



Republic of Rwanda  
Ministry of Education



**RTB** | RWANDA  
TVET BOARD

## FOREST INVENTORY

**FORFI402**

**Apply fundamental forest inventory**

### Competence

**RQF Level:** 4

**Learning Hours**



**Credits:** 8

**Sector:** Agriculture and Food processing

**Trade:** Forestry

**Module Type:** Specific

**Curriculum:** AFPFOR4002 - TVET Certificate 4 in Forestry

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|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |  |                      |                      |     |                   |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--|----------------------|----------------------|-----|-------------------|
| <b>Purpose statement</b> | This module describes the skills, knowledge and attitude required to conduct forest inventory. It is designed for learner who have successfully completed level III in Forestry and pursuing level IV in Forestry. At the end of this module, learner will be able to Identify preliminary works of forest inventory, carry out tree measurement and stand parameters and Report Forest inventory. Qualified learner deemed competent may work in various places including open field and a range of tasks related to tree measurement. She/he can work alone with others under minimum supervision |     |  |                      |                      |     |                   |
| <b>Delivery modality</b> | <b>Training delivery</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |  | <b>100%</b>          | <b>Assessment</b>    |     | <b>Total 100%</b> |
|                          | Theoretical content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |  | 30%                  | Formative assessment | 30% | 50%               |
|                          | Practical work:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |  | 70%                  |                      | 70% |                   |
|                          | • Group project and presentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20% |  |                      |                      |     |                   |
|                          | • Individual project /Work                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 50% |  |                      |                      |     |                   |
|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |  | Summative Assessment |                      |     | 50%               |

## Elements of Competency and Performance Criteria

| Elements of competency                                      | Performance criteria                                                                                        |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>1. Identify preliminary works of forest inventory</b>    | 1.1. Forest species are described according to the forest inventory objectives                              |
|                                                             | 1.2. Forest area is correctly determined in accordance with the spatial data                                |
|                                                             | 1.3. Sample plots are efficiently determined according to the sampling methods                              |
|                                                             | 1.4. Tools and equipment are appropriately selected according to the forest status and inventory objectives |
| <b>2. Carry out tree measurements and stand parameters.</b> | 2.1. Tree heights are accurately measured according to the tree size                                        |
|                                                             | 2.2. Tree diameters are accurately measured according to the tree size                                      |
|                                                             | 2.3. Tree volume is accurately determined according to the size of trees                                    |
|                                                             | 2.4. Slope is accurately measured according to the landscape                                                |
|                                                             | 2.5. Soil types are properly identified according to the soil characteristic of the sample plots            |
|                                                             | 2.6. Vegetation cover is properly determined according to the landscape                                     |

|                                   |                                                                                                                            |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------|
|                                   | 2.7. Age of the forest tree species is properly determined according to the information provided by the forest owner       |
|                                   | 2.8. Impacts of forest to the surrounding environment are properly identified according to the forest inventory objectives |
| <b>3. Report forest inventory</b> | 3.1. Key report elements are properly identified according to the report contents                                          |
|                                   | 3.2. Reporting template or format is properly elaborated according to the inventory objectives                             |
|                                   | 3.3. Key elements are properly compiled in accordance with forest inventory objectives                                     |
|                                   | 3.4. Compiled document is accurately submitted according to the client requirements                                        |

### Knowledge, Skills, and Attitude

| Knowledge                                                                                                                                                                                                       | Skills                                                                                                                                                                                                                                                                                                                                                            | Attitude                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>✓ Identify forest inventory site</li> <li>✓ Identify forest type</li> <li>✓ Identification of report elements</li> <li>✓ Identify forest inventory parameters</li> </ul> | <ul style="list-style-type: none"> <li>✓ Determine forest inventory area</li> <li>✓ Determine sample plots used in forest inventory</li> <li>✓ Select tools and equipment used in forest inventory</li> <li>✓ Carry out tree measurements and stand parameters</li> <li>✓ Elaborate forest inventory report</li> <li>✓ Compile forest inventory report</li> </ul> | <ul style="list-style-type: none"> <li>✓ Respect safety, health and environment on the workplace</li> <li>✓ Respect forest inventory</li> <li>✓ Work in team</li> <li>✓ Work under minimum supervision</li> <li>✓ Manage the time</li> </ul> |

## Course content

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Learning outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>At the end of the module the learner will be able to:</b> <ol style="list-style-type: none"> <li>1. Identify preliminary works of forest inventory.</li> <li>2. Carry out tree measurements and stand parameters.</li> <li>3. Report forest inventory</li> </ol> |
| <b>Learning outcome 1: Identify preliminary works of forest inventory.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Learning hours: 25</b>                                                                                                                                                                                                                                           |
| <b>Indicative content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>• Site description <ul style="list-style-type: none"> <li>✓ Accessibility</li> <li>✓ Topography</li> <li>✓ Geographical coordinates</li> </ul> </li> <li>• Description of forest <ul style="list-style-type: none"> <li>✓ Composition</li> <li>✓ Density</li> <li>✓ Age</li> <li>✓ Arrangement</li> <li>✓ Ownership</li> </ul> </li> <li>• Determination of forest area</li> <li>• Determination of sample plots <ul style="list-style-type: none"> <li>✓ Sampling methods</li> <li>✓ Key sampling elements <ul style="list-style-type: none"> <li>✚ Sample form</li> <li>✚ Sampling rate</li> <li>✚ Sample size</li> <li>✚ Sampling interval</li> </ul> </li> </ul> </li> <li>• Selection of tools and equipment used in forest inventory</li> </ul> |                                                                                                                                                                                                                                                                     |
| <b>Resources required for the learning outcome</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                     |
| Equipment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Chain saw, GPS, dumpy level, theodolites, total station, Relascope, Laptops, PPE, Projector                                                                                                                                                                         |
| Materials                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Paints, Pegs, Warning tapes, marker                                                                                                                                                                                                                                 |
| Tools                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Axes, Saws, Machete, Tree marker, Clinometer, Compass, Tape measure, Forest map, Ranging rod, calculator, hoes, ropes,                                                                                                                                              |
| Facilitation techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Demonstration and simulation, Individual and group work, Practical exercise, Individualized, trainer guided and Group discussion, viewing films and videos, pictures                                                                                                |

|                              |                                                                   |
|------------------------------|-------------------------------------------------------------------|
| Formative assessment methods | Written assessment, Oral presentation, and Performance assessment |
|------------------------------|-------------------------------------------------------------------|

| Learning outcome 2: Carry out tree measurements and stand parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Learning hours: 45                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Indicative content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• Measurement of tree heights</li> <li>• Measurement of tree diameter/circumference</li> <li>• Determination of tree volume <ul style="list-style-type: none"> <li>✓ Volume calculation <ul style="list-style-type: none"> <li>+ Newton formula</li> <li>+ Huber formula</li> <li>+ Smalian formula</li> </ul> </li> </ul> </li> <li>• Determination of basal area</li> <li>• Determination of bark thickness <ul style="list-style-type: none"> <li>✓ Diameter under bark</li> <li>✓ Diameter over bark</li> </ul> </li> <li>• Determination of forest rotation period <ul style="list-style-type: none"> <li>✓ Mean annual increment</li> <li>✓ Current annual increment</li> </ul> </li> <li>• Determination of total volume of stand <ul style="list-style-type: none"> <li>✓ Mean diameter</li> <li>✓ Mean height</li> <li>✓ Average basal area of stand</li> </ul> </li> <li>• Conversion of forest volume <ul style="list-style-type: none"> <li>✓ Cubic meter to stere</li> <li>✓ Stere to cubic meter</li> </ul> </li> </ul> |                                                                                                                                                                                                                  |
| Resources required for the indicative content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                  |
| Equipment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Chain saw, GPS, Bitterlich Relascope, Laptops, PPE, Projector                                                                                                                                                    |
| Materials                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Paints, pegs, Warning tapes, logs, field book, pencil,                                                                                                                                                           |
| Tools                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Axes, Saws, Machete, Tree marker, Clinometer, Compass, Caliper, Diameter tape, Tape measure/steel tape, Haga altimeter, Hammer, Forest Map, Ranging rod , Bark gauge, Increment borer, calculator, diameter tape |
| Facilitation techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Demonstration and simulation, Individual and group work, Practical exercise, Individualized, trainer guided and Group discussion, viewing tutorials and pictures                                                 |
| Formative assessment methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Written assessment, Oral presentation, and Performance assessment                                                                                                                                                |

|                                                                                                                                                                                                                        |                                                                                                                                                                        |                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Learning outcome 3: Report forest inventory</b>                                                                                                                                                                     |                                                                                                                                                                        | <b>Learning hours: 10</b> |
| <b>Indicative content</b>                                                                                                                                                                                              |                                                                                                                                                                        |                           |
| <ul style="list-style-type: none"> <li>• Identification of report elements</li> <li>• Elaboration of reporting template or format</li> <li>• Compilation of report</li> <li>• Submission of compiled report</li> </ul> |                                                                                                                                                                        |                           |
| <b>Resources required for the learning outcome</b>                                                                                                                                                                     |                                                                                                                                                                        |                           |
| Equipment                                                                                                                                                                                                              | Printers, Scanners, Laptops, Projector, Internet                                                                                                                       |                           |
| Materials                                                                                                                                                                                                              | Report format sheet, Papers, Pencils, Flip chart, Markers, Notebook                                                                                                    |                           |
| Tools                                                                                                                                                                                                                  | Pens, Ruler, Chalk board                                                                                                                                               |                           |
| Facilitation techniques                                                                                                                                                                                                | Demonstration by viewing films and videos pictures and simulation, Individual and group work, Practical exercise, Individualized, trainer guided and Group discussion, |                           |
| Formative assessment methods                                                                                                                                                                                           | Written assessment, Oral presentation, and Performance assessment                                                                                                      |                           |

### Integrated/Summative assessment

#### Integrated situation

Ultimate Forest Company (UFC) is located in Nyanza District with the main purpose of producing electrical poles and sawn timber. This company has bought 5 sites of mature forests by bargaining with forest owners (farmers). One site has been harvested with the aim to produce logs, electrical poles, sawn timber and firewood. After selling forest products, the company experience a huge loss caused by poor determination of harvestable volume. To resume harvesting activities, the company wishes to recruit a competent forest technician to identify preliminary works of forest inventory, carry out tree measurements and stand parameters and report forest inventory.

As a forest technician, you are requested to conduct forest inventory through the following tasks:

1. Install sample plots in the area of 1ha using sampling rate of 25% in three (3) hours
2. Determine the harvestable volume of forest on 1 ha in four (4) hours.
3. Make a report of forest inventory activities in one (1) hour.

**Instructions:**

1. Tools, materials and equipment are available in the store
2. Time allowed to accomplish these tasks is eight (8) hours

### Resources

|           |                                                                                                                                                                                                                                                           |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment | Chain saw, GPS, dumpy level, theodolites, total station, Relascope, PPE, Projector, computer                                                                                                                                                              |
| Materials | Paints, pegs, warning tapes, marker, forest inventory templates, notebook, pencils, pens, papers, erasers                                                                                                                                                 |
| Tools     | Clinometer, compass direction, forest map, ranging rod, hoes, ropes, axes, saws, machete, tree marker, Clinometer, Caliper, Tape measure/steel tape, Haga altimeter, Hammer, Forest Map, Ranging rod, Bark gauge, calculator, diameter tape, Blume Leiss. |

| Assessable outcomes                                            | Assessment criteria<br>(Based on performance criteria)                         | Indicator                                             | Observation |    | Marks allocation |
|----------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------|-------------|----|------------------|
|                                                                |                                                                                |                                                       | Yes         | No |                  |
| <b>1. Identify preliminary works of forest inventory (30%)</b> | 1.1. Forest species are described according to the forest inventory objectives | Forest site is assessed                               |             |    | 2                |
|                                                                |                                                                                | Topography of the forest is considered                |             |    | 2                |
|                                                                |                                                                                | Geographical coordinates of the forest are identified |             |    | 2                |
|                                                                |                                                                                | Forest composition is identified                      |             |    | 2                |
|                                                                |                                                                                | Forest density is determined                          |             |    | 2                |
|                                                                |                                                                                | Age of species is determined                          |             |    | 2                |
|                                                                |                                                                                | Tree species arrangement are identified               |             |    | 2                |
|                                                                |                                                                                | Forest ownership is identified                        |             |    | 2                |
|                                                                | 1.2. Forest area is correctly determined in accordance with the spatial data   | Forest shape on a map is identified                   |             |    | 1                |
|                                                                |                                                                                | Forest area is determined                             |             |    | 1                |

|                                                                                |                                                                                                             |                                 |  |  |   |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------|--|--|---|
|                                                                                | 1.3. Sample plots are efficiently determined according to the sampling methods                              | Sampling method is selected     |  |  | 2 |
|                                                                                |                                                                                                             | Sample form is identified       |  |  | 2 |
|                                                                                |                                                                                                             | Sampling rate is calculated     |  |  | 2 |
|                                                                                |                                                                                                             | Sample size is determined       |  |  | 2 |
|                                                                                |                                                                                                             | Sampling interval is determined |  |  | 2 |
|                                                                                | 1.4. Tools and equipment are appropriately selected according to the forest status and inventory objectives | Tools are selected              |  |  | 1 |
|                                                                                |                                                                                                             | Equipment is selected           |  |  | 1 |
| <b>2. Carry out tree measurements and stand parameters</b><br><br><b>(60%)</b> | 2.1. Tree heights are accurately measured according to the tree size                                        | Tree height is measured         |  |  | 4 |
|                                                                                | 2.2. Tree diameters are accurately measured according to the tree size                                      | Tree diameter is measured       |  |  | 4 |
|                                                                                |                                                                                                             | Tree circumference is measured  |  |  | 4 |
|                                                                                |                                                                                                             | Basal area is calculated        |  |  | 4 |
|                                                                                |                                                                                                             | Bark thickness is measured      |  |  | 4 |
|                                                                                | 2.3. Tree volume is accurately determined according to the size of trees                                    | Volume is calculated            |  |  | 4 |
|                                                                                |                                                                                                             | Conversion of volume is done    |  |  | 4 |
|                                                                                | 2.4. Slope is accurately measured according to the landscape                                                | Horizontal distance is measured |  |  | 4 |
|                                                                                |                                                                                                             | Vertical distance is measured   |  |  | 4 |
|                                                                                | 2.5. Soil types are properly identified                                                                     | Soil pH is determined           |  |  | 2 |
|                                                                                |                                                                                                             | Soil structure                  |  |  | 4 |

|                                                                                       |                                                                                                                            |                                                                                   |                                   |  |   |
|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------|--|---|
|                                                                                       | according to the soil characteristic of the sample plots                                                                   | Soil texture                                                                      |                                   |  | 4 |
|                                                                                       | 2.6. Vegetation cover is properly determined according to the landscape                                                    | Vegetation cover is identified                                                    |                                   |  | 2 |
|                                                                                       | 2.7. Age of the forest tree species is properly determined according to the information provided by the forest owner       | Current annual increment is calculated                                            |                                   |  | 4 |
|                                                                                       |                                                                                                                            | Mean annual increment is calculated                                               |                                   |  | 4 |
|                                                                                       | 2.8. Impacts of forest to the surrounding environment are properly identified according to the forest inventory objectives | Negative impacts are identified                                                   |                                   |  | 2 |
|                                                                                       |                                                                                                                            | Positive impacts are identified                                                   |                                   |  | 2 |
|                                                                                       | <b>3. Report forest inventory (10%)</b>                                                                                    | 3.1. Key report elements are properly identified according to the report contents | Elements of report are identified |  |   |
| 3.2.Key report elements are properly identified according to the report contents      |                                                                                                                            | Reporting template is interpreted                                                 |                                   |  | 3 |
| 3.3.Key elements are properly compiled in accordance with forest inventory objectives |                                                                                                                            | Reporting elements are compiled                                                   |                                   |  | 3 |
| 3.4.Compiled document is accurately submitted according to the client requirements    |                                                                                                                            | Compiled report is submitted                                                      |                                   |  | 1 |
| <b>Total marks</b>                                                                    |                                                                                                                            | <b>100</b>                                                                        |                                   |  |   |
| <b>Percentage Weightage</b>                                                           |                                                                                                                            | <b>100%</b>                                                                       |                                   |  |   |
| <b>Minimum Passing line % (Aggregate): 70%</b>                                        |                                                                                                                            |                                                                                   |                                   |  |   |

## Reference books:

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2. **Z.A. and Y.T.** 2013. Training manual on: forest inventory and management in the context of SFM and REDD+, Ethiopia.
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4. **Barrett, T. M., Eckmuller, O., Fried, J.S., Lund, H.G., Kohl, M, & Nuutinen, T.** 2004. Inventory. Chapter in Encyclopedia of forest sciences Volume 1: 403-433. Elsevier Ltd., Oxford, UK.
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7. **Husch, B.** 1971. Planning a forest inventory. FAO Forestry and Forest Products Study No. 17/FAO Forestry Series No. 4. FAO, Rome.
8. **Johnson, E.W.** 2000. Forest sampling desk reference. CRC Press, BOCA Raton, USA.
9. **Philip, M.S.** 1994. Measuring trees and forests. CAB International. Cambridge, UK.
10. **Pretsch, H.** 2010. Forest dynamics, growth and yield – From measurement to model. Springer, Berlin Heidelberg.
11. **Tomppo, E., Gschwantner, T., Lawrence, M. & McRoberts, R.E. (eds).** 2010. National forest inventories – Pathways for common reporting. Springer, European Science Foundation.
12. **Weiskittel, A.R., Hann, D.W., Kershaw Jr., J.A. & Vanclay, J.** 2011. Forest growth and yield modeling. Wiley-Blackwell, Oxford, UK. Videos
13. FAO - 1981 - Manual of forest inventory (FP 27)
14. JOHNSON E. - 2000 - Forest sampling desk reference
15. LAAR, A. van et al. - 2007 - Forest mensuration
16. PICARD N. et al. - 2012 - Manual for building tree volume and biomass allometric equations
17. RNRA - 2015 - District Forest Inventory field operations guide
18. RNRA - 2015 - Field operations guide for data collection for the elaboration of Pine and Eucalypt volume tables

19. CHAVE J. et al. - 2014 - Improved allometric models to estimate the aboveground biomass of tropical trees
20. DE FORESTA H. et al. - 2013 - Towards the assessment of trees outside forests
21. DIETZ J. et al. - 2011 - Guidelines for establishing regional allometric equations for biomass estimation through destruct
22. FAO - 2004 - National forest inventory - Field manual template
23. JOHNSON E. - 2000 - Forest sampling desk reference
24. LAAR, A. van et al. - 2007 - Forest mensuration
25. LUND G. - 1998 - Guidelines for designing multipurpose resource inventories
26. MANDALLAZ D. - 2008 - Sampling techniques for forest inventories
27. MANIATIS D. et al. - 2010 - Options for sampling and stratification for national forest inventories to implement REDD+ un~1
28. SCHUCK A. et al. - 2002 - Compilation of forestry terms and definitions
29. WEST P. - 2009 - Tree and forest measurement
30. [https://www.forestcarbonpartnership.org/sites/fcp/files/fcpdocs/2015/October/Forest%20Inventory%20%26%20Management\\_Manual.pdf](https://www.forestcarbonpartnership.org/sites/fcp/files/fcpdocs/2015/October/Forest%20Inventory%20%26%20Management_Manual.pdf)
13. <https://www.nnrg.org/wp-content/uploads/2015/02/NCF-Inventory-Monitoring-Guidelines.pdf>
31. <https://www.fao.org/3/ae578e/ae578e.pdf>