Natural Resources Conservation and Development

Level II

Learning Guide-43

Unit of Competence: Facilitate Agro-forestry Practices

Module Title: Facilitating Agro-forestry Practices

LG Code: AGR NRC2 LO2-LG-43

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LO 2: Identify Agro forestry species

Instruction Sheet	Learning Guide #43

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Identifying Agro forestry species
- Matching Identified species with site

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, **upon completion of this Learning Guide, you will be able to**:

- Identify Agro forestry species
- Match Identified species with site

Following up and evaluating Rehabilitation activity progress

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1and Sheet 2
4. Accomplish the "Self-check 1, and Self-check 2," **in page -4, and 9** respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1," **in page -10.**
6. Do the "LAP test" **in page – 10** (if you are ready).

Information Sheet-1	Identifying Agro forestry species

2.1. Identifying Agro forestry species

Concepts of Agroforestry

Basically, agroforestry involves the deliberate growing of trees and shrubs, collectively called woody perennials, on the same unit of land as agricultural crops or animals/pastures, in some form of either spatial mixture or temporal sequence.

In agroforestry there is significant interaction (ecological and economical) between the woody and the non woody components. There are three attributes which, theoretically all agroforestry systems posses, these are:

Multipurpose trees (MPTs)

Multipurpose trees and shrubs are trees which make more than one substantial contribution as products or services function, to the land use system in which they are grown. High qualities of nitrogen fixing multipurpose trees are much more preferable for agro forestry systems. Nitrogen-fixing trees (NFT) are those which show evidence of symbiotic nitrogen fixation usually through nodule-forming bacteria of the genus rhizobium or actinomycetes of the genus frankia. More than 650 species of trees are reported to be nitrogen fixing. One of the most important decisions in agroforestry is the selection of species. The selection of an agroforestry species depend on the following factors:

     a. Agro ecological condition

     b. The characteristics and growth requirements of the species

     c. Objectives / purpose of agroforestry

Agro ecological condition

     Agro ecological condition includes: climate, soil, physiography, and biotic factors. The species selection first must be adapted to the site condition. The climate, soil, and biotic factors affect the growth and performance of trees shrubs and other forms of vegetation directly while the physiographic factors affect the climate and the soil thus affect the vegetation From the point of view of selecting species for various agroforestry systems, several climatic parameters should be considered, such as annual rain fall, humidity, number of rainy days, mean minimum and mean maximum with extreme range of temperature.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. The selection of an agroforestry species depend on: **(**3pts)

   _____

   _____

   _____

2. Agro ecological condition includes: _____, _____,_____,_____. **(**3pts)

Note: **Satisfactory rating - 3 points   Unsatisfactory – below 3points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____   Date: _____

Short Answer Questions

   1. _____

      _____

   2. _____

      _____

      _____

      _____

Information Sheet-2	Matching Identified species with site

2.1. Matching Identified species with site

This Consider the possibilities and limitations in species selection for agroforestry includes indigenous species, exotics and species introduction, and genetic variation and tree improvement.

♦ **Indigenous species:-**is one that grows naturally in the country concerned though not necessarily in all parts and certainly suited to all sites. With such species there are no political or quarantine problems and there are some important biological advantages.

   i. **G**rowths of natural stands provide some indication of possible performance in plantation.
   ii. The species is adapted to the environment and already filling an ecological niche.
   iii. The species even in monoculture are generally considered more ecologically valuable than exotics for conservation of natural fauna and flora.
♦ **Exotic tree introduction**:-the majority of successful plantation for agroforestry in the tropics consists of exotics. There are several factors which can lead to great success if a careful choice of exotics is used.
   - **Ecologically** an exotic may be both, more free from pathogens and pests and also more vulnerable to serious, uncontrolled damage once they occur.

Ecological consideration is the first priority to other factors when considering the tree selection in all agro forestry plantations planning work.

The tree species chosen to be grown in conjunction with agriculture crops should have the following characteristics:

- They should be amenable to early wide specimen;
- They should be able to tolerant a relatively high incident of pruning, that is, their photosynthetic efficiency should not significantly decrease with heavy pruning;
- They should have a low crown diameter to bole diameter ratio, that is, the width of their crown should be small, relative to the bole diameter;
- They should be tolerant of side shade, if indeed not of full overhead shade in the early stage of growth;
- Their phyllotaxis should permit the penetration of light on the ground;
- Their phonology, particularly with respect to leaf flushing and leaf fall, should be advantageous to the growth of the annual crop in conjunction with which they are being raised;
- Their rate of litterfall and their decomposition should have a positive effect on the soil;
- Their above ground changes over time in structure and morphology should be such that they retain or improve those characteristics which reduce competition for solar energy, nutrient and water;
- They should be efficient nutrient pumps.

These characteristics of an ideal tree for agroforestry are not complete and may change depending on the site and agroforestry system. In general the ideal tree for an agroforestry

system should be examined with respect to its: root characteristics, crown characteristics, bole characteristics, phenological characteristics, nutrient and water absorption characteristics, growth characteristics and shelter to insect pest and diseases

1. Root characteristics

In a plant, root performs two important function: (a) they provide anchor and support to the plant and (b) the absorb water and nutrient from the soil. When woody perennials are grown with annual crops, it is necessary that root distribution of the trees and annual plant should be such that they are distributed in different areas. Most annual crops have their root distribution in the upper 40cm soil layers. Since the root of most agricultural crops lie in the surface of the soil, it is necessary that such tree species be preferable which have a deep root system. If tree roots are also distributed on the surface layer of the soil they will not only compute with agricultural crops for nutrients and water, but also cause obstruction in soil working.

2. Crown characteristics

When trees are grown with agricultural crop either as intercrop or on the boundary, the tree crown is of great significance. The tree crown consists of branches, twigs and leaves. The characteristics of a crown which are important from the agroforestry point of view include (i) density, (ii) size, (iii) shape, (iv) height, etc. trees having a dense crown do not permit enough light on the soil which adversely affects the process of photosynthesis in agricultural crops. The tree, therefore, should have a light crown which will permit enough light in the ground for photosynthesis activity of agricultural crops. In agroforestry, the smaller the tree crown, the better for the mixture. The ratio of crown size and bole diameter should be as low as possible. Larger crown will have an effect on a larger area for shading. Smaller crowns also help in accommodating a larger of trees per unit area in comparison to larger crowns. With size of the crown remaining the same, the trees with conical or cylindrical crowns should be preferred. Trees having an oval or umbrella- shaped crown will affect the annual crops over a large area.

3. Bole Characteristics

The tree bole should be straight and long. The clear bole should be long enough and branches emerge at higher locations. Several trees, such as *Eucalyptus* hybrid, *Casuarinas equisetifolia, pines,* etc., have a long clear bole. The bole should be upright and straight. In several species, however, branching starts early and the clear bole length is small. Most

broad-leaved species have this tendency. Some species develop a long clear bole due to natural pruning if planted in close spacing. If trees do not have self-pruning characteristics, they should tolerant a high incident of artificial pruning. Some species, such as *Populus deltoids, Dalbergia sissoo, etc.,* tolerate pruning and develop a relatively good clear bole and produce quality timber. Tree species which are planted for fodder have to be lopped. Therefore, these species should be able to tolerate lopping with no damage to the tree or disease infection.

4. Phenological Characteristics

Phenological characters, particularly leaf fall, emergency of new leaf, phyllotaxis, etc., are important. Deciduous species are preferred because they cause no competition for light, nutrient and moisture during the period of leaflessness. The longer the period of leaflessness, the better the growth of agricultural crops. The leaf litter deposited due to leaffall adds organic matter in the soil and maintains the productivity of the soil.

5. Nutrition and water requirement

When trees are grown with agricultural crops or grasses care has to be taken to select such woody species which do not have unnecessarily high requirement for nutrient and water. This is necessary to avoid competition between agricultural crops and perennial crops. For example *Eucalyptus tereticornis*, which has been grown on a large scale under agroforestry systems, has been accused of excessive consumption of water and nutrients adversely affecting agricultural crops and soil productivity. In general, uptake and release of nutrients are controlled by the species, density and age of the trees. When the crop is young, the uptake is more and the release is far less. As the age of the trees advance the release becomes substantial.

6. Growth characteristics

The species selected should essentially be fast growing. It should be able to withstand competition during early stages, particularly when species are being selected for intercropping. The tree species if grown wider spacing should not develop as *wolf tree* and should be adapted to initial wider spacing. The tree must be able to with stand adverse conditions in the seedling and young plant stage. The tree should be capable of withstanding lopping, pruning, and browsing. The tree should be adaptable to difficult site conditions and its roots should go deep and absorb nutrients from deeper layers.

7. Shelter to insect pest and diseases

The tree should be such that it in no way provides shelter to insect pests and diseases of agricultural crops. The b tree should not carry such pests and diseases which may damage agricultural crops. Some common insect pests and diseases have been reported in the case of forest trees and fruit trees.

Desirable Characteristics of Multipurpose Trees (Mpts) and Shrubs

The desirable characteristics of multipurpose trees are summarized below (table 2.1.)

Table 2.1. Multipurpose tree characteristics and agroforestry systems

Tree attributes	Relationship to performance in Agro forestry
Height	Ease of harvesting leaf, fruit, seed and branch wood; shading or wind effects
Stem form	Suitability for timber, posts and poles, shading effects
Crown size shape and Density	Quantify of leaf, mulch and fruit production, shading wind effects
Maltistemed habit	Full wood and pole production, shading or wind effects
Rooting pattern (deep or shallow, spreading or geotropic)	Competitiveness with other components, particularly resource sharing with crops, suitability for soil conservation
Physical and chemical composition of leaves and pods	Fodder and mulch quality, soil nutritional aspects
Thorniness	Suitability for barrier or alley cropping
Wood quality	Acceptability for fuel and various wood products
Phonology (leaf flush, Flowering and fruiting) and cycle (season)	Timing and labor demand for fruit, fodder of seed harvesting season of fodder availability barrier Function and wind break effect
Pest and disease resistance	Important regardless of function; biomass productivity, early establishment

Site adaptability and Ecological range	Suitability for extreme sites or reclamation uses
Phenotypic or eco-Morphological variability	Potential for genetic improvement need for culling unwanted phenotype
Response to pruning and cutting management Practices	Use in alley farming, or for lopping or coppicing
Possibility of N2 fixation	Use in alley farming, planted fallow, or rotational system

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the Characteristics of Agroforestry Species (3pts)
2. **List and describe Desirable Characteristics of Multipurpose Trees (Mpts) and Shrubs (3pts)**

Note: **Satisfactory rating - 3 points   Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____   Date: _____

Short Answer Questions

1. _____
   _____.

2. _____
   _____
   _____

Operation Sheet 1	Identify Agro forestry species

Objective   To know agro forestry species

        To know characteristics of AF

Materials, tools and equipment: Paper, pen note pad

Procedure:

- ➢ Wear safety cloths
- ➢ Surveying the environment
- ➢ Contact the households exercising the system, manual of plant identification
- ➢ Record data
- ➢ Identify the characteristics of AF species

LAP Test	**Practical Demonstration**

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

Task 1- Identify Agro forestry species

Reference:

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