



Module 9: Field Optimization



Goal

Farmers will adopt optimization techniques that better utilize space, time, sunlight, and water to increase production efficiency by using top view mapping, side view mapping, and seasonal calendars.

Learning Objectives

1. Learn how to make a seasonal calendar.
2. Learn how to diversify crops and time planting and harvesting to increase use of time on the field.
3. Learn how to make a side view map.
4. Learn which types of plants increase use of vertical space (e.g. timber trees, shrubs, and vines).
5. Understand the benefit of garden level perennials (root crops, grasses, vines, ginger, shrubs, cover crops) for soil conservation, segmentation and pest control.

Venue and Timing

This module should be given at the beginning of year three. The training should be held at a Forest Garden that is representative of most of the Forest Gardens in the area.

Relevant Technical Manual Chapters

Before this training event, the facilitator should review and thoroughly understand the following chapters and sections in the Technical Manual:

- Chapter 1: Introduction to the Forest Garden
- Chapter 2: Phased Approach
- Chapter 15: Optimizing Your Forest Garden Understory

Preparation

- Determine which months each module (and flexible activities where relevant) are to be facilitated using the table in Activity 5.
- Draw seasonal calendar chart on flip chart paper (empty, to be filled in during workshop).

- Draw example of a side view map on flip chart paper, based on a Forest Garden you have visited in the project.
- Identify multiple options for perennial plants that the group can grow to: a) fill in the vertical layers of their Forest Gardens, and b) provide food or income in the lean months. Consider native plants that are used traditionally for food, medicines, etc. Be sure that these options are appropriate for the local agroecological conditions and that seeds or cuttings are locally accessible.
- Update the farmer group MoU for the year, to be signed at the end of the workshop.

Supplies

- 2 copies of the Farmer Group MoU for the upcoming year (to be signed by the farmer group attending the workshop)
- Participant Farmer List template
- Vegetable pictures cards
- Roll of flipchart paper and tape
- Markers of various colors
- a small ball

Total Time

3-4 hours

Handouts in Farmer's Workbook

- Map of Field
- Seasonal Harvest Calendar
- Examples of Side View Maps
- Side View Mapping
- Optimizing Your Forest Garden

Module 9: Field Optimization

Summary of Activities

Opener: Lessons learned ball toss (45 mins)

- Congratulate farmers for completing the second year of training and explain the purpose of the meeting
- Farmers toss a ball and review what they learned in the last two years
- Review key points not discussed during the ball toss and get feedback on year one activities

Activity 1: Create a top view map (45 mins)

- Walk around the host farmer's Forest Garden
- Create a top view map of the Forest Garden
- Host farmer discusses successes and challenges of year 2

Activity 2: Seasonal crop calendar (1 hour)

- List the crops growing in the Forest Garden
- Create a seasonal calendar for the Forest Garden
- Discuss seasonal calendar and gaps in harvesting
- Discuss the benefits of planting perennials and types of perennials available

Activity 3: Side view mapping (1 hour)

- Explain the concept of side view mapping and walk through field to be mapped
- Show example of side view map of a Forest Garden visited during a previous workshop
- Small groups create a side view map of the host farmer's Forest Garden
- Small groups present side view maps and select the best one
- Discuss gaps from side view map

Activity 4: Optimization strategies for the Forest Garden (45 mins)

- Review the gaps identified in the three mapping activities: top view map, seasonal calendar and side view map
- Small groups make recommendations for optimizing the Forest Garden
- Small groups present recommendations for host's Forest Garden
- Discuss techniques participant farmers will adopt to optimize time and space in their Forest Gardens

Activity 5: Plan year three activities (30 mins)

- Discuss year three plans for the group
- Read and discuss Memorandum of Understanding, sign MoU, and update Participant Farmer List (optional for non-TREES projects)

Take Home Activity 6: Create a side map and update top map of your Forest Garden

- Farmers create a side view map of a transect of their Forest Garden
- Follow-up

Opener: Lessons Learned Ball Toss

Description

This activity gives farmers time to share what they learned during the second year of the Forest Garden training program. The facilitator records feedback to share with TREES staff for monitoring and evaluation purposes.

Instructions for Farmers

1. Congratulate farmers for completing the second year of training and explain the purpose of the meeting

Congratulations on making it through the second year of the Forest Garden training program! Today we will review what you have learned during the first two years of trainings and discuss our plans for year three.

The Forest Garden Approach has three phases for establishment. In the first year you focused on Phase 1: protecting the field. In the second year you focused on Phase 2: diversifying your field by planting a variety of vegetables, crops and fruit trees to feed your family and sell at market. In Phase 3 you will focus on optimizing your Forest Gardens to increase productivity and sustainability. As you optimize your Forest Gardens, protection and revitalization of the site and soils will be an on-going activity. Do you have any questions?

2. Farmers toss a ball and review what they learned in the last two years

Everyone stand in a circle. We will play the ball toss game we played at the beginning of year 2. I will start by saying something I learned in the last two years and then toss the ball to someone else. That person says something they learned about Forest Gardens and tosses the ball to someone who has not spoken. The game continues until everyone has a chance to share something they learned about Forest Gardens.

- What are the benefits of Forest Gardens compared to other cropping systems?
- What are Forest Garden layers? How do these layers help to maximize production?
- How do you continue to protect your Forest Gardens and revitalize your soils?
- How does diversifying the trees and crops you plant help your families?
- How does it help the land?
- What techniques and skills have you learned and practiced?
- What are you doing differently now than you were before? What are the results so far?

3. Review key points not discussed during the ball toss and get feedback on year one activities

Thank you all for sharing what you learned. Please continue to share your successes and challenges today so you can all learn from one another. I would like to hear from you about the workshops and your work in your Forest Garden during

the second year. I will write down your feedback on flip chart paper so I can take it to share with the rest of the TREES staff.

- What are three things you liked and disliked about the training events?
- Which materials did you find most and least helpful?
- What are three things you like about the support TREES staff provided?
- What are three things in the project that could be improved for next year?
How?

Activity 1: Map the Forest Garden

Description

Farmers inspect the host farmer's Forest Garden then discuss successes and challenges of the last year. The facilitator draws a top view map of the Forest Garden and the farmers identify gaps in the use of space in the field.

Instructions for Farmers

1. Walk around the host farmer's Forest Garden

We will start the workshop today by taking a walk around the field and observing what is planted. Think about the following questions as you walk around the Forest Garden.

- Are there any empty spaces where nothing is planted? Is there empty space around the perimeter? Is there empty space around the fruit trees?
- What Forest Garden components, layers, and techniques do you observe?
- What has the farmer done well?
- What could be improved? How?

2. Create a top view map of the Forest Garden

Now I will draw a map of the Forest Garden to show what we observed, like we did when we made our Forest Garden designs in year 1. The top view map, which captures the view of the Forest Garden site from above, shows us how we use space on the ground. By looking at what is there now, we can identify empty space that the farmer could better use in the Forest Garden.

I will show the green wall, agroforestry trees, fruit trees, permagarden, slopes and permanent objects.

- What are the top three gaps to fill to improve the use of space in the Forest Garden?

3. Host farmer discusses successes and challenges of year 2

The farmer hosting us on his/her field today will come to the front and discuss his/her Forest Garden design and what they did over the last year.

- How are your green walls doing? Will you need to plant a lot more trees to complete them and fill in gaps in the coming year?
- Do you notice any changes in soil health? For example, more organic matter in their soils, more beneficial insects living in/around the soil (e.g. earthworms and beetles), better water retention, improved yields?
- Do you have any erosion problems during heavy rains? If so, how can erosion be minimized?
- What were some successes?
 - Are your plants growing better than before?

- Are you growing more types of products than before?
- What did you do with the food crops you grew? Did you sell them? Did you use them to feed your family?
- What are some of the techniques you learned that you used in your Forest Garden?
- Have you noticed any changes in how water moves through the field? In how wind moves through the field? How soil moves through the field when it rains?
- What were some challenges?
 - What challenges have you had with Forest Garden design?
 - What challenges have you had with tree nurseries?
 - What challenges have you had with planting to protect your field?
 - What challenges have you had with your garden?
 - What challenges have you had with outside factors, like pests, droughts, floods?
 - How have you addressed these challenges? Do others have ideas for how they could be addressed?
- Have other farmers in the group faced similar challenges? How have they overcome them?
- What would you like to improve on in the coming year?

Activity 2: Seasonal Crop Calendar

Description

The facilitator guides the group in the creation of a seasonal calendar that shows when all the different plants in the Forest Garden are ready to harvest. This exercise helps the farmers visualize the times of year when the Forest Garden is not producing. Then the farmers discuss the gaps in the use of time in the field and the benefits of adding perennials to the Forest Garden.

Instructions for Farmers

1. List the crops growing in the Forest Garden

Today we will learn how to grow crops that you can harvest at different times of the year to increase productivity of your Forest Garden. First let us review what our host has in his/her Forest Garden now. Call out the plants in the Forest Garden one by one and I will write the name or draw a picture on the flip chart paper.

2. Create a seasonal calendar for the Forest Garden

Now let us discuss when the different plants in the Forest Garden can be harvested over the course of a full year. I created a calendar, like we used to talk about selling vegetables at market during the last permagardening workshop. Let us fill in the calendar with check marks to show when you can harvest each of the different crops from your Forest Garden. Be sure to include all food crops as well as other products that can be used, sold, or traded, e.g. fuelwood and fodder.

Figure 1: Example of a seasonal calendar. Write and draw/use cutout pictures of the different crops planted in the Forest Garden.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Dry ☀	Dry ☀	Dry ☀	Rain ●	Rain ●	Rain ●	Rain ●	Rain ●	Rain ●	Rain ●	Dry ☀	Dry ☀
Maize												
Beans												

3. Discuss seasonal calendar and gaps in harvesting

- What time of year does the Forest Garden produce the most?
- What time of year does the Forest Garden produce the least?
- Who has plants in your Forest Garden that you harvest during the lean months? What are these and when do you harvest them?
- What plants can you add to your Forest Garden to harvest during the lean months?

- What are the top three gaps to fill to improve the use of time in the Forest Garden?

4. Discuss the benefits of planting perennials and types of perennials available

- There are some types of plants that will produce year after year without replanting (provide a local example). We call these types of plants perennials.
- What types of perennials grow in this community?
- What types of perennials produce food crops or other products that can be sold at market?
- What times of the year do these perennials produce?
- What are some native species that families traditionally use for food, medicines, or other products that can be grown in our Forest Gardens?
- How can planting perennials benefit the Forest Garden? (soil and water conservation, segmentation, pest control)

Activity 3: Side View Mapping

Description

The facilitator guides the group through an exercise to create a side view map of the Forest Garden, which shows the side view of the Forest Garden site. Then the facilitator leads a discussion around gaps in the vertical structure of the Forest Garden and the types of plants to add (roots and tubers, ground covers, shrubs, vines, tall timber trees, etc.) to fill those gaps. The facilitator will bring a side view map s/he has drawn on flip chart paper based on a Forest Garden observed in the project.

Instructions for Farmers

1. Explain the concept of side view mapping and walk through field to be mapped

In previous workshops we created maps of our Forest Gardens. The maps of the garden showed what it looks like when we look down on the land from above. Today we will create a side view map that shows the different layers of plants in the garden as we see them while walking along a straight line through the Forest Garden, called a transect walk.

- What do you see?
- What are the different layers of plants in a Forest Garden? (1. Root layer 2. Ground cover layer 3. Herbaceous layer 4. Bush-Shrub 5. Small tree layer 6. Large tree layer 7. Climber)

Figure 2: Example of the different layers in a Forest Garden, from www.worldagroforestry.org

(http://www.worldagroforestry.org/Units/Library/Books/Book%2082/imperata%20grassland/html/4.8_mutlistory.htm?n=27)

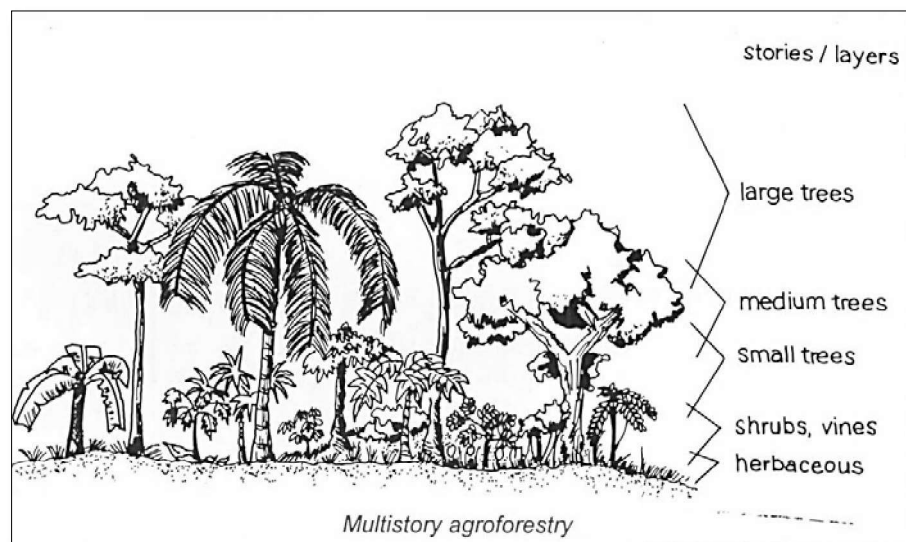
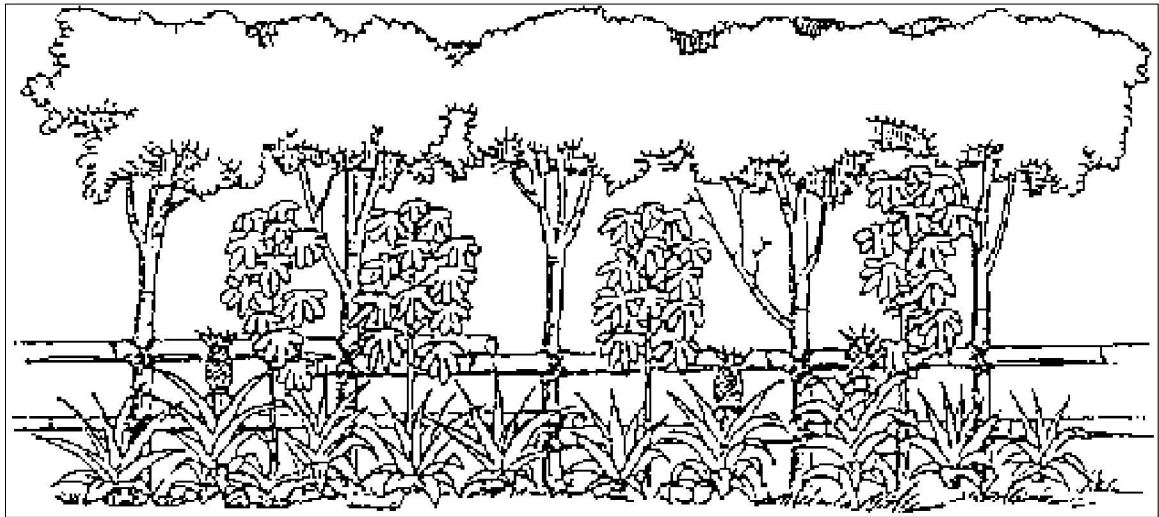


Figure 3: Example of the different layers in a Forest Garden, from www.fao.org



2. Show example of side view map of a Forest Garden visited during a previous workshop

Here is a side view map of a Forest Garden we have visited in this project.

- How is this different from other maps we have created?
- Where do you see gaps in the drawing? Is there space in the Forest Garden that is not being used?
- What types of plants could fill those gaps?

3. Small groups create a side view map of the host farmer's Forest Garden

Form groups of 4 or 5 people and come to collect flip chart paper and markers.

Take 30 minutes to take a transect walk through the host's Forest Garden and draw a side view map.

4. Small groups present side view maps and select the best one

Each group will come to the front and present your side view map of our host's Forest Garden. Then we will choose the map we think is the best representation of the Forest Garden and use that one for the next activity.

5. Discuss gaps from side view map

The side view map shows how the host farmer uses space above the ground. By looking at what is there now, you can identify empty space that the farmer could better use in the Forest Garden.

What are the top three gaps to fill to improve the use of vertical space in the Forest Garden?

Activity 4: Optimization Strategies for the Forest Garden

Description

Small groups analyze the host farmer's Forest Garden based on the top view map, seasonal calendar and side view map and provide feedback to the host farmer on how to improve his/her Forest Garden in year three in order to optimize vertical and horizontal space and produce crops at different times of the year.

- **Review the gaps identified in the three mapping activities: top view map, seasonal calendar and side view map**

We have completed three activities to help you think about how you use space and time, and sunlight and water, to optimize your Forest Gardens. The top view map shows how you use space across the ground. The seasonal calendar shows how you use time. The side view map shows how you use space above the ground, between the surface and the canopy. You all will analyze the gaps, both in the maps and in the seasonal calendar, to identify crops that can be planted to produce more to eat, sell, or trade in the slower times of year, while at the same time filling in the empty spaces.

- **Small groups make recommendations for optimizing the Forest Garden**

In your small groups, discuss plants to add to our host's Forest Garden to increase productivity by better using time and space. Prepare to present your recommendations to the group.

- What types of plants could fill those gaps on the top view map?
- What types of plants could fill those gaps on the seasonal calendar?
- What types of plants could fill those gaps on the side view map?
- Which tall trees are good for timber?
- What is the benefit of planting agroforestry trees dispersed throughout the field?
- What types of plants would improve the soil (nitrogen-fixing, weed suppression, moisture retention)?
- Did you see any erosion problems? What could you do to keep more soil and water in the Forest Garden?
- What do you want the field look like in 5 years?

- **Small groups present recommendations for host's Forest Garden**

Each group will present their recommendations for the host farmer's Forest Garden. Then we will hear from our host about how this informs his/her plans for year three.

- Based on the recommendations heard from the groups, what changes do you, the host farmer, plan to make to the Forest Garden design?
- What new plants or trees will you add to your Forest Garden as a result of your exchanges with other farmers and TREES facilitators?
- How does this help you maximize your use of time? How will you increase the number of harvests?
- Are there still any gaps in the calendar?

- How does this help you maximize your use of space?
- **Discuss techniques participant farmers will adopt to optimize time and space in their Forest Gardens**

Before we start talking about the group activities for year three, each farmer should stand up and mention the two changes you plan to make to your Forest Garden as a result of what you have learned today.

 - How will you apply the strategies you learned today to your field?
 - How is your field similar or different from our host's field?
 - What perennials do you want to add to your Forest Garden?
 - Which timber trees do you want to add to your Forest Garden?
 - Are there any challenges to adding these new plants/products? How can you overcome them?

Activity 5: Plan Year Three Activities

Description

Farmers discuss plans for year three, including the workshop schedule, and sign the Memorandum of Understanding.

Instructions for Farmers

1. Discuss year three plans for the group

During the first year you planted trees to protect your Forest Gardens and revitalize your soils. In the second year you diversified your Forest Gardens by planting fruit trees and vegetables. In the coming year you will continue to increase productivity of your Forest Garden by optimizing what you grow and how. The training topics we will cover this year will teach you all to raise and plant timber trees, to graft fruit trees, and to sustain your garden's productivity permanently.

- How can you work together as a group to get the most out of your Forest Gardens? What are your interests and needs for Year 3? What are the priorities?
- What are the main crops you will plant next year as a group? Do you need to plant more agroforestry trees for your green walls, alleys, and contours? Fruit trees? Vegetables? Timber trees?
- What species will you focus on, and on average how much would each farmer hope to plant? What timber species should you plant? About how many timber trees on average will each farmer hope to plant?

I have prepared a schedule for when each module and flexible activity will be facilitated with over the course of Year 3. They are as follows:

Timing of Training Modules for Year 3

Module	Agricultural Calendar	Module Facilitation (month)
10. Timber Trees and Perennials	Facilitated with enough time for the slower-growing species to be ready for planting at the start of the main rainy season.	
11. Permagardening for the Future	During a time of year when gardens are not traditionally planted, to demonstrate how to grow vegetables at different times of the year.	

12. Grafting	When rootstock started in Year 2, and scions, are ready for grafting (this may be before, between, or after modules 10 and 11).	
13. Advanced Optimization (Year 4)	Beginning of Year 4	

Activities 2-4 are optional for non-TREES projects

2. Read and discuss Memorandum of Understanding

I will read the Memorandum of Understanding (MoU), which you all will need to sign before we close the meeting today. We sign a new MoU each year, after reviewing the progress you have made on your Forest Garden in the previous year. An important part of the review involves an evaluation of each farmer's Forest Garden. It is important that everyone knows that your commitment to the project, which is demonstrated by adopting the skills and techniques you learn in the workshops, is a key criterion we look at when we decide to continue with the project for another year.

3. Sign Memorandum of Understanding

When everyone agrees on the terms, we will all sign the MoU. I will take a copy and I will leave a copy here with the lead farmer.

4. Update the Participant Farmer List (PFL)

Finally, I will pass around the Participant Farmer List sheet for farmers to fill in for year. If any farmers who were invited to participate in year two of the project are not present, the lead farmer will take the PFL and MoU to them to fill in and sign, and return the completed documents to the facilitator.

Take Home Activity 6: Create a side view map of your Forest Garden

Description

Farmers create a side view map of their Forest Garden after doing a transect walk, as demonstrated in the workshop. The facilitator will review the side view map on the next field visit.

Instructions for Farmers

Farmers create a side view map of a transect of their Forest Garden

Take a walk along a straight line through the middle of your Forest Garden and draw a side view map. Think about plants you can add to your Forest Garden to optimize time and space.

Follow-up

The facilitator will visit each farmer within the next month to examine and photograph each participant farmer's Forest Garden side view map, and discuss optimization strategies.

Evaluation Checklist for Skills Learned in Year 3



At the end of the year you will be evaluated on the following practices that you learned and discussed during training events. In demonstrating that you have completed the Year three evaluation criteria, you will be invited to continue into the fourth year of the project.

Year 3 Evaluation Criteria

- Green Wall
 - Three rows, fully surrounding the Forest Garden site
 - Gaps replanted
 - Well-managed
 - Dead fence surrounding green wall if still needed (for all projects where this is determined to be a requirement)
- Alley Cropping and/or Contour Planting
 - Optimum number planted
 - Gaps replanted
 - Well-managed
- Fruit Trees
 - At least 4 species planted
 - At least 2 species grafted
 - Proper spacing between trees
 - Each tree mulched and weeded
- Timber Trees
 - At least 1 species planted
 - Proper spacing between trees planted
 - Each tree is weeded and mulched
- Compost
 - Three active piles
 - Well-managed
- Permagarden
 - Multiple species
 - Demonstrated use and explanation of at least 3 IPM measures
 - Production timed for demand
 - Demonstrated use of the 4 S's
 - Perennials planted on berms around garden

Module 9: Facilitator's Notes



The facilitator should use the following pages to note down any questions or findings from the group that should be kept for or addressed at a later time. Depending on the module this may include species selection by group, crops identified in seasonal calendars, or anything else that should be noted.