RQF LEVEL:5

TRADE: FORESTRY

MODULE CODE:
FORFM501

TEACHER'S GUIDE

Module name: FOREST MANAGEMENT PLAN ELABORATION

Table of content

Acronyms

FMP: Forest management plan

GPS: Global positioning system

MS: Meteorological stations

PH: Hydrogen potential

Introduction

A. FOREST MANAGEMENT

Forest management is a branch of forestry concerned with overall administrative, legal, economic, and social aspects, as well as scientific and technical aspects, such as silviculture, protection, and forest regulation. This includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, forest genetic resources, and other forest resource values. [1] Management can be based on conservation, economics, or a mixture of the two. Techniques include timber extraction, planting and replanting of different species, cutting roads and pathways through forests, and preventing fire.

Objectives:

-To provide the maximum benefits to the greatest number of people for all time

-To maximize economic and social output in the forest plantation

--To maintain preferably increasing the forest capital by silvicultural operations

-To make a periodic and constant the wood income

-To ensure the entire forest vocational area a maximum rate of production

B. FOREST MANAGEMENT PLAN

A forest management plan is a guide and a tool to help you make decisions, look at your options, and plan for the future. The plan may need to be modified as your ownership goals and objectives, and site conditions, change over time.

A forest management plan is a detailed written document that includes three important elements:

1. A detailed description of the property and the resources on the property,

2. A specific list of goals or objectives for management of the property, and

3. A schedule of activities to be performed on the property to help realize goals and objectives.

There is no specific format for including these elements in a plan; however, all three must be covered to some level if the management plan is to be useful.

Module Code and Title: **FORFM501:** FOREST MANAGEMENT PLAN ELABORATION

Learning Units:

1.Carry out site study

2.Determine the required cost and income in forest management plan

3. Design forest management plan

4. Establish monitoring and evaluation tools of the forest management

Learning Unit 1: Carry out site study

Picture/s reflecting the Learning unit 1

STRUCTURE OF LEARNING UNIT

Learning outcomes:

1.1. Collect edaphic and climatic data

1.2 Estimate trees species productivity

1.3. Inspect the severity of pests and diseases

1.4 . Identify land use systems

Learning outcome 1.1. Collect edaphic and climatic data

Duration: 7 hrs

Learning outcome 1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. To analyse soil properties
2. To assess climatic data
3. To assess geographical coordinate

Resources

Equipment	Tools	Materials
GPS Ph meter Meteorological stations	- soil auger	-Site vegetation

Advance preparation:

.Availability of the site to be observed

.Availability of tools and equipment for soil analysis

. Availability of meteorological station

Indicative content 1.1.1. Soil properties

Soil texture

Soil is made up of different-sized particles. Soil texture refers to the size of the particles that make up the soil and depends on the proportion of sand, silt and clay-sized particles and organic matter in the soil. Sandy soils feel gritty when rubbed between your fingers.

Soil structure

Soil structure describes the way the sand, silt and clay particles are clumped together. Organic matter (decaying plants and animals) and soil organisms like earthworms and bacteria influence soil structure.

Soil porosity

Soil porosity refers to the pores within the soil. Porosity influences the movement of air and water. Healthy soils have many pores between and within the aggregates.

Soil pH

Soil pH is a measure of the acidity and alkalinity in soils. pH levels range from 0 to 14. The optimal pH range for most plants is between 5.5 and 7.0

Soil pH plays an important role in availability of nutrients essential for plant growth.


Theoretical learning Activity

Group discussion on soil properties

Brainstorming on porosity


Practical learning Activity

Practical exercises on soil structure analysis

Points to Remember (Take home message)

Soil properties
Soil texture
Soil structure
Ph on soil fertility

Indicative content 1.1.2. Climatique data

Rainfall

All plants /trees depend on the availability of water, nutrients and light as essential resources for growth. In tropical rain forests, these resources vary over spatial and temporal scales and, as a result, tree growth varies with resource availability. In general, tree growth increases with rainfall and decreases with drought.

Temperature

Is a key factor in trees growth and development. Along with the levels of light, carbon dioxide, air humidity, water and nutrients, temperature influences plant/trees growth and ultimately crop yields

Relative humidity.

Relative humidity (RH) is the ratio of the partial pressure of water vapour to the equilibrium vapour pressure of water at given temperature

Wind.

The perceptible natural movement of the air especially in the form of current of air blowing from a particular direction.

 Theoretical learning Activity

Group discussion Climatic data

Brainstorming Climatic data

oral presentation Climatic data

 Practical learning Activity

Field visit Climatique data

Points to Remember (Take home message)

Climatic data temperature: Rainfall relative Humidity wind

Indicative content :1.1.3. Geographical coordinates

Latitude

Is defined as the angle formed by the intersection of a line perpendicular to the Earth's surface at a point and the plane of the Equator

Longitude.

A meridian, or line of longitude, is formed by a plane that passes through the point and the North and South poles. The longitude value is defined by the angle between that plane and a reference plane

Altitude. altitude is a distance measurement, usually in the vertical or "up" direction, between a reference datum and a point or object.


Theoretical learning Activity

In group discussion on geographical coordinate

Brainstorming geographical coordinate


Practical learning Activity

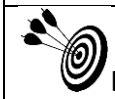
Practical exercises on altitude

 Points to Remember (Take home message)

Geographical coordinates : Altitude Latitude Longitude

Learning outcome 1.2: Estimate trees species productivity

 **Duration: 9 hrs**

 **Learning out come 2 objectives:**

By the end of the learning outcome, the trainees will be able to:

1. To classify different tree species
2. To determine tree spacing of plantation
3. To differentiate tree species according to their growth rate
3. Calculate tree volume

 **Resources**

Equipment	**Tools**	**Materials**
Computer Clinometers	Calculator -First Aid kit	Tree markers - Pegs Handbook –

- GPS - Compass,	Ranging rods -Tape measure - Caliper - Haga - Relascope - Machete	

Advance preparation:

-Availability of different tree species

-Available o tools and equipment

-Availability of mature tree

Indicative content 1.2.1. Estimate trees species productivity

Tree species identification / Dendrology

Dendrology is a science that studies, identifies, and even names plants that have woody structural systems. Dendrology may not seem like the most interesting science at first glance, but it is grossly complicated and interesting.

There is no sharp boundary between plants **taxonomy** and dendrology:

Taxis*:* Latin meaning arrangement or order;

nomy*:* refers to knowledge.

So, taxonomy is the knowledge of order or classification of plants.

Plants taxonomy as science, finds, identifies, describes, classifies and names plants. Plants taxonomy is an old science that uses the gross morphology (physical characteristics, it means leaf shape, flower form, fruit form, etc) of plants to separate them into similar groups.

 Theoretical learning Activity

In group discussion tree species classification

Brainstorming on scientific names

 Practical learning Activity

Field visit in forest plantation of different species

Points to Remember (Take home message)

Tree species identification (dendrology)

Family Species:

Taxonomic categories are:

Kingdom

Phylum /Division

Class

Order

Family

Genus

Species

Indicative content 1.2.2: Forest plantation structure

Spacing(density): An average of **6 to 20 feet** for smaller trees is enough spacing, while between 50 to 60 feet apart is ideal for larger trees.

sites lay out: A site layout plan shows a detailed layout of the whole site and the relationship of the proposed works with the boundary of the property. The choice of where and what to plant depends on the purpose of the plantation, on who the land and the trees belong to and on other possible uses of the land.


Theoretical learning Activity

Brainstorming on tree spacing

Oral presentation ideal spacing while tree planting


Practical learning Activity

Practical exercises o tree plantation


Points to Remember (Take home message)

Square spacing

Rectangular spacing

Triangular spacing

Indicative content 1.2.3: Trees species growth rate

. Trees species growth rate is influenced by numerous variable such as: soil, drainage, water, fertility, light ,exposure ,the designation slow means plant grows 12" or less per year, medium refers to 13 to 24"of growth per year, and fast to 25"or great.

Theoretical learning Activity

Group discussion on tree species growth rate

Brainistroming on species growth rate

oral presentation on species growth rate

Practical learning Activity

Practical exercises on classification of tree about tree species growth rate

Points to Remember (Take home message)

Fast growing species:

Eucalyptus spp

Alnus spp

Medium growing tree species

Grevillea robusta

Acacia spp

. Low growing species:

Pinus spp

Callitris spp

Indicative content 1.2.4: Forest regime and development stages

Coppice forests Coppice: is a forest regenerated from vegetative shoots that may originate from the stump and/or from the roots, depending on the species

Full grow High forest stand (full grow): A high forest is a type of forest originated from seed or from planted seedlings

Coppices with standards: Coppice with standards Coppice with standards is a silvicultural system in which selected stems are retained, as standards, at each coppice harvest to form an uneven-aged overstorey which is removed selectively on a rotation consisting of a multiple of the coppice cycle.

Development stages:

Cover, Recruit, Perch low ,High perch ,Young futaie ,Mean futaie, Old futeie

Theoretical learning Activity

In group discussion on development stages

oral presentation development stages


Practical learning Activity

Field visit in the forest about tree development stages

Points to Remember (Take home message)

Forest regime development stages

High forest stand (full grow)

Simple coppice stands

Coppices with standard

Development stages

Indicative content 1.2.5: Forest volume estimation

Forest volume estimation:

Total volume of stand: Estimates of volumes for different types, qualities and sub-samples of stands are essential for effective forest production management. These estimates will assist in the determination of potential product harvests, but may also be useful for estimating the amount of carbon locked up in the forests - important in green-house gass studies and fire research.

Mean height Average: The mean tree height of forest stands is a crucial stand characteristic in forest planning. Currently, the mean tree height is determined by field measurements or by photogrammetric measurements utilizing aerial photographs.

Basal area of stand: Basal area is the common term used to describe the average amount of an area (usually an acre) occupied by tree stems. It is defined as the total cross-sectional area of all stems in a stand measured at breast height, and expressed as per unit of land area (typically square feet per acre).

Theoretical learning Activity

Oral presentation on trees volume

Practical learning Activity

Field visit

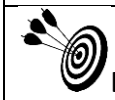
Practical exercises on tree volume calculation.

 Points to Remember (Take home message)

Total volume of stand : V =∑vi Mean height Average: ∑hi/n Basal area of stand:G=∑gi

Learning outcome 1.3. Inspect the severity of pests and diseases

 **Duration: 4 hrs**

 **Learning out come 2 objectives:**

By the end of the learning outcome, the trainees will be able to:

1. To perform pests and diseases diagnosis
2. To classify pests and dieses
3. To control pests and diseases

 **Resources**

Equipment	Tools	Materials
- Internet - PPE	- DVD player Books –	- Forest stand – - parts of attacked trees

 **Advance preparation:**

-Availability of different Forest stand

-To be trained about pests and diseases

-Availability of attacked tree

-Availability of tools / equipment used to collect insects

Indicative content 1.3.1. Pests and diseases diagnosis.

Pests and diseases diagnosis:

When carrying out the site study, it is advisable to inspect the severity of pests and diseases, and this will help landowners in forest management to make decisions which are more interconnected with forest status.

observation

sampling

causal agent

propagation mode

Theoretical learning Activity

In group discussion diseases diagnosis

Brainstorming causal agent

Oral presentation propagation mode

Practical learning Activity

Field visit

Practical exercises

Points to Remember (Take home message)

Disease Diagnosis

Observation

sampling of pests and diseases

Indicative content 1.3.2. Pests and diseases classification

Like all living things, trees are susceptible to disease. A tree needs a good supply of light, water, carbon dioxide and nutrients from the environment for optimum growth.

Tree disease can stem from fungal, bacterial or viral sources.

Theoretical learning Activity

In group discussion diseases classification

Practical learning Activity

Field visit on diseased trees

Points to Remember (Take home message)

Pests and diseases classification:

Physiological diseases

Viral diseases

Fungal diseases

Bacteria diseases

Indicative content 1.3.3. Pestes and diseases control methods

Pests and diseases control methods

After collecting data on pests and diseases, the decision on control based on their types is crucial. There are two possibilities of fighting against pests and diseases which are curative treatment and preventive treatment.

Preventive treatment

This technique is aiming at fighting the pests and diseases before they occur in the field, some activities of preventive treatment are:

Sanitation in a forest

Sowing on time

Use of resistant seeds

Adequate fertilization

Mixing tree species

Pruning and thinning

Curative treatment

This is a treatment which is done after the occurrence of pests and diseases in a field

It includes the use of pesticides, biological control, physical removal etc

Theoretical learning Activity

In group discussion on Preventive treatment

Brainstorming on Curative treatment


Practical learning Activity

Practical exercises on curative treatment of pests and diseases


Points to Remember (Take home message)

Pests and diseases control.

Preventive treatment

Curative treatment

Learning outcome 1.4. Identify land use systems

Duration: 5hrs

Learning out come 4. Objectives:

By the end of the learning outcome, the trainees will be able to:

1. Classify land use properties
2. Describe forest stand
3. Precise appropriate land use conditions

Resources

Equipment	Tools	Materials
- GPS	- Land law – - Maps	- Forest stand – -Land title

Advance preparation:

-Availability of different Forest stand

-To be trained about pests and dieases

-Availability of attacked tree

-Availability of tools / equipment used to collect insects

Indicative content 1.4.1. Land use property

Definitions:

Land: The surface of the earth identified by specific boundaries, including the airspace above that portion of surface, the minerals beneath it, and surrounding biodiversity, erections and developments on that.

Land use

The concept of land use refers to a series of activities done to generate one or more products or services.

The same land use can occur on several different parcels of land, and reciprocally, the same land may have several uses.

The categories of forest area are classify into 3 categories :

State forest: A forest on State land planted by the State, Government Project, planted through community work or any other organ, a natural forest, forest planted along State roadsides,

Private forest: a forest planted by an individual, the State, planted through community work or by any other person on private land, planted by a group of people with or without legal personality on their land.

District forest: a forest located on a District land and that was planted by the District, a District project, planted through community work or planted by any other organ partnering with the District.

Theoretical learning Activity

In group discussion on land use properties

Brainstorming on state forest

oral presentation on private forest.


Practical learning Activity

Field visit the categories of forest area

Points to Remember (Take home message)

Land use property : State

District

Private properties

Indicative content 1.4.2. Forest stands description

Localization: **. Stand Location** – Of interest silviculturally is the topographic location of the stand. Generally, two broad topographic positions are recognized, upland or bottomland

Area: done for different categories such as forest and non-forest or different forest types. Forest area estimation is also a crucial input to all quantifications or estimations of "deforestation". A clear definition of "forest" is required in any case. For the determination of forest area there are at least two basic approaches:

delineation (mapping) from remote sensing imagery, or

Statistical sampling (either in the field or from remote sensing imagery).

Plots number:In the forest depend on two(2) factors:

Sampling rate

Size of the forest

Theoretical learning Activity

In group discussion on forest description

Brainstorming the categories of forest area


Practical learning Activity

Practical exercises to describe the forest


Points to Remember (Take home message)

Forest stands description: Localization Area Plots number

Indicative content 1.4.2. Land use conditions

Agriculture : the land of lower slope or medium slope must be used in crop production Forest: For high land or degraded soil **Pasture** : Is the land of medium slope in order to produce fodder for livestock **Wetland** : : is protected area to conserve water and wild animals

Theoretical learning Activity

In group discussion land use conditions

Brainstorming on pasture


Practical learning Activity

Field visit land use condition

Points to Remember (Take home message)

Land use conditions:

Agriculture

Forest

Pasture

Wetland


Learning outcome 1.Formative assessment

Written assessment

Assessment tools

True or false questions

Multiple choice

Open ended questions

Case studies

Please mix different assessment tools for triangulation and relevancy of assessment

Practical assessment

Assessment tools

Assay

Task to be performed

Observation checklist


Learning unit 1 : Formative assessment

Written assessment

Question 01: Read the following statements and answer by true or false in provided space (**3marks)**

Forest management is branch of forestry concerned with overall administrative, legal, economic, and social aspects, as well as scientific and technical aspects, such as silviculture, protection, and forest regulation……

A guide and a tool to help you make decisions, look at your options, and plan for the future is forest management plan ……

The capacity to receive, store and transmit energy to support plant growth refer to photosynthesis ……

Question 02: The following list are tools used in climatic data collection .Illistrate their roles:

Rain gouge.

Thermometer

Hgrometer

Anemometer

Altimeter

Question 03: Explain the following term:

a) Dendrology / **2 marks**

b)Plants taxonomy / **2 marks**

Question 04. List out any 3 scientific names of Araucaria trees / 2**marks**

Question 05. The following are tree species growth rate**. /5marks**

A. Fast growing tree species

B. Medium growing tree species

C. Low growing tree species

Match the following names of tree with the above growth rate by writing the letters A,B and C in the provided space.

1)…… Araucaria spp

2) …… Alnus spp

3)……Cassia spp

4)……..Casuarina spp

5)…… Eucalyptus spp

Question 06 ; Integrated Pest Management strategies require detailed studies which can be broken down into three steps: what are those steps? **3marks**.

Question 07: Outline the four (4) class of tree diseases/ **2marks**

Question 08. In Rwanda, the Forest land uses are divided into three main categories according to the properties. What are the characteristics of state forest? **/3marks**

Question 09: List out the components forest stand**/3marks**

Answer of assessment

Question 01: Read the following statements and answer by true or false in provided space (**3marks)**

Forest management is branch of forestry concerned with overall administrative, legal, economic, and social aspects, as well as scientific and technical aspects, such as silviculture, protection, and forest regulation…… true 1mark……

A guide and a tool to help you make decisions, look at your options, and plan for the future is forest management plan …true… 1mark……

The capacity to receive, store and transmit energy to support plant growth refer to photosynthesis ……false… 1mark……

Question 02: The following list are tools used in climatic data collection .Illistrate their roles: **/2marks**

Rain gouge.	Measurement of rainfall	1mark
Thermometer	Measurement of Temperature	1mark
Hgrometer	Relative humidity	1mark
Anemometer	Wind direction measurement	1 mark
Altimeter	Measurement of altitude	1mark

Note: consider any 2 answers

Question 03: Explain the following term:

a) Dendrology / **2 marks**

b)Plants taxonomy / **2 marks**

ANSWER:

a. The dendrology is the science and study of wood plants (trees, and shrubs) 2marks

b. Plants taxonomy as science, finds, identifies, describes, classifies and names plants. 1marks

Question 04. List out any 3 scientific names of Araucaria trees / 2**marks**

Answer.

- **Araucaria angustifolia 1mark**
- **Araucaria araucana 1mark**
- **Araucaria bidwillii 1mark**
- **Araucaria columnaris 1mark**
- **Araucaria cunninghamii 1mark**

Note: Consider any 2 answers

Question 05. The following are tree species growth rate**. /5marks**

A. Fast growing tree species

B. Medium growing tree species

C. Low growing tree species

Match the following names of tree with the above growth rate by writing the letters A,B and C in the provided space.

1)…… Araucaria spp

2) ……. Alnus spp

3)……Cassia spp

4)……..Casuarina spp

5)…… Eucalyptus spp

5 ANSWER:

1)……C…… Araucaria spp 1mark

2) ……B…… Alnus spp 1mark

3)……B……Cassia spp 1mark

4).....C.....Casuarina spp 1mark

5).....C..... Eucalyptus spp 1mark

Question 06 ; Integrated Pest Management strategies require detailed studies which can be broken down into three steps: what are those steps? **3marks**.

ANSWER: Those steps are:

a precise description of pest population dynamics in space and time 1mark

a general survey to estimate the variability in the first step between seasons or across a region; 1mark

the control strategy, including a survey by the grower of population dynamics 1mark

Question 07: Outline the four (4) class of tree diseases/ **2marks**

Answer: The four class of tree diseases are:

1.Physiological

Diseases 1marks

2. Viral diseases 1marks

3. F ungal diseases 1marks

4.Bacteria diseases 1marks

Note: consider any 2 answers

Question 08. In Rwanda, the Forest land uses are divided into three main categories according to the properties. What are the characteristics of state forest? **/3marks**

ANSWERS:

The **Characteristics are:**

The goal is to satisfy the general interests /1mark

It must produce the most wood needed and generating more general interest/ 1mark

It requires sufficient capital /1mark

Question 09: List out the components forest stand**. /3marks**

Answer: The elements composing stand description are:

1. Stand Composition 1 mark

2. Stand Density /1mark

3. Stand Form. /1 mark

4. Stand Origin /1 mark

5. Stand Location /1 mark

6.Forest area / 1mark

Note: Consider any 3 correct answers

Practical assessment

Task to perform: Determine tree volume on standing tree by using calliper and Haga.

Learning Unit 2: Determine the required cost and income in forest management plan.

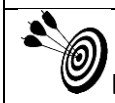
Picture/s reflecting the Learning unit 2:

STRUCTURE OF LEARNING UNIT 2: Determine the required cost and income in forest management plan.

Learning outcomes:
2.1. Estimate the cost of tools, equipment and materials
2.2. Estimate required human resources
2.3. Estimate forest financial income

Learning outcome 2.1. Estimate the cost of tools, equipment and materials.

 **Duration: 6hrs**

 Learning outcome 1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Identify tools, equipment used in forest management plan.
2. Estimate tools used in forest management plan.
3. Estimate equipment and materials used in forest management plan.

 **Resources**

Equipment	**Tools**	**Materials**
Hardware shops Computer	Calculators Books -	Papers Internet

 **Advance preparation:**

-Availability of market

-To be informed about the price of national forest products

-To be informed about the different types of tools or equipment used in forest management plan

Indicative content 2.1. Identification of Tools, Equipment and materials.

Identification of tools equipment and materials.

When choosing tools and equipment factors must be taken into consideration: Availability of tools or equipment, Financial capacity, site size, opportunities, operations ,price, environmental conditions, social conditions, precision, speed of use . robustness.

Some of those material , tools and equipment are: Calculators, Paper sheet, Computer, GPS, Compass, Relascope, Caliper, Tape measure, Clinometers, Haga, Panga, Hoes ,Pens, Pegs, Ranging poles ,Forest map, Spade, Axe, Pruning saw, Bow saw, Two man saw, Sprayer, Duster Secateur, wheelbarrow, Ladder, Pruning knives Slashers

Theoretical learning Activity

Group discussion Identification of tools equipment and materials.

Practical learning Activity

Practical exercise to identify tools and equipment

Points to Remember (Take home message)

Identification of tools, equipment and materials: Calculators,

Computer, GPS, Compass, Caliper, Tape measure, Clinometers, Haga, Panga, Hoes ,Pens, Pegs, Ranging poles ,Forest map, Spade, Axe, Pruning saw, Two man saw, Sprayer, Duster Secateur, wheelbarrow, Ladder,

Indicative content 2.2: Cost estimation of Tools, Equipment and materials

The cost estimation of tools, equipment and materials.

The Cost estimation of tools, equipment and materials should be calculated according to the conditions of market and the factors as specification, pricing experience, (cost/availability/performance), accuracy and reliability of cost information, site constraints. Material availability, financial capabilities of the client.

Theoretical learning Activity

In group discussion on trees cost estimation


Practical learning Activity

Practical exercises on cost estimation

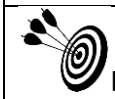
Points to Remember (Take home message)

The factors affecting the cost estimation of tools or equipment for forest management plan:

The Cost estimation of tools, equipment and materials should be calculated according to the conditions of market and the factors as Accuracy, reliability of cost information, site constraints. Material availability, financial capabilities of the client.

Learning outcome 2.3: Estimate forest financial income

Duration: 6hrs



Learning out come 2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. To differentiate the forest products

2. Estimate the expected forest production

Resources

Equipment	**Tools**	**Materials**
Computer	Calculators - Pens -	Papers

Advance preparation:

-Availability of different forest products

-Available of other forest products

-Information about the price of forest products.

Indicative content 2.2. 1. The types of forest products:

The types of forest products:
Fire wood
Charcoal
Timber
Posts
Poles
Stakes
All forest by-products
o Resin
o Gum
o Tannin
o Wax
o Latex
o Essential oils
o Tar
o Flavonoid

Theoretical learning Activity

In group discussion on forest products

Practical learning Activity

Practical exercises on selection of forest products.

Points to Remember (Take home message)

The types of forest products Estimation of expected forest production

Indicative content 2.2. 2.Estimation of expected forest production

The financial income must be estimated by observing products and services that can be derived from the forest. Forest products are those tangible things that come from forest, while forest services are those intangible products that come from the forest

Theoretical learning Activity

In group discussion the financial income

Brainstorming the financial income

oral presentation the financial income

Practical learning Activity

Practical exercises to calculate the financial income

Points to Remember (Take home message)

The types of forest products Estimation of expected forest production

Learning unit 2 : Formative assessment

Written assessment

Question 1: Outline the criteria to take into consideration when selecting tools, and equipment used in forest management plan**?** **/4marks**

Question 2: The table below shows the cost estimation of tools, equipment and materials used in forest management plan.

Show the total cost of Tools/Equipment /Materials for each**.** **/ 5marks**

Question 3: The table below shows the cost estimation of tools, equipment and materials used in forest management plan.

Show the total cost of Tools/Equipment /Materials for each**.** **(5marks)**

Tools/Equipment /Materials	Quantity	Cost of one item	Total cost
Tape measure	7	5555	
Axe	5	5000	
Slasher	25	2000	
Rods	16	11250	
Pegs	120	1500	
Total			

Question4 : Illustrate the forest management activities /**4marks**

Question 5: What are the criteria used for estimation of labor force /**2marks**

Question 6. Forest products are sometimes marked to meet specific cash

Question 7: Outline (four) 4 factors of different forest products selection/2marks .

Answer of assessment

Question 1: Outline the criteria to take into consideration when selecting tools, and equipment used in forest management plan**?** **/4marks**

Answer: The criteria to take into consideration are:

Availability of tools or equipment /1 mark

Financial capacity 1 mark

site size 1 mark

opportunities 1 mark

operations 1 mark

price 1 mark

environmental conditions 1 mark

social conditions 1mark

precision-speed of use 1 mark

robustness. 1mark

Note: consider any 4 correct answers

Question 3: The table below shows the cost estimation of tools, equipment and materials used in forest management plan.

Show the total cost of Tools/Equipment /Materials for each**.** **/ 5marks**

Question 4: The table below shows the cost estimation of tools, equipment and materials used in forest management plan.

Show the total cost of Tools/Equipment /Materials for each**.** **(5marks)**

Tools/Equipment /Materials	Quantity	Cost of one item	Total cost
Tape measure	7	5555	
Axe	5	5000	
Slasher	25	2000	
Rods	16	11250	
Pegs	120	1500	
Total			

Answer

Tools/Equipment /Materials	Quantity	Cost of one item	Total cost
Tape measure	7	5555	38885
Axe	5	5000	25000
Slasher	25	2000	50000
Rods	16	11250	180000
Pegs	120	1500	180000
Total		473885 frws	

Question 4: Illustrate the forest management activities /**4marks**

Answer:

The forest management activities include:

(i) forest fire protection;/1 mark

(ii) supervision of forest 1 mark

(iii) veldt management; 1 mark

(iv) research support on indigenous forests; 1 mark

(v) wildlife management; 1 mark

(vi) silviculture; 1 mark

(vii) anti-poaching activities; 1 mark

(viii) community participation. 1 mark

Note: consider any 4correct answers

Question 5: What are the criteria used for estimation of labor force /**2marks**

Answer: Those criteria used for estimating labor force

Forest management area / 1mark

Forest management activities /1mark

Education level of labor force /1mark

Question 6. Forest products are sometimes marked to meet specific cash needs. List any 8 names of forest products / **4 marks**

Answers

- Firewood /1mark
- Charcoal/1mark
- Timber /1mark
- Posts /1 mark
- Poles /1mark
- Stakes /1mark

O Resin /1mark

Question 7: Outline (four) 4 factors of different forest products selection/2marks .

ANSWER: The factors of forest products selection are:

The needs for cash/ 1mark

The accessibility of markets / 1mark

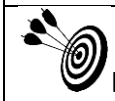
The quantity of product that are available for the collection and sale. ,/1mark

Picture/s reflecting the Learning unit 3

STRUCTURE OF LEARNING UNIT 3 : Design forest management plan

Learning outcomes:
3.1. Establish forest management objectives 3.2. Conduct forest inventory and resources 3.3. Establish forest schedule activities and forest operational plan

Learning outcome 3.1. : Establish forest management objectives

 **Duration:5hrs**
 Learning outcome 3 Design forest management plan By the end of the learning outcome, the trainees will be able to: 3.1.To formulate general objectives 3.2. To formulate Specific objectives 3.3. To formulate hypothesis
 **Resources**

Equipment	**Tools**	**Materials**
Internet Computers	Pen	- Papers

Advance preparation:

Available of forest map

Forest area

Tools and equipment for forest inventory

Planned activities

Indicative content 3.1.1. Objectives formulation

General objectives: To meet the people 'need for fire wood , timber, and other forest products and contribute to food production thought an effective interaction between forestry and farming practices.

Specific

Measurable

Achievable/Attainable/Action oriented

Realistic/Reasonable/Relevant

Time-bound/ Time-restricted

Specific objectives: specified objective(Harvest 30 acre of mature pine timber by sealed bid sale thought a forest consultant in 15 years)

Theoretical learning Activity

In group discussion on forest plantation objectives

Practical learning Activity

Field visit

Practical exercises general objectives formulation

 Points to Remember (Take home message)

Objectives formulation: Specific objectives General objectives

Indicative content 3.1.2. Hypothesis formulation

Hypothesis are testable explanations of a problem, phenomenon an or observation that can be tested by further investigation.

 Theoretical learning Activity

In group discussion hypothesis

Brainstorming on hypothesis

Oral presentation hypothesis

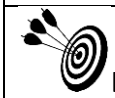
Practical learning Activity

Practical exercises to formulate an hypothesis

Points to Remember (Take home message)

Common forms of hypothesis are: simple complex alterative

Learning outcome 3.2. Conduct forest inventory and resources

 **Duration:8 hrs**
 Learning outcome 3 Design forest management plan By the end of the learning outcome, the trainees will be able to: 1.Identify of tools and materials 2.To recruit Labour and personnel 3.To perform sample forest stands 4.To Select mature trees
 **Resources**

Equipment	**Tools**	**Materials**
Internet Computers	Pen	- Papers

Advance preparation:

Available of forest map

Forest area

Tools and equipment for forest inventory

Planned activities

Indicative content 3.2.1. Identification of Tools and Materials

Topofil	**Rope**
Diameter tape	Ranging pole
Chainsaw	Bark gauge
Blume Leis	Axe
Compass	Pens
Dendrometers	Forest map
GPS	Handbook
Caliper	Calculator
Haga	Computer
Relascope	Communication tools
Panga	Transport means
Markers	PPE
Dendrometer	Laser

Theoretical learning Activity

In group discussion on Identification of Tools and Materials

Brainstorming. Identification of Tools and Materials


Practical learning Activity

Practical exercises to identify the tools and equipment

Points to Remember (Take home message)

Identification of tools and materials.

Indicative content 3.2.2 Labor and personnel recrutement

For labour and personal recruitment must focus on reading and writing in order to facilitate forest inventory activities and must vary according to the function and intensity of work.

Theoretical learning Activity (duration 10 min)

Oral presentation Labour and personnel recruitment


Practical learning Activity

Field visit on Labour and personnel recruitment


Points to Remember (Take home message)

Labour and personnel recruitment

Indicative content 3.2.3. Sample forest stands.

Sample form sample size Sampling techniques(random, stratified, systematic) Safety and First Aid instructions)


Theoretical learning Activity (duration 10 min)

In group discussion Sampling techniques

Brainistroming

oral presentation


Practical learning Activity

Practical exercises to establish sample size


Points to Remember (Take home message)

In forest invent inventory three forms are generally used such as square, rectangular and circular but the most preferred in current practices is circular.

Indicative content 3.2.4 Select mature trees

Characteristics of mature trees: Diameter Height


Theoretical learning Activity

In group discussion on tree diameter

Brainistroming on tree height


Practical learning Activity

Field visit

Practical exercises on tree height measurement

 Points to Remember (Take home message)

As trees become older and grow taller, they increase their relative fitness to competing trees or to other life forms. The general characteristics of mature trees are diameter and height

Indicative content 3.2.3. Sample Forest stands.

Sample form: In forest invent inventory three forms are generally used such as square, rectangular and circular but the most preferred in current practices is circular

sample size: The sample size determination is the act of choosing the number of observation to include in statistical sample.

Sampling techniques (random, stratified, systematic) Safety and First Aid instructions)

 Theoretical learning Activity

Group discussion about sample form

Brainstorming on sample size

 Practical learning Activity

Practical exercises on calculation of possible sample and sampling units


Points to Remember (Take home message)

In forest invent inventory three forms are generally used such as square, rectangular and circular but the most preferred in current practices is circular.

Indicative content 3.2.5. Collect the data.

Tree growth parameters: There are three basic parameters commonly measured to characterize the size of single trunk tree which are: height, diameter. circumference, basal area, crown surface.

Biological rotation age or Stand revolution

Is a period where forest or stand have harvested and replaced by the same species(reconversion) or other species (conversion).

Filling format of data record: Before understanding the design of any recording document, attention should be drawn to the specific data to be recorded


Theoretical learning Activity (duration 10 min)

Oral presentation on tree growth parameters


Practical learning Activity

Practical exercises to measure height, diameter. circumference, basal area, crown surface.

Points to Remember (Take home message)

Trees parameters Stand revolution Filling format of data record

Indicative content 3.2.6. Data entry

Data entry

Theoretical learning Activity

Group discussion on data entry

Brainstorming data entry

oral presentation data entry

Practical learning Activity

Practical exercises for data entry

Points to Remember (Take home message)

Data entry

Indicative content 3.2.7. Estimate Forest volume.

Total volume of stand: The volume of the selected tree is then determined and the stand volume estimated by inflating the sample tree volume by the number of trees in the stand.

$V = v * N$

Mean height: The arithmetic mean of the height of all trees in the stand is a useful measure of stand height in even-aged stands.

Average basal area of stand: $G=\sum gi/n$

Theoretical learning Activity

Group discussion total volume of stand:

Brainistroming on mean height

Oral presentation average basal area of stand

Practical learning Activity

Field visit average basal area of stand

Practical exercises total volume of stand

Points to Remember (Take home message)

Estimate forest volume: Total volume of stand Mean height Average basal area of stand

Indicative content 3.2.8. Conversion method (from forest volume to stere or timber)

In general 1 stere (1st) correspond to 0.65 to 0.75volume cubic meter($m^{3)}$

The volume calculation must be based on the available stere of wood.

Theoretical learning Activity (duration 10 min)

Group discussion Conversion method

Brainstorming Conversion method

oral presentation Conversion method

Practical learning Activity

Practical exercises Conversion method

 Points to Remember (Take home message)

In general 1 stere(1st) correspond to 0.65 to 0.75volume cubic meter($m^{3)}$

Learning unit 3. Written assessment

1.Complete those sentences:

a)**……**in terms of observable aspects of what the forester will be able to do.

b) **……** can be observed or counted during or after the the implem*entation*.

2.Define: a) Population

b) Sample

3.What are difference between random sampling and systematic sampling?

Solutions:

1.a. **Specific: What is to be done** in terms of observable aspects of what the forester will be able to do

b) **Measurable:** can be observed or counted during or after the the implem*entation*

2.a) Population: In statistics, a population is a complete set of items that analysis.

b) Sample: Is a subset containing the characteristics of a larger population.

3.Random sampling Is a sampling method in which all members of a group (population or universe) have an equal and independent chance of being selected. While

Systematic sampling: Is a method of choosing a random sample from among a larger population

Assessment tools

Task to be performed in pair measure the sample stand of 100m^2

and calculate the mean volume and mean height.

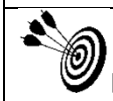
Learning Unit 4: Elaborate monitoring and evaluation tools of the forest management plan implementation

Picture/s reflecting the Learning unit 4

STRUCTURE OF LEARNING UNIT 4: Elaborate monitoring and evaluation tools of the forest management plan implementation

Learning outcomes:
4.1. Identify forest status baselines
4.2. Establish forest management plan log frame
4.3. Establish forest management contingency plan

Learning outcome 4.1. Identify forest status baselines

 **Duration:10 hrs**
 Learning outcome 4. Identify forest status baselines. By the end of the learning outcome, the trainees will be able to: 4.1 .Perform forest status baselines parameters determination. 4.2. Establishment of baselines format .
 **Resources**

Equipment	**Tools**	**Materials**
Internet Computers	Pen Format	- Papers Forest stand

Advance preparation:

Forest area

Tools and equipment for forest inventory

Planned activities

Indicative content 4.1.1. Forest status baselines parameters determination

Area: Area-determinations and mapping are just a few of the many aspects of forestry requiring spatial information.

Density: Tree density gives foresters an idea of how closely trees are growing in a given area

Tree species: In botany, a tree is a perennial plant with an elongated stem, or trunk, supporting branches and leaves in most species.

Forest establishment date: In Rwanda, planting should be done during the short rainy season (October-November) and long rainy season (March –April-May). There is no restriction about the planting time during

Cloudy days but the best time is before noon on sunny days.

Forest stand regime:

Soil characteristics: The scientific study of soil is called Pedology. Soils are a composition of mineral particles 45% , organic matter 5% , air 25% , and water 25% . Brown earths are fertile and very suitable for agriculture. Their suitability for agriculture are due to their characteristics of good **texture**, dark colour, and pH value.

Accessibility of the site:

Vegetation: Vegetation regions can be divided into five major types: forest, grassland, tundra, desert, and ice sheet. Climate, soil, the ability of soil to hold water, and the slope, or angle, of the land all determine what **types** of plants will grow in a particular region.


Theoretical learning Activity

Group discussion about Forest status baselines parameters determination.

Brainstorming about Forest status baselines parameters determination.

oral presentation about Forest status baselines parameters determination.


Practical learning Activity

Field visit in forest

Practical exercises about Forest status baselines parameters determination.


Points to Remember (Take home message)

Area: The Forest Products Measurements group is responsible for determining the methodology to correctly locate and determine the size of timber units. Sufficiently accurate areas are often required to calculate volume correctly or to determine area needs for forest management .(An area of forest for which an approved).

Density: D = N/ha

Tree species:in botany, a tree is a perennial plant with an elongated stem, or trunk, supporting branches and leaves in most species

Soil characteristics: The scientific study of soil is called Pedology.

Vegetation: Vegetation regions can be divided into five major types: forest, grassland, tundra, desert, and ice sheet. Vegetation regions can be divided into five major types: forest, grassland, tundra, desert, and ice sheet

Indicative content 4.1.2. Establishment of baselines format

Establishment of baselines format


Theoretical learning Activity (duration 10 min)

In group discussion of 6 students about establishment of baselines format

Brainstorming about establishment of baselines format

oral presentation about establishment of baselines format


Practical learning Activity

Field visit of area where there is baselines format establishment

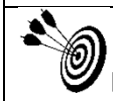
Practical exercises about establishment of baselines format


Points to Remember (Take home message)

Establishment of baselines format

Learning outcome 4.2: Establish forest management plan log frame

 **Duration:6hrs**

 Learning outcome : : Establish forest management plan log frame

By the end of the learning outcome, the trainees will be able to:

1.Perform setting of monitoring and evaluation indicators

2. Perform scheduling of monitoring and evaluation activities

3. Elaborate of reporting and follow up forms of monitoring and evaluation results

 **Resources**

Equipment	**Tools**	**Materials**
Internet Computers	Pen Format	- Papers Forest stand

 **Advance preparation:**

Forest stand

Tools and equipment for forest management plan log frame

Planned activities

Indicative content 4.2.1. Setting of monitoring and evaluation indicators

Planned forest activities: A forest management plan defines the planned forestry activities (e.g. inventory, yield calculation, harvesting, silviculture, protection and monitoring), specifying objectives, actions and control arrangements in a forest area.

Objectives: It aims at determining whether or not the intended project goals and objectives are being on the track. Forest management monitoring can also be defined as the ongoing process by which management gets regular feedback on the progress being made towards achieving the goals and objectives of the management plan

Assumptions: Assumption is "A factor in planning process that is considered to be true, real or certain often without any proof or demonstration". Another definition could be "The forest management Assumptions are events or circumstances that are expected to occur during the management life-cycle.

Financial means: Financial monitoring of the managements concerns comparing the actual costs to the planned costs in the management budget. Financial report reflects the actual activities carried out.


Theoretical learning Activity (duration 10 min)

In group discussion of 6 students about Setting of monitoring and evaluation indicators

Brainstorming about Setting of monitoring and evaluation indicators

oral presentation about Setting of monitoring and evaluation indicators


Practical learning Activity

Field visit about about Setting of monitoring and evaluation indicators.

Practical exercises about Setting of monitoring and evaluation indicators.


Points to Remember (Take home message)

Planned forest activities: A forest management plan defines the planned forestry activities

Objectives: It aims at determining whether or not the intended project goals and objectives are being on the track.

Assumptions: : Assumption is "A factor in planning process that is considered to be true, real or certain often without any proof or demonstration

Financial means: Financial monitoring of the managements concerns comparing the actual costs to the planned costs in the management budget.


Indicative content 4.2.2. Scheduling of monitoring and evaluation activities

Scheduling of monitoring and evaluation activities: Monitoring &Evaluation is a process of continual gathering of information and assessment of it in order to determine whether progress is being made towards pre-specified goals and objectives, and to highlight whether there are any unintended (positive or negative) effects from a forest management plan and its activities


Theoretical learning Activity (duration 10 min)

In group discussion of 6 students about scheduling of monitoring and evaluation activities

Brainstorming about scheduling of monitoring and evaluation activities

oral presentation about scheduling of monitoring and evaluation activities


Practical learning Activity

Field visit about about scheduling of monitoring and evaluation activities

Practical exercises about about scheduling of monitoring and evaluation activities


Points to Remember (Take home message)

Scheduling of monitoring and evaluation activities:

Monitoring: is the continuous collection of data on specified indicators to assess for a development intervention (project, programme or policy) its implementation in relation to activity schedules and expenditure of allocated funds, and its progress and achievements in relation to its objectives

Evaluation: is the periodic assessment of the design, implementation, outcomes and impact of a development intervention

Indicative content 4.2.3. Elaboration of reporting and follow up forms of monitoring and evaluation results

The purpose of a monitoring visit (sometimes called a supervision visit or a field visit) is to make sure that project activities are implemented the way they are described in the plan. It normally involves meeting with the people running the project, meeting with the participants, and observing the activities

 Theoretical learning Activity (duration 10 min)

In group discussion of 6 students about elaboration of reporting and follow up forms of monitoring and evaluation results

Brainstorming about elaboration of reporting and follow up forms of monitoring and evaluation results

oral presentation about elaboration of reporting and follow up forms of monitoring and evaluation results.

 Practical learning Activity

Field visit of area where there is elaboration of reporting and follow up forms of monitoring and evaluation results.

Practical exercises about elaboration of reporting and follow up forms of monitoring and evaluation results.

 Points to Remember (Take home message)

Evaluation report : An *evaluation report*, in the simplest sense, is a document which ***reports*** the results, findings, interpretations, conclusions, or recommendations derived through an *evaluation*. An *evaluation report* primarily gives an executive summary of the points covered by the *evaluation*

Learning outcome 4.3: : Establish forest management contingency plan

Duration:10hrs

Learning outcome 4 : Establish forest management contingency plan

By the end of the learning outcome, the trainees will be able to:

1.Identify risks and assumptions.

2. analyse risks and assumptions analysis

3. Elaborate of contingency format

Resources

Equipment	Tools	Materials
Internet Computers	Pen Format Existing forest management plan	- Papers

Advance preparation:

Existing forest management plan

Tools and equipment for forest management Establish forest management contingency plan

Indicative content 4.3.1. Risks and assumptions identification

The assumptions describe the situations, events, conditions or decisions which are necessary for the success of the project, but which are largely or completely beyond the control of the project's management. Natural risks Artificial risk


Theoretical learning Activity (duration 10 min)

In group discussion of 6 students about risks and assumptions identification

Brainstorming about risks and assumptions identification

oral presentation about risks and assumptions identification


Practical learning Activity

Practical exercises about risks and assumptions identification


Points to Remember (Take home message)

Natural risks Artificial risks

Indicative content 4.3.2. Risks and assumptions analysis

Objectives
Purpose
Results
Activities: As we begin the process of understanding the concepts of valuing and managing diversity, we must spend time exploring our own biases and stereotypes that we carry as individuals.


Theoretical learning Activity (duration 10 min)

In group discussion of 6 students about risks and assumptions analysis

Brainstorming about risks and assumptions analysis

oral presentation about risks and assumptions analysis


Practical learning Activity

Practical exercises about risks and assumptions analysis


Points to Remember (Take home message)

Objectives
Purpose
Results
Activities

Indicative content 4.3.2. Risks and assumptions analysis

Objectives
Purpose
Results
Activities: As we begin the process of understanding the concepts of valuing and managing diversity, we must spend time exploring our own biases and stereotypes that we carry as individuals.


Theoretical learning Activity (duration 10 min)

In group discussion of 6 students about risks and assumptions analysis

Brainstorming about risks and assumptions analysis

oral presentation about risks and assumptions analysis


Practical learning Activity

Practical exercises about risks and assumptions analysis


Points to Remember (Take home message)

Objectives
Purpose
Results
Activities

Indicative content 4.3.3. Elaboration of contingency format

Elaboration of contingency format


Theoretical learning Activity (duration 10 min)

In group discussion of 6 students about elaboration of contingency format

Brainstorming about elaboration of contingency format

oral presentation about elaboration of contingency format


Practical learning Activity

Practical exercises about elaboration of contingency format


Points to Remember (Take home message)

Elaboration of contingency format

Written assessment

Questions

1.A baseline format can help the execution of work processes become properly guided. Outline the three **(3)** parameters of forest status baselines.

2.In order to evaluate the forest management plan, Identify the indicators of monitoring and evaluation in forest management plan.

3.List different types of risk in forest management plan.

4.The assumptions describe the situations, events, conditions or decisions which are necessary for the success of the project. Distinguish assumptions analysis from Assumptions Activity.

5.A forest management plan is a guide and a tool to help you make decisions. Explain different forest status baselines parameters that should be used to determine your forest productivity.

Answers of assessment

1.A baseline format can help the execution of work processes become properly guided. Outline the three **(3)** parameters of forest status baselines. / **3marks**

Answer: Those parameters are:

Area -Density -Tree species- Forest establishment

Date -Forest stand regime- Soil characteristics- Accessibility of the site-Vegetation

2.In order to evaluate the forest management plan, Identify the indicators of monitoring and evaluation in forest management plan./**4marks**

Answers: Those indicators are:

Planned forest activities /**1mark**

Objectives /**1mark**

Assumptions/**1mark**

Financial means/**1mark**

3.List different types of risk in forest management plan./**2marks**

Answers:

Natural risks

Artificial risks

4.The assumptions describe the situations, events, conditions or decisions which are necessary for the success of the project. Distinguish assumptions analysis from Assumptions Activity./**10marks**

Answer:

Assumptions analysis refers to a specific technique that is used by project team members to minimize risks involved in making assumptions during the process of planning a particular project.

Assumptions Activity : As we begin the process of understanding the concepts of valuing and managing diversity, we must spend time exploring our own biases and stereotypes that we carry as individuals

5.A forest management plan is a guide and a tool to help you make decisions. Explain different forest status baselines parameters that should be used to determine your forest productivity.

Answer:

The forest status baselines parameters:

Area: Area-determinations and mapping are just a few of the many aspects of forestry requiring spatial information.

Density. Tree density gives foresters an idea of how closely trees are growing in a given area.

D = N/ha

Tree species: In botany, a tree is a perennial plant with an elongated stem, or trunk, supporting branches and leaves in most species.

Rwanda constitutes the eastern limit for plants from the Guineo-Congolian region

Practical assessment

Elaborate the contingency format

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