Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

Tree sawing

FORTS502

Convert tree into Sawn timber.

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

Issue Date: May, 2024

<table>
<tr><td>Purpose statement</td><td colspan="5">This module is reserved for level five (L5) forestry. The module describes skills, knowledge and attitude required to convert tree into sawn timber. It is designed for learner who have successfully completed level IV in Forestry and pursuing level V in Forestry. At the end of this module, learner will be able to Assess the forest stand, perform tree logging, and perform log sawing. Qualified learner deemed competent may work in various places including open field, and a range of tasks related to sawmilling. She/he can work alone or with others under minimum supervision.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="5">Apply knowledge of wood properties and wood preservation, Apply basics of GIS and ArcGIS in forestry.</td></tr>
<tr><td rowspan="5">Delivery modality</td><td colspan="2">Training delivery</td><td>100%</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="3">Formative assessment</td><td>30%</td><td rowspan="3">50%
Group project and presentation. Individual project /Work</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>• Group project and presentation</td><td>30%</td></tr>
<tr><td>• Individual project /Work</td><td>40%</td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
</table>

Elements of Competency and Performance Criteria

Elements of competence	Performance criteria
1. **Assess the forest stand.**	1.1. Resources are properly organized according to types of tasks.
	1.2.Data are properly collected according to data collection methods and techniques.
	1.3. Data are well analysed according to data analysis tools(software)
2. Perform tree logging.	2.1. Trees are properly selected according to tree species, shape, size, and end uses.
	2.2. Trees are safely cut according to tree felling techniques.
	2.3. Trees are correctly bucked according to sawn timber specifications
3. **Perform log sawing.**	3.1. Sawmill machines are properly operated according to types of saw patterns, log sizes and recovery rate.
	3.2. Sawn timbers are properly graded according to their quality and defects.

	3.3.	Sawn Timbers are properly dried according to the drying methods and end use.
	3.4.	Sawn timbers are properly stored accordingly to end uses, size, species, and moisture content.

Knowledge, Skills, and Attitude

Knowledge	Skills	Attitude
✓ Description of wood properties ✓ Description of environment safeguard procedures, rules, and regulations ✓ Description of Data collection and analysis techniques ✓ Identification of tree species ✓ Description of Tree felling techniques ✓ Description of wood preservatives ✓ Description of Wood preservation techniques ✓ Description of Forest policy, laws, and regulations ✓ Description of waste management principles. ✓ Description of Forest harvesting methods and techniques	✓ Operating mechanical forest harvesting equipment ✓ Operating automated forest harvesting equipment ✓ Operating forest harvesting hand tools ✓ Timber Storage management skills. ✓ Manipulation of computer skills ✓ Communication skills ✓ Tree measurements skills ✓ Tree felling skills ✓ Price estimation skills ✓ Forest data analysis skills	✓ Having Team working spirit in sawn timber production. ✓ Being Time manager for task completion. ✓ Being responsible on the tasks. ✓ Output oriented or results oriented. ✓ Having a good communication on works. ✓ Being worthy trusted on works.

✓ Description of wood defects.		

Learning outcomes	At the end of the module the learner will be able to: 1. Assess Forest stand. 2. Perform tree logging. 3. Perform log sawing.
Learning outcome 1: Assess the forest stand.	**Learning hours: 20**

Indicative content

- Introduction to sawn timber production
  - ✓ Description of key concept
    - Tree
    - Timber
    - Logs
    - Forest stand
    - Sawn timber
  - ✓ Importance of sawn timber
- Mobilization of resources in production of sawn timber
  - ✓ Tools materials and equipment
    - Stationary /heavy duty machine
    - Half stationary/mobile machine
    - Sawmilling tools
    - Sawmilling materials
  - ✓ Human resources
  - ✓ Financial resources
- Description of forest stand components
  - ✓ Identification of forest stand
  - ✓ Tree species composition
  - ✓ Tree density and distribution
  - ✓ Tree diameter
    - Mean diameter
    - Diameter distribution
  - ✓ Tree height
    - Mean height
    - Bole height
    - Total height

- Merchantable height
- Crown height
- Dominant height

✓ Age class distribution
✓ Soil characteristics

- Description of forest stand assessment methodologies.
  - ✓ Types of forest data
  - ✓ Forest data collection methodologies
  - ✓ Selection factors of forest stand assessment methodologies
- Conducting forest stand assessment
  - ✓ Forest data collection
    - Qualitative
    - Quantitative
  - ✓ Forest data analysis and interpretation.
    - Data recording template
    - Microsoft office excel.
    - ArcGIS
  - ✓ Reporting forest data

Resources required for the learning outcome	
• Equipment	• Computer, GPS, PPE, First aid kit, Audio visual equipment, camera, Projector
• Materials	• Ropes, pegs, Paints, Markers, handbook, pens, pencils, papers, internet, Data analysis software, forest map.
• Tools	• Binoculars, tape measure, haga altimeter, haga hyposometer, sunto clinometer, Relascope, axe, machete,
• Facilitation techniques	• Discussion, brainstorming, demonstration, simulation, pictures/video presentation field visit • Trainer presents picture and videos of forest stand to trainees • Trainer presents the concept of sawn timber conversion. • Trainer form groups for discussing about stand characteristics. • Trainer organizes field visit for selecting sawn timber tree, resources, and hazards identification. • Trainees present their field report in a group. • Trainer closes the session with expert view about stand characteristics.
Formative assessment methods	• Written assessment • Oral presentation

	• Performance assessment

Learning outcome 2: Perform tree Logging	Learning hours: 20

Indicative content

- Selection of tree for sawn timber
  - ✓ Selection criteria
    - Tree species
    - Natural defects
    - Healthy
    - Size
    - Log Form
    - End use.
- Application of tree felling techniques
  - ✓ Manual tree felling
    - Creation of directional cuts
    - Tree felling cuts
  - ✓ Mechanical/motorized tree felling

- Application of bucking techniques
  - ✓ Debranching
  - ✓ Marking
    - Size
    - Diameter
    - Length
  - ✓ Crosscutting
  - ✓ Grading logs

Resources required for the indicative content

Equipment	Audio visual equipment, circular saw, frame saw, chain saw, Band saw, combinational saw, sawing table, hummer, sharpening machine, PPE, debarkers, first aid kits, electronic balance, projector and project screen, log carriage, log loader, logger, winch,
Materials	marking pencils, rope, Folding ruler, nails, wet stone, grinding stone, sheeting, flipchart
Tools	Saw handed by two people, wedges, machete, metal file, Pictures, hammers, flipchart stand, tape measure,
Facilitation techniques	• Brainstorming, simulation, demonstration, pictures/video presentation field visit. • Trainer present about tree felling techniques/ may use video or oral.

	• Trainer explains briefly about tree felling techniques and bucking techniques. • Trainer organises practices about timber tree felling and bucking. • Trainer assists trainee in activities and provide necessary support. • Trainer can perform tree felling by demonstration and trainees in groups also imitate the techniques as shown by trainer.
Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment

Learning outcome 3: Perform log sawing	**Learning hours: 30**
Indicative content	

- **Determination of conversion efficiency**
  - ✓ Factors affecting recovery rate.
    - Volume of log
    - Volume of sawn timber
  - ✓ Calculation of recovery rate
- **Description of log sawing pattern/methods.**
  - ✓ Through and through sawing
  - ✓ Tangential (cant) sawing
  - ✓ Taper (live) sawing
  - ✓ Quarter sawing.
  - ✓ Grade sawing.
- **Operating sawmilling tools and equipment.**
  - ✓ Adjustment
  - ✓ Switching on
  - ✓ Log feeding.
  - ✓ Monitoring
  - ✓ Switching off
- **Checking of sawn timber quality**

✓ Sawn timber defects.

✓ Sawn timber sizes

✓ Sawn timber smoothness/roughness

✓ Sawn timber structure

✓ Sawn timber texture

- **Description of timber drying methods**

✓ Natural drying

✓ Artificial drying

- Vacuum
- Smoking

✓ Selection criteria of timber drying Method

- Grading of sawn timber
  - Grading criteria
  - Sawn timber grades
- **Storage of sawn timber.**

✓ Storage conditions

✓ Sawn timber stacking arrangement

- Vertical
- Horizontal

✓ Labelling/tagging

✓ Recording of sawn timber stock

- Template/store cards.
- Stock register.
- Software

Resources required for the indicative content	
Equipment	Audio visual equipment, circular saw, frame saw, chain saw, Band saw, combinational saw, sawing table, rope, hummer, sharpening machine, PPE, debarkers, first aid kits, electronic balance, projector and projector screen,
Materials	marking pencils, Folding ruler, nails, wet stone, grinding stone, sheeting, flipchart, paints.
Tools	Saw handed by two people, wedges, machete, metal file, Pictures, hammers, moisture meter, flipchart stand, tape measure.
Facilitation techniques	• Brainstorming, simulation, demonstration, pictures/video presentation field visit • Trainer with trainees categorize sawing tools, equipment, and operate them. • Trainer explains types of tools and equipment required in sawn timber conversion. • Trainer explains and presents and presents log sawing patterns either oral or video. • Trainer organizes field practices and operate different tools, and equipment and trainees imitate the trainer.

Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment

Integrated assessment

Integrated situation

GAKIRE SAWMILL Ltd. is a company located in MUHANGA District, with sustainable mandate to supply quality sawn timber in East African region. The company has 200 ha of mature forest from which 100ha are converted into sawn timber in phase I. Currently, clients are complaining for poor quality of timber due to splitting, cupping, under sized sawn timber and uneven drying. For the company to overcome this, you are hired as a skilled forest technician in charge of producing quality sawn timber. To do this you are requested to:

1. Select one (1) mature tree in the forest stand
2. Perform logging for selected tree.
3. Produce five (5) planks of 15x5x4000mm each.

All tools, materials and equipment are available in sawing site.

The task should be accomplished within five (5) hours.

Resources

Tools	Saw handed by two people, wedges, machete, metal file, moisture meter, hummer, tape measure.
Equipment	Circular saw, frame saw, chain saw, Band saw, combinational saw, sawing table, rope, sharpening machine, PPE, Debarkers, first aid kits, electronic balance
Materials	marking pencils, Folding ruler, nails, wet stone, grinding stone, sheeting, markers, paints, trees.

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1:	**1.1. Resources are properly**	**Ind1:** Tools materials and equipment mobilized			2

Assess the forest stand. (20%)	**organized according to types of tasks.**	**Ind2:** Human resources are mobilized			2
		Ind3: Financial resources are mobilized			2
	1.2. Data are properly collected according to data collection methods and techniques.	**Ind1:** Qualitative data are collected			4
		Ind2: Quantitative data are collected			4
	1.3 Data are well analyzed according to data analysis tools(software)	**Ind1:** Recording template is filled			2
		Ind2: Microsoft office excel is used.			2
		Ind3: ArcGIS is used			2
Learning outcome 2: Perform tree logging. (30%)	**1.4. Trees are properly selected according to tree species, shape, size, and end uses.** **2.2. Trees are safely cut according to tree felling techniques.**	**Ind1:** Selection criteria are considered			2
		Ind2: Tree condition is checked			2
		Ind3: Tree dimensions are taken			3
		Ind1: Danger zone is determined			2
		Ind2: Escape route is created			3
		Ind3: Directional cuts are created			**3**
		Ind4: Felling cuts are created			**3**
	2.3. Trees are correctly bucked according to sawn timber specifications	**Ind1:** Debranching is done			**3**
		Ind2: Marking is done			**3**
		Ind3: Grading logs is done			**3**
		Ind4: Marking is done			**3**
Learning outcome 3. Perform log sawing. (50%)	**3.1. Sawmill machines are properly operated according to types of saw patterns, log sizes and recovery rate.**	**Ind1:** Adjustment is done			3
		Ind2: Switching on is done			2
		Ind3: Log feeding. is done			3
		Ind4: Monitoring is done			3
		Ind5: Switching off is done			2

	3.2. Sawn timbers are properly graded according to their quality and defects.	**Ind1:** Sawn timber defects are checked			5
		Ind2: Sawn timber sizes are measured			5
		Ind3: Sawn timber Smoothness /roughness is checked			2
		Ind4: Sawn timber structure is checked			2
		Ind5: Sawn timber texture is checked			2
	3.3. Sawn Timbers are properly dried according to the drying methods and end use.	**Ind1:** Natural drying is applied			5
		Ind2: artificial drying is applied			5
	3.4. Sawn timbers are properly stored accordingly to end uses, size, species, and moisture content.	**Ind1:** Storage conditions are respected			**2**
		Ind2: Sawn timber stacking arrangement			**5**
		Ind3: Labelling/tagging is done			**2**
		Ind4: Recording of sawn timber stock is done			**2**
Total marks					**100**
Percentage Weightage					**100%**
Minimum Passing line % (Aggregate): 70%					

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