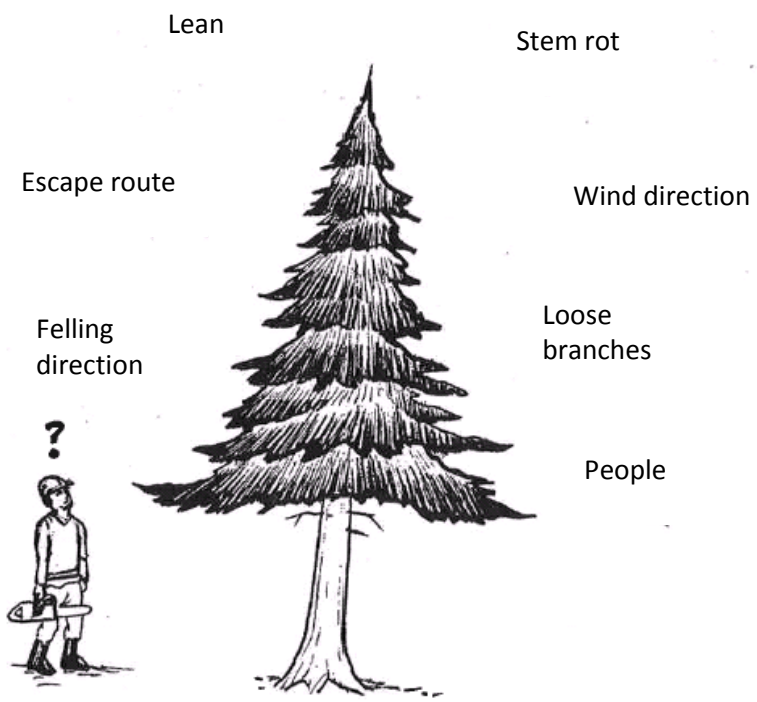
After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

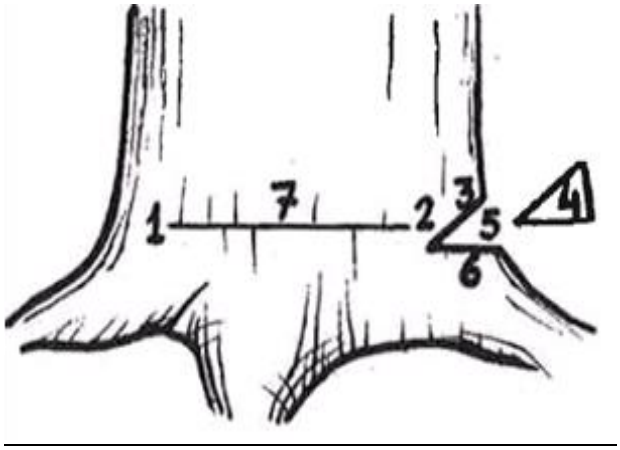
Tree felling is a skill. It can be a dangerous operation. The better one is at foreseeing what will happen when you start cutting down a tree and the more one knows how to be in control, the more efficient and safe you will be. Less damage of valuable wood will occur, leading to a higher earning when selling the log. Preconditions are training, the right felling technique, appropriate safety precautions, and proper planning of what to do when.



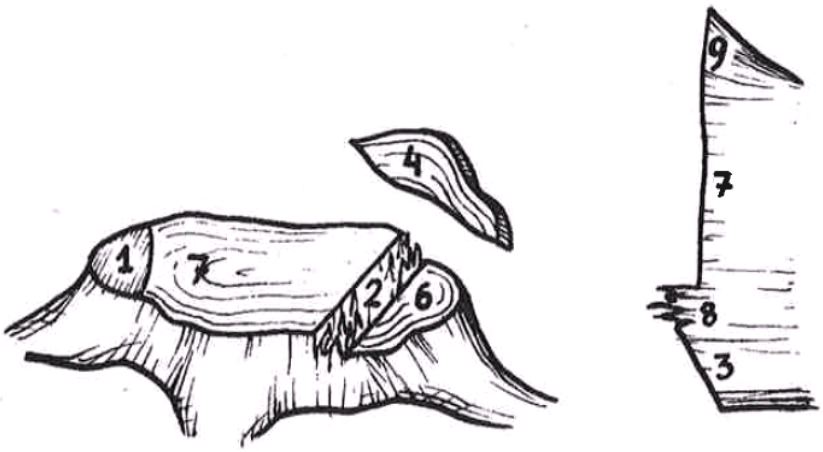
Felling plan

1. Hazards - Identify any tree defects, decay or characteristics of the tree that may affect the felling plan. Consider obstacles within the site such as stones, fallen trees, a small stream, sloping of the terrain etc. Some hazards can be removed, others have to be avoided or dealt with. Assess the strength and direction of the wind.
2. Lean - Assess the lean. Determine forward/back lean and side to side lean. This determines the "bad" and "good" sides of the tree for felling. Decide then on the felling direction.
3. Escape - Always think about your escape route before you begin the felling operation. The escape route should follow a 45 degree angle opposite the felling direction.

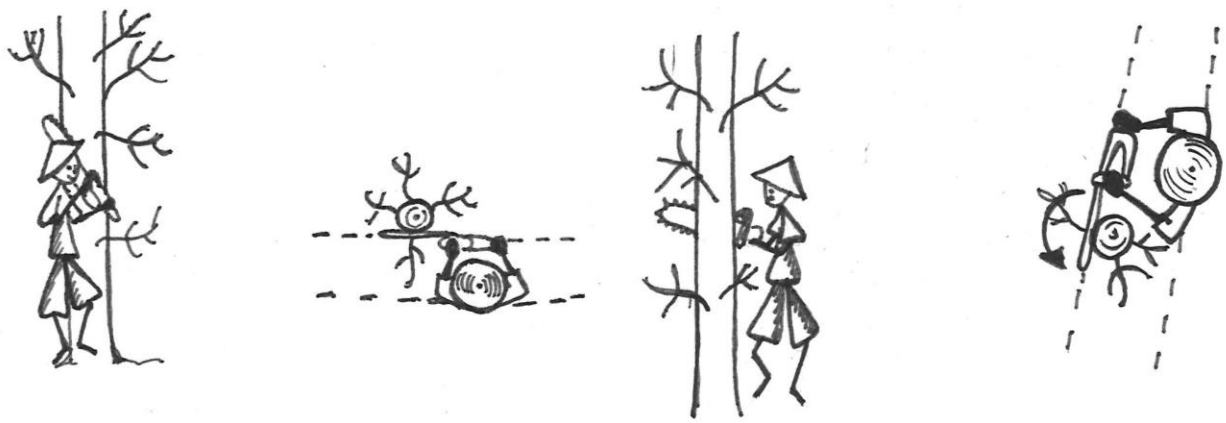
4. Hinge – The notch and hinge are critical for safe and accurate tree felling. Plan size, depth and placement of the notch. Determine the desired thickness and length of the hinge.
5. Back cut – The back is often taken for granted, yet is often the cause of misdirected falls. Determine your desired position for finishing the felling cut.

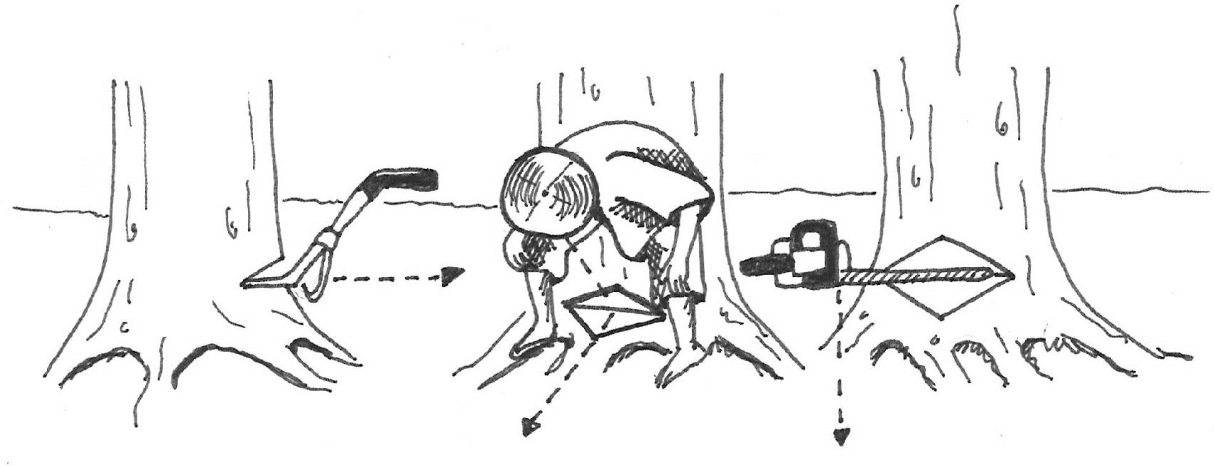


1. Holding wood
2. Hinge
3. Face cut – slanting cut
4. Face cut
5. Notch
6. Face cut – horizontal cut
7. Felling cut – back cut
8. Burr
9. Buttress



Before felling, remove the lower branches and create a good work space on the ground. Use a machete or axe to remove the branches and the axe and saw to do the actual felling.





Choosing the direction in which the tree shall fall and felling it

The notch is made to control the felling direction. But remember that factors as e.g. lean and wind direction have a major influence, which can be underscored by the placement of the notch or has to be compensated for by placing the notch and making a back cut and eventually helped by the use of a felling lever or wedges.

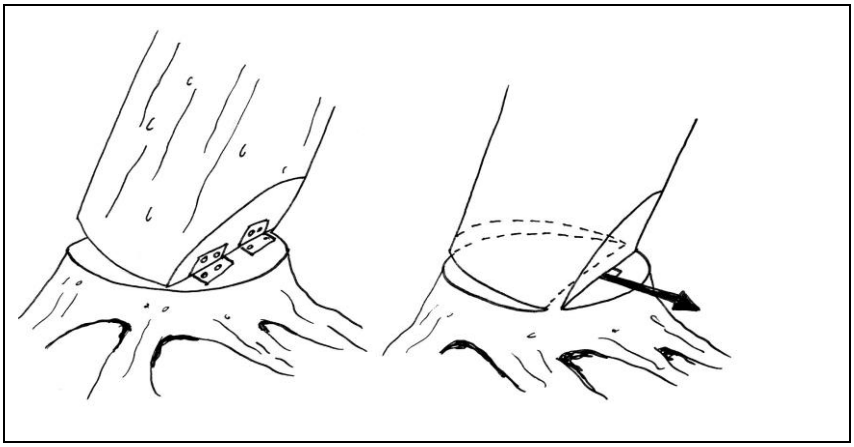
Anybody who fells trees should be able to estimate the height of a tree and thus the position of the felled tree.

The Notch (face cut)

The traditional 45 degrees notch has been used for many years. A possible limitation when it comes to big trees is that the tree may still be at a 45 degree angle when the notch closes and the hinge breaks, causing loss of control. An open face notch of 70-90 degrees allows the tree feller to take full advantage of the hinge, with at greater degree of control because the hinge doesn't break until the tree is almost on the ground.

- The rule of thumb for the depth of the notch is 1/3 of the depth of the tree.
- Make the slanting cut first when making the face cut.
- Use the slanting cut as a sight through which to line up the horizontal cut and avoid sawing too far and creating a bypass.
- Bypass cuts can reduce the effectiveness of the hinge and even render it useless.

Hinge

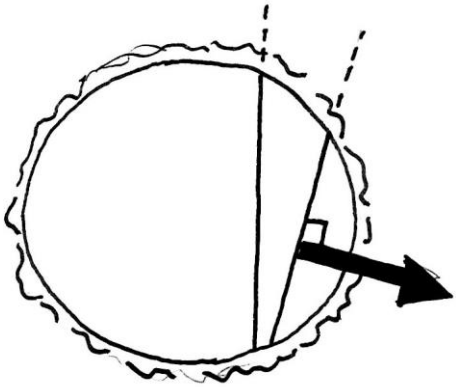


The hinge steers the tree in the desired fall direction. If the hinge is of proper thickness then the wood fibres will break when the notch closes.

- The rule of thumbs is that the thickness of a hinge should be 10% of the tree's diameter.
- Allow a thicker hinge on trees with significant internal decay.
- Trees with a forward lean may not require the full 10% thickness.
- Avoid cutting the hinge when making the back cut, as this can result in loss of control.

Back cut

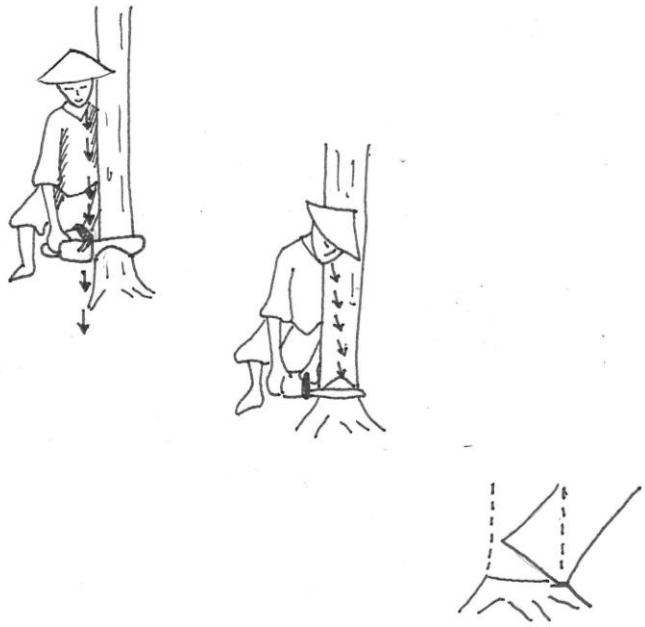
The back cut is made by cutting from the back of the tree towards the notch. The hinge is formed as the back cut approaches the notch. If you cut through the hinge on one side or the other, you may lose some control of the felling direction. When using the 45 degrees notch it is important to make the back cut slightly higher than the apex (horizontal cut) of the notch to reduce the tendency of the tree to kick back of the stump towards the feller when the hinge breaks.

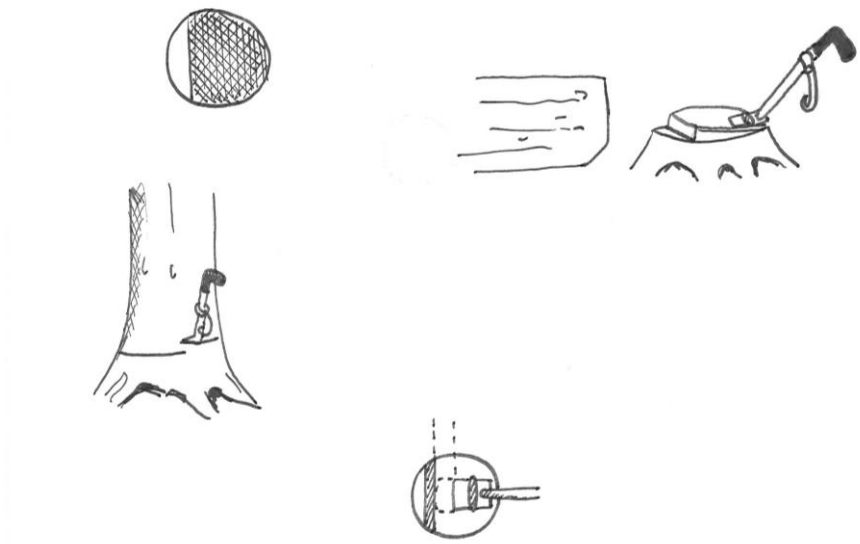


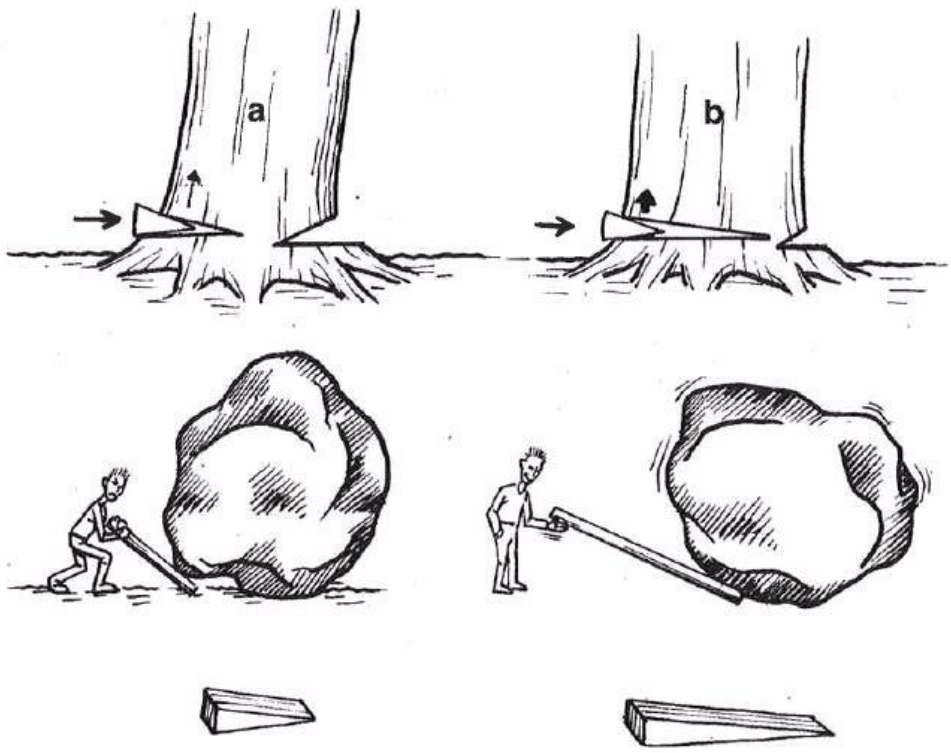
If the tree has a significant sideward lean, make sure when making the back cut that you leave a thicker hinge opposite the lean side, so the hinge will not break by the pull of the sideward lean.

Felling lever and wedges

Some of the often overlooked tools when felling trees are the felling lever (for small trees) and wedges (for big trees). These tools can prevent the saw from being pinched in the back cut. This can be a problem on a tree that is leaning, particularly if it is a back lean. Lifting the bottom of the tree a few centimetres can move the tree top more than a meter. The number of meters the tree top can be moved depends on the height and girth of the tree.





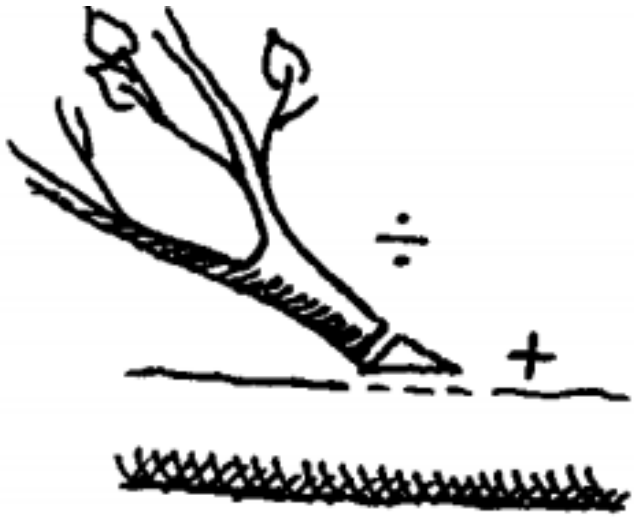


The bigger the tree, the more important the accuracy in the felling operation and the more powerful the forces of the tree and the less ability to effectively use one’s personal strength and body weight.

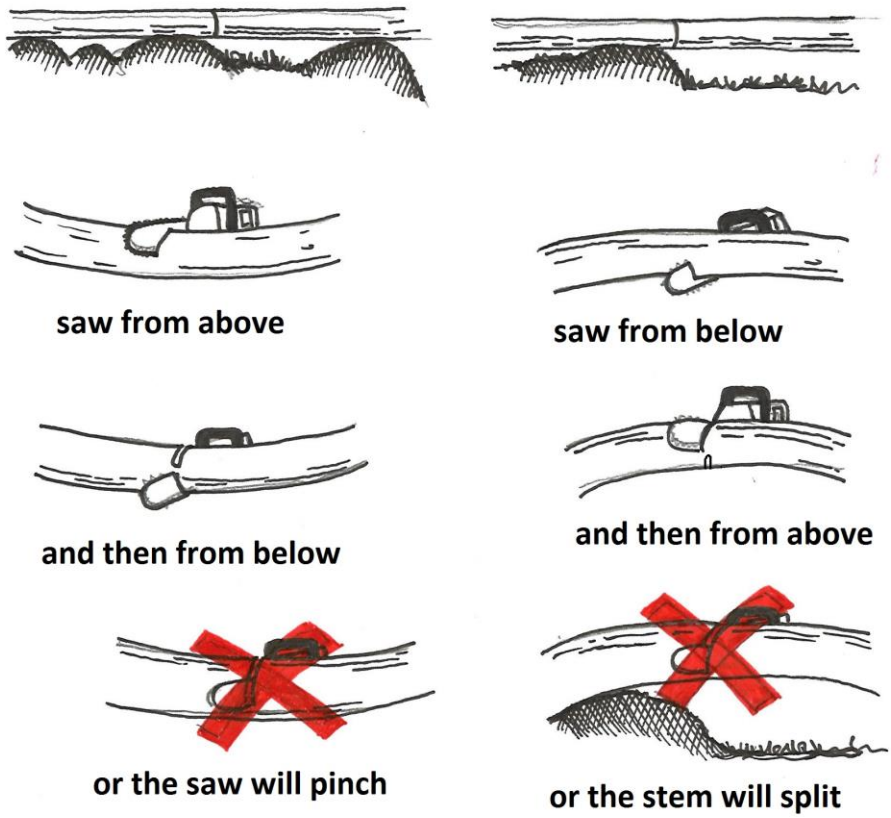
Removing the branches on the felled tree

Use your axe for this purpose and a saw when it comes to big branches. When you have finalized one side and cut off the top of the tree then turn the tree, or if it is a big tree the section you are working on, around by the use of the hook on your felling lever.

Cutting of larger branches:

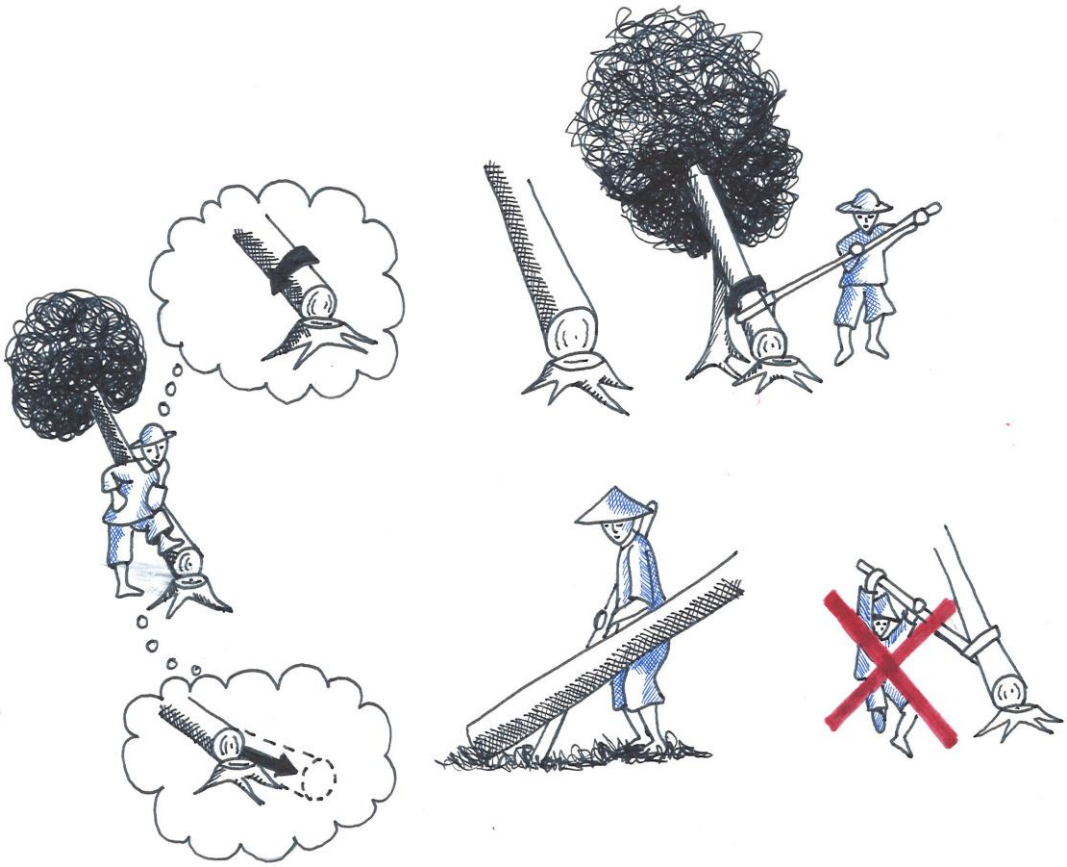


Crosscutting the stem after felling

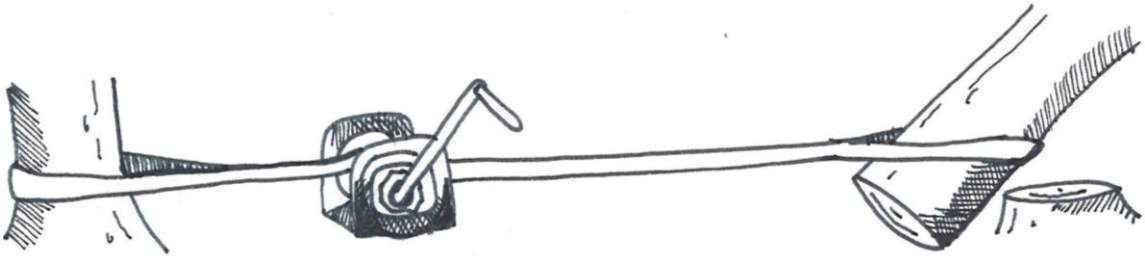


When the stem is lying on an uneven surface, there is always a risk of pinching the saw and/or splitting the tree when cross cutting it. The technique to avoid this is simply a question of gravity. If the stem will sink when cross cut always start with a cut above and finish with one from below. Do the opposite if the cross cut part will fall to the ground.

When the felled tree leans toward another tree**,** cut the hinge from both sides leaving only a few centimetres of it in the middle. Observe how the top of the tree has been hatched in the branches of the standing tree and use the felling lever or a hook on a long stick to slowly twist it in its natural falling direction. If the tree is severely hatched use a long stick, hand winch, ox, buffalo or tractor to drag it down in a backward direction after having cut over the hinge.



Manual Winch



SESSION 26. PLANTING TECHNIQUES OF SNOWBELL

(Vietnamese name: Cây bồ đề)

Objective

After the session, participants will be able to:

- Present planting and management techniques of snowbell.
- Identify a suitable planting season and a good management method for snowbell.
- Choose a suitable time to harvest snowbell.

Duration

60 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape.

Steps

Facilitators begin the session by asking: "Who among you has ever grown snowbell in this area?"

Facilitators introduce the objectives of the session.

Facilitators present planting and management techniques of snowbell, covering the following contents:

- Standards of a qualified seedling
- Planting season
- Spacing and planting density
- Harvesting

Facilitators ask the class: "Is it possible to grow snowbell in your area? Why or why not?"

Facilitators wrap up and conclude the session.

Facilitators' Notes

Seedling Standards

- 3 – 4 months-old, 20 – 30 cm in high, 2 mm root collar diameter, well developed, straight, no damages by pests or diseases.

Planting season

The most suitable planting season for both bare root seedlings and potted seedling is from April – May, and from October - November.

Planting methods

- Use the potted seedlings for intensive planting of only one species on potential farmland. Intercrop with short-term agricultural crops.
- Use the potted seedling for scattered planting along roads and canals.
- Vegetation treatment: clear vegetation thoroughly one month before planting.
- Planting density: 2,000 trees (2m x 2.5m); 1.600 trees/ha (2.5m x 2.5m) or 1.300 trees/ha (3mx3m).
- Soil preparation: prepare soil at least 15 days before planting. Prepare holes with a size of 30cmx30cmx30cm for concentrated planting of one species.
- Planting: choose a shady day to plant. Remove soil in the middle of the holes, remove pots and put seedlings straight into the middle of the hole and then cover with soil.
- 20 – 30 days after planting, replace any dead plants with new ones to maintain planting density.

Harvesting and processing

- Trees can be harvested between 6 - 12 years. Products can be used for pulpwood, construction, mining, and housing depending on the quality of products. Average production is from 12 – 15 m^3/year/ha.

SESSION 27: LAW ON FORESTRY

Objective

After the session, participants will be able to:

- Present some main contents of the Law on Forestry which relate directly to forest growers.

Duration

90 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, case studies.

Steps

Facilitators write name of the session on the board and present the objectives of the session.

Facilitators stick various case studies on the board, divide the class into 4 random groups and request them to discuss the case studies for 30 minutes, then write their comments on a big sheet of paper.

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Case study

In a regular group meeting of the farm forestry producers' group in Huong Tho village on forest law, the group management board brought up different issues concerning the forest law. The group members have been discussing the particular law and have come up with different answers. Each side maintains that their answers are correct. The group management board did not know how to solve this problem. The two groups' answers are summarized below:

Contents	Group 1	Group 2
The year the current forest law was issued is:	2004	2006
Duration of allocated land and forest	Normally 30 years	50 -70 years depending on characteristics of forest species
Procedures that need to be done before harvesting in plantations	Prepare a harvesting paper with the forest management board of the commune	Apply for a harvesting permit and get an approval from the forest development board of the commune: forest plot, type of trees, etc.

A fine will be paid in connection to a forest fire	It will be fined according to stipulations of the Law	According to stipulations of the Forest Law

By assuming that you participated in the discussion, which answers will you support or do you have your own answers?

SESSION 28: MAINTENANCE OF HEDGEROWS AND STONE FENCES IN AGRO-FORESTRY MODELS

Objective

After the session, participants will be able to:

- Define necessary tasks to maintain hedgerows and stone fences to prevent soil erosion.
- Design a plantation intercropping with maize in agro-forestry models of hedgerows, ditches and stone fences.

Duration

90 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, some pictures of intercropping in agroforestry models.

Steps

Facilitators introduce the objectives of the session.

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper.

1. How so you maintain hedgerows and stone fences to make sure that they can prevent soil erosion and washouts?

2. What should you pay attention to when planting maize between two hedgerows? Why?

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

Maintenance of hedgerows and stone fences

Hedgerows:

- Prune hedgerows the first time to 40cm one to two months after planting, place all the cut branches and leaves around the hedges (use as mulching material). During the second pruning, spread all of the cut biomass across the entire field. This will help create nutritious humus for the soil.
- Hedgerows should not be pruned at times where the weather is too cold or there is too much hoarfrost.
- Supplementary hedges to the existing hedgerows should be sown after the 3 first years.
- Every year, the soil at the bottom of ditches should be taken out and put at the foot of the hedgerow.

Stone fences:

- Check the foundation of stone fences.
- Add more stone or rearrange stones where the fence has collapsed or sunk.

Intercropping maize with hedgerows

- Plant maize 40 cm away from hedgerows.
- Spacing and planting density of maize: 60x40cm.
- Plant maize following the contour lines (the hedgerows), and plant from the top down.

SESSION 29: COSTS AND PROFITS OF AFFORESTATION

Objective

After the session, participants will be able to:

- Estimate all costs related to the establishment of a forest plantation.
- Classify each kind of product from a standing tree.
- Estimate profits from a forest plantation.

Duration

120 minutes

Materials

A0 paper, A4 paper, felt-pen, adhesive tape, template of cost calculation, template of profit calculation, indicator table of height and diameter of acacia.

Steps

Facilitators introduce the objectives of the session.

All costs related to establishment of 1 ha acacia plantation

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper.

1. What do we need to do to plant and manage 1 ha acacia mangium and 1 ha hybrid acacia until it can be sold?

2. How many working days will be needed to do all those tasks? How much money will be needed at local price?

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Classification of products from a standing tree

Facilitators draw a tree on the board and present:

- Regulation on size of pulpwood
- Regulation on size of timber
- Calculation of slender level of stem
- Calculation of product length by size
- Calculation of each log's volume

Facilitators provide examples and request the class to calculate the number of meters of wood that can be used as timber and as pulpwood with the given data below:

- Diameter at breast height of 1.3m is 8 cm and the height of the tree is 10m.

Facilitators sum up calculated results and give the right answer to the class.

Calculation of profit

Facilitators introduce calculation of profit from a 1ha forest plantation

- Introduce a template for calculation of profit.
- Ask participants about the selling price at the local market.
- Take an example which facilitators have calculated in advance, apply it in the template of calculation and calculate together with the class.

Facilitators' Notes

Facilitators should refer to the Technical Manual under *Costs and Benefits* of plantations on pages 84 – 100. Specifically, there is an example of calculating the cost and net revenues of a 1 ha acacia plantation with the density of 3000 seedlings/ha (page 96 – 100).

SESSION 30: MAKING A FOREST PRODUCTION AND BUSINESS PLAN

Objective

After the session, participants will be able to:

- Present the aims of making a forest production and business plan.
- Define the structure of a production and business plan.
- Make a forest production and business plan.

Duration

120 minutes

Materials:

A0 paper, A4 paper, felt-pen, adhesive tape, template of production and business plan.

Steps

Facilitators introduce the objectives of the session.

Facilitators divide the class into four groups and request them to discuss the following questions for 20 minutes and then write down the results of their discussion on a big paper.

1. What is the purpose of preparing a production and business plan?

2. Do we need to conduct market surveys for forest products to have a reasonable production and business plan? If yes, what information should we collect?

3. Do we need to analyse household conditions during planning? If yes, what elements should we analyse?

4. What should we do to be able to estimate profits of this plan? How is this done?

5. What contents should be included in the plan?

Facilitators facilitate the group discussions and the presentation of the groups' results.

Invite the groups to present their discussion results, while other groups listen and elaborate.

After the presentation, facilitators ask the groups:

- Is there anyone who is not clear about something and would like the presenting group to explain further?
- Any others questions or opinions?

Facilitators sum up all opinions and draw lessons learnt.

Facilitators' Notes

1. Market information needed to be collected

- Type of forest products and size requirements.
- Selling price of each kind of product.
- Selling places and methods (at the plantation, at store or delivery to the buyers' place).
- Who produces these kinds of products? How do they sell it?

2. Analysing conditions of the household

- Number of workers
- Experience and techniques of the family
- Soil conditions
- Capital conditions

3. Estimate profits

- Calculate all costs (based on information of the costs and profits session)
- Calculate profits (based on information of the costs and profits session)

4. Structure of the production and business plan

a. Rational

- Market information
- Household conditions
- Types of products selected on basis of market demands and family conditions

b. Contents

- Place of production
- Area
- Production costs
- Capital
- Estimated profits

CLOSING CEREMONY OF FFS

Objective

- Disseminate and encourage the expansion of the technical training program.
- Evaluate training results of FFS.
- Encourage a movement of learning and sharing knowledge of forestry in the community.
- Set up a foundation for group formation and development.

Materials

Reports, learning forests, contents of program**.**

Duration

½ day

Process

1. **Organizing tasks**

Facilitators have a meeting with the Commune Farmer Union to discuss the closing ceremony of the FFS. During the meeting the following should be addressed:

- Venue, time, program of the closing ceremony.
- Participants: commune authority, DFU, PFU and other relevant organizations in the commune.
- Creating invitations and sending invitation to the participants.

- Agree on the title of the ceremony and prepare it.
- Select a Master of Ceremony (MC) for the ceremony.

2. Conducting the closing ceremony

- Singing and dancing before the official meeting starts.
- MC introduce and welcome participants.
- MC introduce the meeting program.
- MC speaks about some of the experiments in forestry that were conducted during the FFS training. MC creates a lively atmosphere between meeting participants and FFS participants on the results and the meaning of the various experiments.
- MC invites participants back to the meeting hall.
- MC invites participants to express their opinions on the application and expansion of FFS in the local areas on the basis of FFS results.
- Handover of certificates to FFS participants.
- MC ends the ceremony.

Facilitators' Notes

The time of the FFS closing ceremony should not collide with a local festival, the starting crop season or other special events in the commune.

Identify specific objectives of the ceremony and report to the leaders of the commune to disseminate and spread out the training content and also to create favorable conditions for the setup of farm forestry producers' groups later.

Facilitators' Notes on Using this Manual

Based on the 16 week schedule of the FFS, facilitators should select suitable tree species relevant for the local population. For example, some areas in Hoa Binh province, local people would like to be trained on snowbell. However, farmers in Ha Tinh province would like to be trained on Aquilaria crassna.

The 16 week schedule of the FFS is fixed on silvicultural techniques and general knowledge, but the facilitators can be flexible about when and in which order to cover the technical parts of the forest species. The manual is designed to cover the facilitating process in the classroom only. Therefore, facilitators have to combine this manual with the Technical Manual to ensure all basic information will be provided to the farmers.

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