



Republic of Rwanda
Ministry of Education



RTB | RWANDA
TVET BOARD

FORTB502

Timber by-products management

Manage timber by-products

Competence

RQF Level: 5

Learning Hours: 70



Credits: 7

Sector: Agriculture and Food Processing

Trade: Forestry

Module Type: Specific

Curriculum: AGRFOR 5002 TVET Certificate V in Forestry

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Purpose statement	This module is reserved for level five (L5) Forestry learners; it describes the skills, knowledge and attitudes required to manage forest by-products. Up on completion of this module, the learners will be able to Collect and process timber by-products and market timber products. Qualified learner deemed competent may work in various places including wood industry.				
Learning assumed to be in place	Apply knowledge of wood properties and wood preservatives				
Delivery modality	Training delivery	100%	Assessment	Total 100%	
	Theoretical content	30%	Formative assessment	30%	
	Practical work:	70%		70%	50% Group project and presentation Individual project /Work
	<ul style="list-style-type: none"> Group project and presentation 30% Individual project /Work 40% 				
	Summative Assessment			50%	

Elements of Competency and Performance Criteria

Elements of competence	Performance criteria
1. Collect timber by-products	1.1. Timber by-products are well classified according to their origin, size and end use.
	1.2. Inventory of timber by-products is well conducted according to their types
	1.3. Stacking and packaging of timber by products are properly conducted according to their types and market requirements.
2. Process timber by-products	1.4. Timber by products are well dried according to the product specification
	1.5. Timber by products are properly re-sawn referring to the product specifications
	1.6. Charcoal are properly made respecting wood charcoal making technology.
	1.7. Briquettes /Charcoal briquettes are properly made respecting briquettes making technology.
3. Market timber Products	3.1. Timber products are well graded according to market requirements and product specifications.

3.2. Timber products are properly packaged based on storage conditions

3.3. Price of timber products is effectively estimated according to market requirements and products specification.

Knowledge	Skills	Attitude
<ul style="list-style-type: none"> ✓ Description of timber by products concepts ✓ Description of Environmental safeguard procedures, rules and regulations ✓ Description of tree species ✓ Describe by-products preservation methods ✓ Description of forest policy, laws and regulations ✓ Description of waste management principles 	<ul style="list-style-type: none"> ✓ Market Negotiation skills ✓ Forest product valuation ✓ Price estimation ✓ Communication skills ✓ Management of timber by-product storage 	<ul style="list-style-type: none"> ✓ Having a team working spirit with others ✓ Being a Hard worker for assigned tasks ✓ Being flexible to work with others ✓ Being a Time manager for an assigned task ✓ Being responsible for the task assigned ✓ Being Courageous while performing a given task ✓ Having good communication at work

Learning outcomes	At the end of the module the learner will be able to: 1. Collect timber by-products 2.Process timber by-products 3. Market timber products
Learning outcome 1: Collect timber by-products	Learning hours: 15

Indicative content

- Description of key concepts
 - ✓ Definition of technical terms
 - ✚ Wood carbonization
 - ✚ Timber by-products
 - ✚ Calorific value
 - ✚ Kiln
 - ✓ Uses of wood by-products
 - ✓ Types of timber by-products
 - ✚ Slabs
 - ✚ Branches
 - ✚ Sawdust
 - ✚ Stump
 - ✚ Bark
 - ✚ Briquettes
 - ✚ Pellets
 - ✚ Charcoal
- Classification criteria of timber by-products
 - ✓ Origin
 - ✓ Size
 - ✓ Nature
 - ✓ End use.
 - ✓ Tree species
 - ✓ Quantity
- Description of timber by-products quantification methods
 - ✓ Types of inventory
 - ✚ Counting
 - ✚ Weighing
 - ✚ Measuring
 - ✚ Estimation
- Quantification of timber by-products
- Stacking of timber by-products
 - ✓ Individual stacking
 - ✓ Piling
 - ✓ Heaping
- Packaging of timber by-products end products

Resources required for the learning outcome

Equipment	Chimney, chainsaws, chopping machine, drying kilns, balance, moisture meter, PPE, First aid kit
Materials	Fuel, Oil Bags/ Sacks,
Tools	Buckets, Baskets, Spades, Hand hoe, Rakes
Facilitation techniques	<ul style="list-style-type: none"> ● Group discussion, trainer guided, brainstorming, demonstration for practical exercises ● Trainer presents the technical terms frequently used in timber by-products production. ● Trainees ask clarification questions if any. ● Trainer forms small and manageable groups of students. ● Trainer asks the respective groups to discuss on the types and uses of timber by-products. ● Trainer facilitates group discussion ● Trainer asks the groups to classify timber by-products based on: <ul style="list-style-type: none"> ✓ Origin ✓ Size ✓ Nature ✓ End use. ✓ Tree species ✓ Quantity ● Trainer facilitates group discussion. ● Trainer asks trainees to quantify different types of timber by-products ● Trainer facilitates group work ● Trainer asks trainees to stack different types of timber products ● Trainer facilitates group work ● Trainer asks trainees to package different types of timber products ● Trainer facilitates group work
Formative assessment methods	<ul style="list-style-type: none"> ● Written assessment ● Oral presentation ● Performance assessment

Indicative content

- Drying of timber by- products
 - ✓ Drying methods
 - ✓ Determination of moisture content / drying rates
- Re-sizing of raw products
 - ✓ Re-sawing of slabs
 - ✓ Chopping of branches
 - ✓ Splitting of offcuts and stumps
- Charcoal making
 - ✓ Preparation of site
 - ✓ Kilns loading
 - ✓ Ignition of kiln and monitoring
 - ✓ Cooling kiln
 - ✓ Charcoal harvesting
 - ✓ Grading and Packaging of charcoal
- Briquettes making
 - ✓ Re-sizing (chopping, grinding, Sieving and shredding)
 - ✓ Mixing ratio
 - ✓ Preparation: (binder addition and mixing)
 - ✓ Densification (pressing and compacting)
 - ✓ Shaping and sizing size/ forming
 - ✓ Drying
 - ✓ Grading and packaging

Resources required for the indicative content**Equipment**

Saws (Chainsaw, Bow saw, two man saw), Compressing machine, Drying machine, Chopping machine, Drying kiln, PPE

Materials

Fuel, oil, match box, soil, water, soap

Tools

Machete, Knives, Rake

Facilitation techniques

- Group discussion, trainer guided, brainstorming, demonstration for practical exercises, pictures and video presentation
- Trainer presents the technical terms frequently used in timber by-products processing.
- Trainees ask clarification questions if any.
- Trainer forms small and manageable groups of students.
- Trainer asks the respective groups to discuss on the drying of timber by-products.
- Trainer facilitates group discussion
- Trainer asks the groups to perform resizing of different timber by-products
- Trainer facilitates group work.

	<ul style="list-style-type: none"> • Trainer asks trainees to perform charcoal making • Trainer facilitates group work • Trainer asks trainees to perform briquettes making • Trainer facilitates group work • Trainer asks trainees to perform pellets making • Trainer facilitates group work
Formative assessment methods	<ul style="list-style-type: none"> • Written assessment • Oral presentation • Performance assessment • Product based assessment

Learning outcome 3: Market timber products	Learning hours: 20
Indicative content	
<ul style="list-style-type: none"> • Grading of timber products <ul style="list-style-type: none"> ✓ Briquettes grades ✓ Charcoal grades ✓ Timber products grading criteria <ul style="list-style-type: none"> ✚ Moisture content ✚ Calorific value/ species ✚ Market requirements ✚ Market specification • Packaging of timber products <ul style="list-style-type: none"> ✓ Timber products packaging techniques <ul style="list-style-type: none"> ✚ Carton box ✚ Sacks ✓ Timber products storage conditions <ul style="list-style-type: none"> ✚ Dry and well ventilated place • Estimation of timber products prices <ul style="list-style-type: none"> ✓ Market requirements /specification ✓ Price setting factors <ul style="list-style-type: none"> ✚ Species ✚ Season ✚ Competitors pricing ✚ Production cost ✚ Profit margin ✚ Revenue ✓ Timber by-product specification 	
Resources required for the indicative content	
Equipment	Balance,

Materials	Ropes, Sacks, scotch tape, carton box
Tools	Buckets, Baskets,
Facilitation techniques	<ul style="list-style-type: none"> ● Group discussion, trainer guided, brainstorming, demonstration for practical exercises, pictures and video presentation ● Trainer asks the students to perform grading of timber products ● Trainer facilitates group work ● Trainer asks the students to perform packaging of timber products ● Trainer facilitates group work ● Trainer asks the students to perform survey on timber products prices ● Trainer facilitates group work
Formative assessment methods	<ul style="list-style-type: none"> ● Written assessment ● Oral presentation ● Performance assessment ● Product based assessment
Formative assessment methods /(CAT)	<ul style="list-style-type: none"> ● Written assessment ● Oral presentation ● Performance assessment ● Product based assessment

Integrated assessment

Integrated situation

REFOREST Company Ltd. harvests timber in Nyungwe National Park (NNP) buffer zone regularly. The Company harvests old plantations of *Pinus* and *Eucalyptus* species in the eastern periphery of the park. During harvesting and the conversion of tree into sawn timber, the company attains a recovery rate of 40 and 52% for old trees of *Eucalyptus* and *Pinus* spp. respectively, leaving about 48-60% of wood biomass unused. The Company intends to put this massive volume of unused biomass into use to increase resource use efficiency and to generate additional income from sales of timber by-products. As a forest technician, you are hired by the company to manage wood remains (timber by-products) in the harvested part of the forest. To do this, you are requested to:

- 1: Collect timber by-products on a 0.2 ha area
- 2: Produce charcoal from one stack (1m³)
- 3: Produce and package 3.0 kg of briquettes.

All required resources are available in the company store.

This task should be done in 7 days.

Note: this integrated assessment should be done as a project based

Resources

Tools	Bags/ Sacks, Buckets, Baskets, Rake
Equipment	Balance, saws, moisture meter, compressing machine, Drying machine, chopping machine, drying kiln, PPE
Materials	Bags, sacks, ropes, scotch tape, carton box

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: Collect timber by-products (30%)	1.1. Timber by-products are well classified according to their origin, size and end use.	Ind1: The origin of timber by-products is identified			2
		Ind2: The sizes of timber by-products are measured			1
		Ind3: End uses of timber by-products are identified			1
	1.2. Inventory of timber by-products is well conducted according to their types	Ind1: The volume of timber by-products is measured			2
		Ind2: The weight of timber by-products is weighed			2
		Ind3: The quantity of timber by-products is estimated			1
	1.3. Stacking and packaging of timber by-products are properly conducted according to their types and market requirements.	Ind1: Stacking and packaging of by-products are done			2
		Ind2: Stacking and packaging of by-products are done			2
	Learning outcome 2: Process timber by-products (50%)	2.1. Timber by-products are well dried according to the product specification	Ind1: Drying methods of by-products are applied		
Ind2: Drying rates of by-products are respected					2
2.2. Timber by-products are properly prepared referring to the product specifications		Ind1: Slabs are re-sawn			3
		Ind2: Branches are chopped			3
		Ind3: Charcoal are graded			3
2.3. Charcoal are properly made respecting wood		Ind1: Tools, materials and equipment are identified			1

	charcoal making technology.	Ind2: Wood carbonization methods are described			1
		Ind3: Carbonization site is prepared			1
		Ind4: Types of kilns are identified			1
		Ind5: Kiln is constructed			1
		Ind6: Wood carbonization is done			1
		Ind7: Collection and packaging of charcoal are done			1
		2.4. Briquettes /Charcoal briquettes are properly made respecting briquettes making technology.	Ind1: Types of briquettes are identified		
Ind2: Process of briquettes making is followed				1	
Ind3: Briquettes are produced				3	
learning outcome 3. Market timber products (20%)	3.1. Timber products are well graded according to market requirements and product specification	Ind1: Timber products are identified			3
		Ind2: Timber products are graded			3
	3.2. Timber products are properly packaged based on storage guidelines	Ind1: Timber products packaging methods are identified			2
		Ind2: Timber products are packaged			2
		Ind3: Timber products are stored			2
	3.3. Price of timber products is effectively estimated according to market requirements and products specification.	Ind1: Timber products marked prices are surveyed			3
		Ind2: Prices of timber products are set			3
	Total marks				100
	Percentage Weightage				100%
Minimum Passing line % (Aggregate): 70%					

References:

1. M. Temmerman (2019). Briquettes production manual. Basic and advanced technology. UN Environment programme and UN Industrial Development Organization (UNIDO), cited from: https://www.ctc-n.org/system/files/dossier/3b/briquette_production_manual_2.PDF, ON 8 May 2024.
2. Ahenkan A, Boon E (2010). Commercialization of non-timber forest products in Ghana: Processing, packaging and marketing. Food Agric and Env. 8: 962-969.
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5. F.A.O. (1983). Simple Technologies for Charcoal making Forestry Paper 41, FAO. Rome, Italy.