

Trees Outside Forests Module

for

RRI Phase II Training Manual

Compiled by Chun K. Lai, FAO Consultant

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Contents

What is the Purpose of this Module?	3
What are Trees Outside Forests?.....	3
Why are TOF Important?	4
Globally and in Asia.....	4
TOF in the Philippines	5
Why are TOF Relevant for Farmer Field Schools?	7
What are Suggested TOF Field Exercises for FFS-S&G Pilot Sites?	8
Week 3: Conduct AFESA.....	8
Week 6: Collect Organisms from TOF	11
Week 9: Select Additional TOF for Farming System	13
Week 12: Make Plan for Germplasm Production of Desired TOF	15
Week 15: Meet with Partners to Discuss Collaboration.....	16
How to Engage Agricultural Schools in TOF Activities?	17

What is the Purpose of this Module?

This module on “Trees Outside Forests” (TOF) is part of the training manual produced under the DA-FAO Regional Rice Initiative (RRI) Pilot Project Phase II. Implemented during 2015, this phase involves some 34 Farmer Field Schools in Save and Grow (FFS-S&G) pilot sites throughout the Philippines, with the vast majority of sites located in Mindanao, southern Philippines.

A refresher course for FFS facilitators as well as selected agricultural high school teachers was conducted during July 1-10, 2015 in Carmen, Agusan del Norte province in northern Mindanao. The training program included sessions led by resource persons for various special topics that could be integrated into the FFS Save and Grow work. By the end of the training, the group decided to adopt three special topics – aqua-biodiversity, Trees Outside Forests, and farming systems – for the FFS-S&G pilot sites in 2015.

This module aims to primarily provide FFS facilitators and coordinators with essential information on Trees Outside Forests, their relevance and importance, and suggested field exercises during a four-month FFS growing season.

To this end, the module draws upon available documents and training materials on TOF, as well as information and examples gleaned from the TOF field exercise carried out during the refresher course in Agusan del Norte. It is anticipated that the TOF module will be field-tested in one or more FFS-S&G sites during the next growing season, and modified as appropriate.

What are Trees Outside Forests?

TOF are trees and shrubs occurring on lands not defined as *forests* or *other wooded lands*. Therefore, all trees encountered on agricultural and urban lands are considered as TOF.

Systems that integrate TOF, crops and/or livestock are also commonly referred to as agroforestry. TOF may also take the form of small woodlots or windbreaks that are established in the agricultural landscape. And TOF may even include species such as bamboos and palms, which are technically not trees.

Why are TOF Important?

Globally and in Asia

Throughout the world, trees in and around agricultural landscapes are important environmental and socio-economic resources, providing a diverse array of products and services that are essential for the livelihoods and food security of smallholder farmers. According to recent studies, more than 43 % of all agricultural land area globally (over 1 billion hectares) have a tree cover higher than 10 %. In Southeast Asia, more than half of the agricultural areas are under agroforestry, where various combinations of trees, crops, livestock and fish are produced by farmers.¹

In rice production landscapes in Asia, TOF are important for ensuring a sustained flow of valuable products and vital services for farmers and their agroecosystems, including:

TOF Products	Environmental Services
<ul style="list-style-type: none">• Food (fruit, seed, leaves)• Medicine• Wood (fuel, timber, poles)• Forage for livestock• Income (can sell surplus products)• Livelihoods (materials for handicrafts)	<ul style="list-style-type: none">• Watershed protection• Water level regulation• Crop protection and shade provision• Soil conservation and erosion control• Biodiversity conservation• Carbon sequestration and storage

Within the framework of RRI Phase I, TOF assessments were conducted in rice production pilot sites in Indonesia, Philippines and Lao PDR. Although very different conditions exist at the three sites, the assessments confirmed that farmers are acutely aware of the importance of integrating trees in rice production landscapes – for erosion control and stream water regulation, as well as income generation and provision of food for household consumption.²

During the refresher course field exercises conducted in Agusan del Norte, this awareness was very evident in interactions with farmers, as they advocated planting more trees to bring back the abundance of water needed to sustain rice production intensification.

Therefore, to address the challenges of food security, sustainability of agricultural systems and adaptation to climate change effects, the contribution of trees in agricultural lands must be duly recognized by all key stakeholders involved in agricultural production, planning and policy.

¹ Borelli, S and M Conigliaro. 2014. Assessing and Promoting Trees Outside Forests (TOF) In Asian Rice Production Landscapes. The Asia Regional Rice Initiative. FAO, Rome.

² FAO. 2013. Trees Outside Forest in Asian Rice Production Landscapes. Biodiversity, landscapes and ecosystems in agricultural production, FAO, Rome.

TOF in the Philippines

The National Forest and Tree Resources Assessment conducted by DENR during 2003-2005 produced some interesting findings with regard to Trees Outside Forests, including:

- Grazing and windbreaks were perceived to be highest value services provided by TOF
- Coconut (57 %) and *Gmelina* (6 %) were the most frequently occurring TOF species

Agusan del Norte

In the context of Agusan del Norte in northern Mindanao, there is a strong prevalence of coconut-and-rice agroforestry systems, integrating many diverse elements, including:

- Fruit trees (e.g., mango, guava, citrus, banana)
- Timber trees (e.g., “falcata” – *Paraserianthes falcataria*)
- Pasture and legume forage crops for livestock
- Vegetables
- Bamboo
- Ducks, fish, snails and other aquatic resources



Mr. Felix Heyrana's integrated rice-based farm (Buenavista, Agusan del Norte)



Ms. Maria Adelfa Heeb's farm with coconut and other TOF in background, upland kangkong being planted in foreground (Buenavista, Agusan del Norte)



Ms. Heeb's (in photo above) 2.5 hectare farm is a good example of integrated agroforestry, in which she uses 1.25 ha for TOF, 1 ha for rice fields, and 0.25 ha for vegetable garden.

Why are TOF Relevant for Farmer Field Schools?

The Philippine Department of Agriculture's National IPM Program (KASAKALIKASAN) provides a national platform, budgetary resources, facilitators and farmer trainers for FFS Save and Grow activities. Launched in 1993, the program has been successful in applying an experiential learning approach – through Farmer Field Schools – to enable farmers to practice IPM.

The FFS training strategy involves getting farmers into the field over the entire season to grow a healthy crop. The training process is based on farmers' experiences and capabilities to discover and master scientific management skills. Moreover, special topics – such as TOF – can be integrated into the FFS curriculum, which typically lasts four months.

For RRI Phase II, season-long farmer training on sustainable rice production intensification technologies will be conducted in 34 Farmer Field Schools as part of the Save and Grow program. Each pilot FFS-S&G will be facilitated by two municipal-based IPM FFS facilitators, who participated in the 10-day refresher course held in Agusan del Norte. Where possible, each pilot FFS will be linked to an agricultural high school or college, or an active community-based organization (e.g., out-of-school youth, rural housewives) in the municipality.

The refresher course also aimed at highlighting the various contributions that TOF can provide in different types of rice fields (e.g., low/mid/high lands, rainfed/irrigated).

The FFS-S&G activities will be funded by the regional FFS budget of the Agri-Pinoy Rice Program in the respective participating regions (representing 45% of the total budget), and supplemented by the RRI Phase II funds from FAO (55%), which will be used to cover transportation expenses, regional and provincial monitoring activities, partnership support, and central management support.³

³ Department of Agriculture. 2015. Regional Rice Initiative Pilot Project: Phase II Philippines. DA, Manila.

What are Suggested TOF Field Exercises for FFS-S&G Pilot Sites?

Based on the refresher course experience and outcomes – including a tentative weekly calendar of FFS Save and Grow activities – five TOF field exercises (one every three weeks during a 16-week FFS growing season as outlined below) are suggested for FFS-S&G pilot sites that have decided to include TOF as a special topic. It is foreseen that this series of exercises will involve the same farmers and fields over a four-month period.

<i>When?</i>	<i>What?</i>
Week 3	Conduct Agroforestry Ecosystem Analysis (AFESA) – make sketch map of farm; functions and services of TOF
Week 6	Collect organisms from TOF – analyze benefits of TOF in rice production as well as negative effects on crops (and pest management strategies)
Week 9	Select types of TOF to add to farming system – revise sketch map of farm to include additional species/plantings; discuss promotion of value-added practices (e.g., food processing, concoctions, handicrafts production)
Week 12	Make plan for germplasm production of desired TOF – seed sourcing of indigenous and naturalized trees in the locality; seed germination of forest and fruit trees; establishment of nurseries at farmer, school, and community levels
Week 15	Meet with partners (schools, community-based organizations) to discuss collaboration in nurseries, integration of TOF in agricultural school curricula, and tree-planting activities for community-based organizations

Week 3: Conduct AFESA

The Agroforestry Ecosystem Analysis (AFESA) is a way of collecting and analyzing data necessary for decision-making regarding TOF and other agroforestry crops and practices. It is a holistic approach that considers the key elements and interactions within a given farming system or agricultural landscape.⁴

Learning objectives

- Familiarize FFS participants with agroforestry ecosystems, and in particular the services and functions provided by TOF in rice-based farming systems
- Promote learning by discovery and learners toward their own analysis
- Guide farmers to critically analyze and make better decisions on their own fields

Duration

- At least 1 hour for field walks, observations and discussions with farmer
- At least 1.5 hours to process data collected
- At least 1 hour to present outputs to larger group for discussion and feedback

⁴ Callo, DP, Jr, ID Esteban and C Hiyama. 2009. Field Guide of Discovery-based Exercises on FFS for Agroforestry. DENR-JICA ECBFMP, Philippine National IPM Program, ASEAN IPM Knowledge Network.

Materials

- Selected farmer field sites where rice-based agroforestry ecosystem can be observed
- Manila paper, notebooks, pens, colored markers

Methodology

- Field walks and observations
 - Brainstorming/processing in small groups
 - Sharing and participatory discussions in big group
1. Divide big group into smaller groups, with each group visiting one selected farmer field site. Where possible, different types of rice fields should be selected (e.g., occurring on low/mid/high lands, both rainfed and irrigated).
 2. At each site, conduct field walks, observations and discussions with farmer to identify what types of TOF are present in the agroforestry system, and what products and environmental services are provided by the trees, non-trees (e.g., bamboos and palms) and shrubs.
 3. Return to processing area or session hall to analyze information collected in the field. The TOF products and environmental services may be recorded using the format below:

Processing Format

TOF (tree or shrub)	Products	Environmental services

14

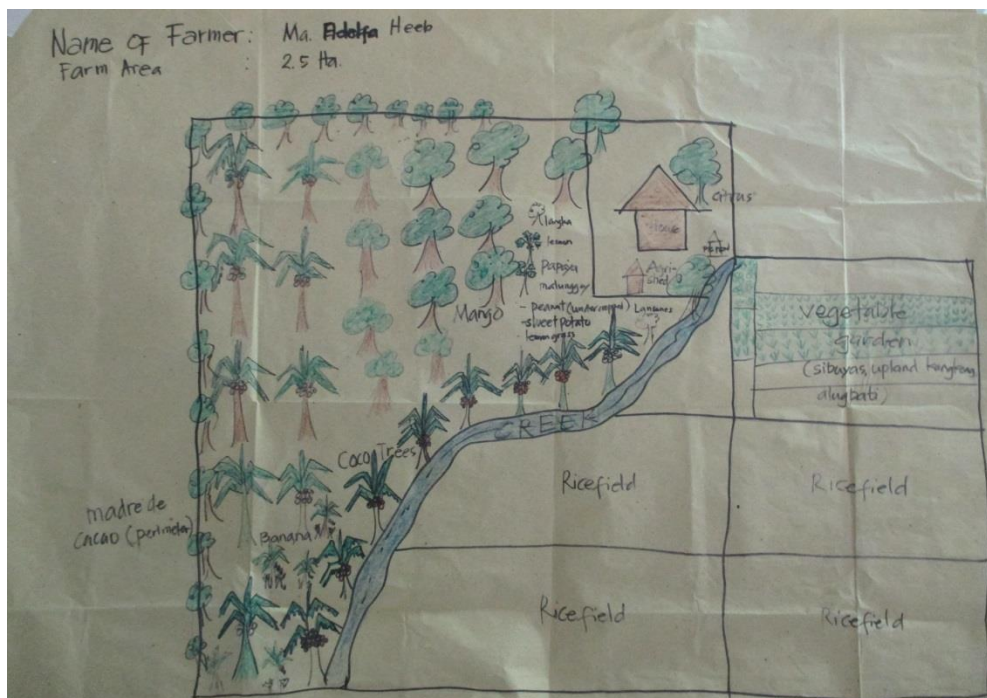
4. Present the small group outputs to the big group to stimulate participatory discussions and critique on the role, products and services provided by TOF in agroforestry ecosystems, as well as their contributions in different types of rice landscapes.

Suggested questions for processing discussion

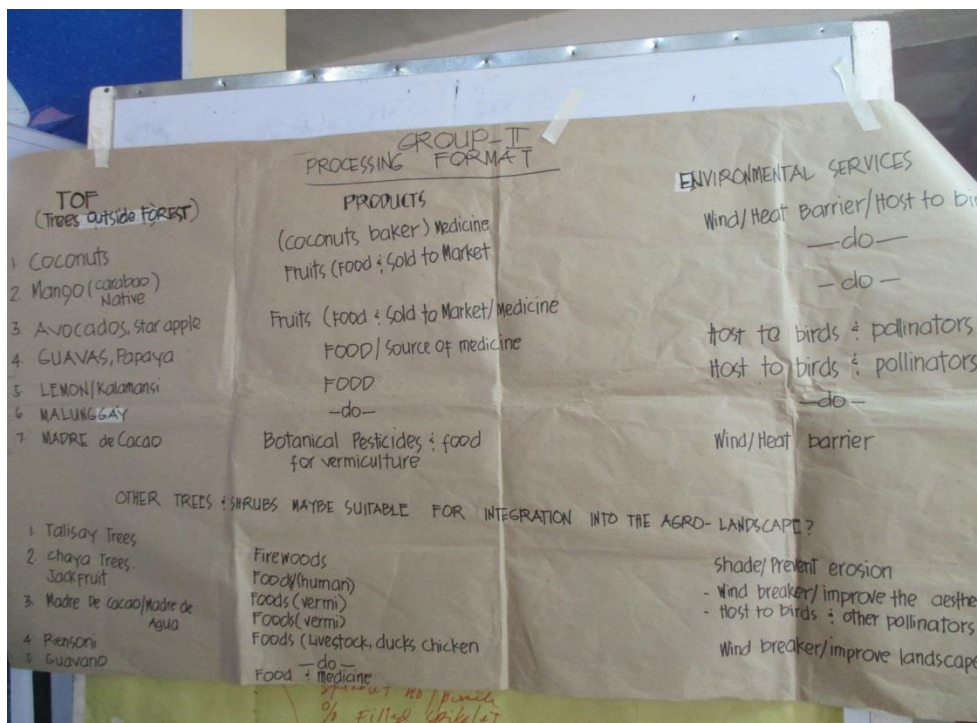
For the AFESA exercise, FFS participants may consider and address these key questions:

- *What types of TOF (trees, non-trees such as bamboos and palms, and shrubs) are present in the agroforestry ecosystem?*
- *Where are they found in the ecosystem?*
- *What are the products and services provided by TOF?*
- *How does their contribution change depending on the type of rice system where they are found?*

During the refresher course for FFS facilitators in Agusan del Norte, the outputs from the small groups included sketch maps of the farms visited as well as records of the products and environmental services provided by TOF (see examples below).



Sketch map of Ms. Maria Adelfa Heeb's farm (Buenavista, Agusan del Norte)



TOF products and environmental services on Ms. Marife Heyrana's farm (Buenavista, Agusan del Norte)

Week 6: Collect Organisms from TOF

This exercise focuses on collecting, recording and identifying organisms found on TOF within agroforestry ecosystems, and analyzing the benefits of TOF in rice production, possible negative effects on crops, and effective pest management strategies.

Learning objectives

- Familiarize FFS participants with the types of organisms associated with TOF, and their effects on sustainable rice production intensification
- Help farmers to understand the trade-offs involved in maintaining or adding TOF in their farming systems

Duration

- At least 1 hour for field walks, collection and recording of organisms on TOF, and discussions with farmer
- At least 1.5 hours to process data collected, and provide feedback to farmer

Materials

- Selected farmer field sites where rice-based agroforestry ecosystem can be observed
- Manila paper, notebooks, pens, colored markers

Methodology

- Field walks and collection of organisms
 - Brainstorming/processing in small groups
1. At each site, a small group conducts field walks and collects/records organisms found on TOF.
 2. Together with the farmer, identify the organisms collected, and discuss what effects different organisms – such as insect pests, natural enemies of pests, birds, and other pollinators – have on rice production.
 3. Also discuss with the farmer the trade-offs involved with TOF in the agroforestry system: weighing the positive effects of TOF on sustainable rice production intensification (e.g., acting as wind/heat barrier; improving water supply; providing green manure and soil enhancement; serving as habitat for natural enemies, birds and pollinators) versus the negative effects (e.g., hosting insect pests or birds that attack rice crops; creating excessive shade on rice; competing with rice for water).

Suggested questions for processing discussion

For this TOF field exercise, FFS participants may consider these key questions:

What types of organisms are found on TOF within the agroforestry system? And what positive and negative effects do these organisms have on rice production?

Week 9: Select Additional TOF for Farming System

Based on the two previous TOF field exercises, consideration can be given to additional TOF (trees and/or scrubs) that could be incorporated into the agroforestry ecosystem in order to support sustainable rice production intensification, as well as generate other benefits for the farmer and the environment.

Learning objectives

- Guide farmers to make better decisions on what trees, non-trees and shrubs to plant in their own fields to sustain rice production, and to create opportunities for value and income addition
- Determine additional TOF that can be planted/incorporated into the agroforestry ecosystem to support sustainable rice production intensification

Duration

- At least 1 hour for field walks, observations and discussions with farmer
- At least 1 hour to process information and summarize in suggested format

Materials

- Selected farmer field sites where rice-based agroforestry ecosystem can be observed
- Manila paper, notebooks, pens, colored markers

Methodology

- Field walks, observations and discussion with farmer
 - Brainstorming/processing with farmer
1. Using the sketch map produced during the week 3 TOF field exercise, return to the field with the farmer and discuss what additional TOF may be planted to help sustain rice production intensification, and generate other benefits for the farmer and the environment.
 2. Using different colors/symbols, indicate on the sketch map where in the agroforestry ecosystem these additional TOF would be planted.
 3. Also discuss how TOF may be used to promote value-added practices such as food processing, concoctions, bio-botanical and medicinal products, and handicrafts production.
 4. Summarize the products and environmental services expected from additional TOF in the suggested processing format. On the next page, the table summarizes the main TOF suggested for inclusion in farmers' fields in Buenavista, Agusan del Norte, and their expected products and services.

Additional TOF suggested for planting on farms (based on refresher course field exercise in Buenavista, Agusan del Norte) and their expected products and environmental services.

TOF	Products	Environmental Services
madre de cacao <i>Gliricidia sepium</i>	<ul style="list-style-type: none"> • forage • medicinal and insect repellent uses 	<ul style="list-style-type: none"> • windbreak; live fence • green manure; nitrogen fixing • host to birds and other pollinators
madre de agua <i>Trichanthera gigantea</i>	<ul style="list-style-type: none"> • forage • veterinarian uses • vermicomposting 	<ul style="list-style-type: none"> • windbreak
<i>Flemingia macrophylla</i>	<ul style="list-style-type: none"> • fuelwood and stakes • mulch 	<ul style="list-style-type: none"> • hedgerow • nitrogen fixing
rensonii <i>Desmodium cinereum</i>	<ul style="list-style-type: none"> • forage • nitrogen-rich mulch 	<ul style="list-style-type: none"> • hedgerow • erosion control
neem <i>Azadirachta indica</i>	<ul style="list-style-type: none"> • bio-botanical uses 	<ul style="list-style-type: none"> • shade
mahogany <i>Swietenia macrophylla</i>	<ul style="list-style-type: none"> • wood, timber 	<ul style="list-style-type: none"> • erosion control along creeks and irrigation canals
Talalay tree <i>Terminalia catappa</i>	<ul style="list-style-type: none"> • firewood • herbal medicine 	<ul style="list-style-type: none"> • shade • erosion control
bamboo	<ul style="list-style-type: none"> • poles • handicrafts 	<ul style="list-style-type: none"> • erosion control along creeks and irrigation canals
jackfruit <i>Artocarpus heterophyllus</i>	<ul style="list-style-type: none"> • fruit • wood 	<ul style="list-style-type: none"> • host to birds and other pollinators
banana	<ul style="list-style-type: none"> • fruit • income • forage 	
Chaya (tree spinach) <i>Cnidoscolus aconitifolius</i>	<ul style="list-style-type: none"> • nutritious leaves 	

Suggested question for processing discussion

For this TOF field exercise, FFS participants may consider this key question:

What other trees, non-trees or shrubs may be suitable for integration into the agroforestry ecosystem to support sustainable rice production intensification, and generate other benefits for the farmer and the environment?

Week 12: Make Plan for Germplasm Production of Desired TOF

Once additional TOF have been identified with the farmer, as an outcome of the week 9 field exercise, a plan should be made to ensure that the necessary germplasm – seeds, seedlings, other planting materials – will be produced in time for the next tree planting season.

Learning objectives

- Together with farmer, develop a plan to ensure that the necessary seeds, seedlings and other materials will be available for the next planting season
- Decide on best location for establishing a tree seedling nursery – at farm site, agricultural high school or college, or other community area

Duration

- At least 2 hours for discussion with farmer and inspection of possible nursery sites

Materials

- Notebook, pen

Methodology

- Field walks, visit to potential nursery sites, and brainstorming/processing with farmer
1. For the desired TOF that the farmer would like to plant/incorporate into his/her agroforestry system, determine:
 - a. Sourcing of seeds of indigenous and naturalized trees found in the locality, or from external sources
 - b. Simple seed germination tests that can be applied for forest and fruit trees, including: “ragdoll method”; direct seeding; box method; and hot water treatment
 2. Visit potential sites for the establishment of a tree seedling nursery – either at the farmer’s site, an agricultural school, or other community area – and consider these factors:
 - a. Water availability for seedlings
 - b. Suitability of soil for potting mixture
 - c. Ease of protection of nursery
 - d. Who would be responsible for managing nursery

Suggested questions for processing discussion

For this TOF field exercise, FFS participants may consider these key questions:

Where can seeds for the desired TOF be obtained – locally or from external sources?

Where would be the best location for establishing a nursery to produce seedlings in time for the next tree planting season?

Week 15: Meet with Partners to Discuss Collaboration

Meet with local partners – key ones include agricultural high schools or colleges, and community-based organizations – to discuss future collaboration in TOF activities.

Learning objectives

- Together with local partners, discuss the types of collaboration that will support TOF activities, including: seed collection from local and external sources; seed germination testing; and nursery establishment
- Explore scope for integration of TOF in agricultural school curriculum, and tree-planting activities by community-based organizations
- Agree on the roles and responsibilities of various partners in the collaborative activities

Duration

- At least 2 hours for discussion with local partners, and reaching agreement on roles and responsibilities in various TOF activities

Materials

- Farm sketch map, notebook, pen

Methodology

- Brainstorming/processing with farmer and local partners
1. Share the outputs from the previous TOF exercises:
 - a. Farm sketch map of existing TOF as well as desired trees, non-trees and shrubs that the farmer wishes to add to the agroforestry system
 - b. Summary tables of products and environmental services from existing and desired TOF
 - c. Plan to produce germplasm in time for next tree planting season
 2. Attain agreement with partners on their respective roles and responsibilities on collaborative TOF activities.

Suggested questions for processing discussion

For this meeting with partners, participants may consider these key questions:

What kinds of useful collaboration can be developed among farmers, agricultural schools and community-based organizations in support of TOF activities?

What are the specific roles and responsibilities for local partners who will be part of this collaboration?

How to Engage Agricultural Schools in TOF Activities?

As already mentioned, where possible in RRI Phase II, each pilot FFS-S&G site will be linked to an agricultural high school or college, and/or an active community-based organization (e.g., out-of-school youth, rural housewives) in the municipality.

In particular, agricultural schools present excellent opportunities for collaboration due to their educational mandate, pool of teachers and students, and facilities for hosting nurseries and other TOF activities. Possible collaborative activities include the following:

- Select interested teachers and students to participate in FFS-S&G pilot site activities
- Establish tree seedling nurseries at schools that have suitable water availability, soil for potting mixture, and space
- Involve teachers and students in local seed sourcing, germination testing, and nursery maintenance
- Implement tree-planting activities by schools and community-based organizations, on and outside school grounds
- Develop and integrate relevant TOF topics into agricultural school curricula
- Develop and maintain a simple community-based knowledge database on TOF in their locality