Tree and Stand Valuation Decision Support System Tutorial

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INTRODUCTION

Commercial forestry in Kenya can be enhanced through accurate and reliable valuation of forest products. Understanding how to determine the value of an individual tree or plantation is fundamental in forestry. Without an estimate of tree value or plantation there is little to motivate farmers and investors in the commercial forestry industry. By valuing trees or plantation tree owners can:

- Learn about the growth potential of tree species and the site
- Better plan, cost and schedule silvicultural operations such as thinning, pruning and harvesting
- Estimate growth rate and wood yield
- Determine or predict the tree or plantation value

This tutorial has been developed by KEFRI to guide tree growers in undertaking tree valuation using the interactive computer based decision support tool

How it works?

The tree valuation DSS tool enables an individual to obtain the true value of a standing tree or forest plantation by measuring tree diameter at breast height (DBH) and tree height in metres

Necessary Equipment for Tree Valuation

Before undertaking the valuation exercise there are necessary tools and equipment needed to accomplish the task these are:

- Writing board
- Pencil, sharpener and eraser

KEFRI TREE VALUATION

- Suunto clinometer
- GPS for marking reference coordinates at plot centers
- Diameter tapes
- Tape measure (30m)
- Hand held Calculator
- Chalk for marking trees
- Red paint for marking plot center peg
- 1.3 m stick for DBH reference point
- Slashers / Pangas for clearing ground

Team Composition

Team leader – Overall co-ordination in logistics, field data collection, data management and keeping records

Assistant Team Leader – Assisting the team leader, actual data recording in the field on DBH and heights.

Two enumerators- Actual measurements of DBH and tree heights

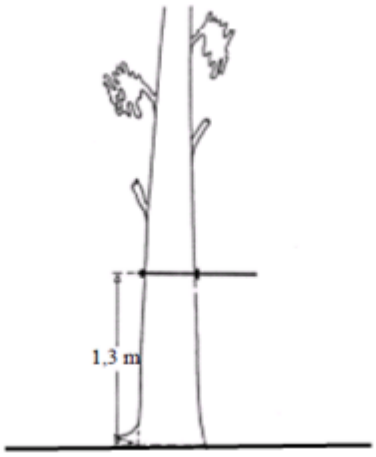
One field Assistant – Clearing the way for smooth operations

TAKING TREE MEASUREMENTS

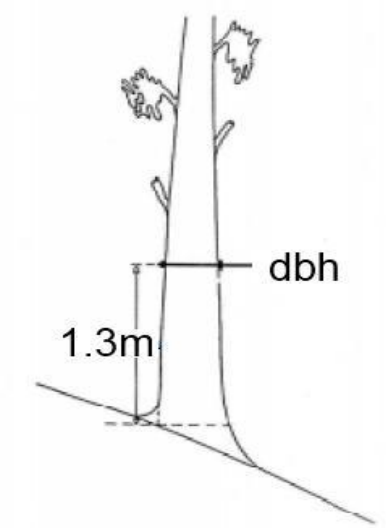
Tree Diameter at Breast Height (DBH)

To determine Diameter at Breast Height (DBH) in cm one needs to use a diameter tape. By convention, the diameter of forest trees is measured in cm at 1.3 m above the ground as illustrated in the Figure 1a-1d.

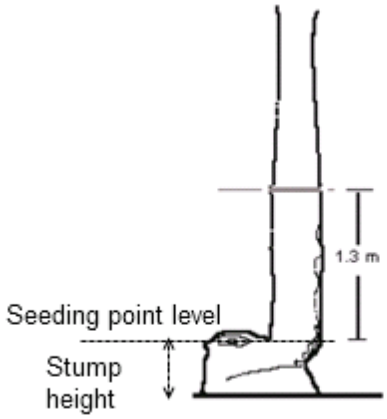
KEFRI TREE VALUATION



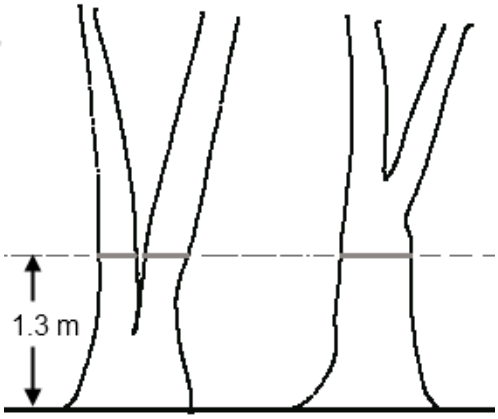
Figure…..a: Measuring DBH on flat terrain



Figure…b. .Measuring DBH on slopy areas



Figure…c: Measuring DBH of coppice trees

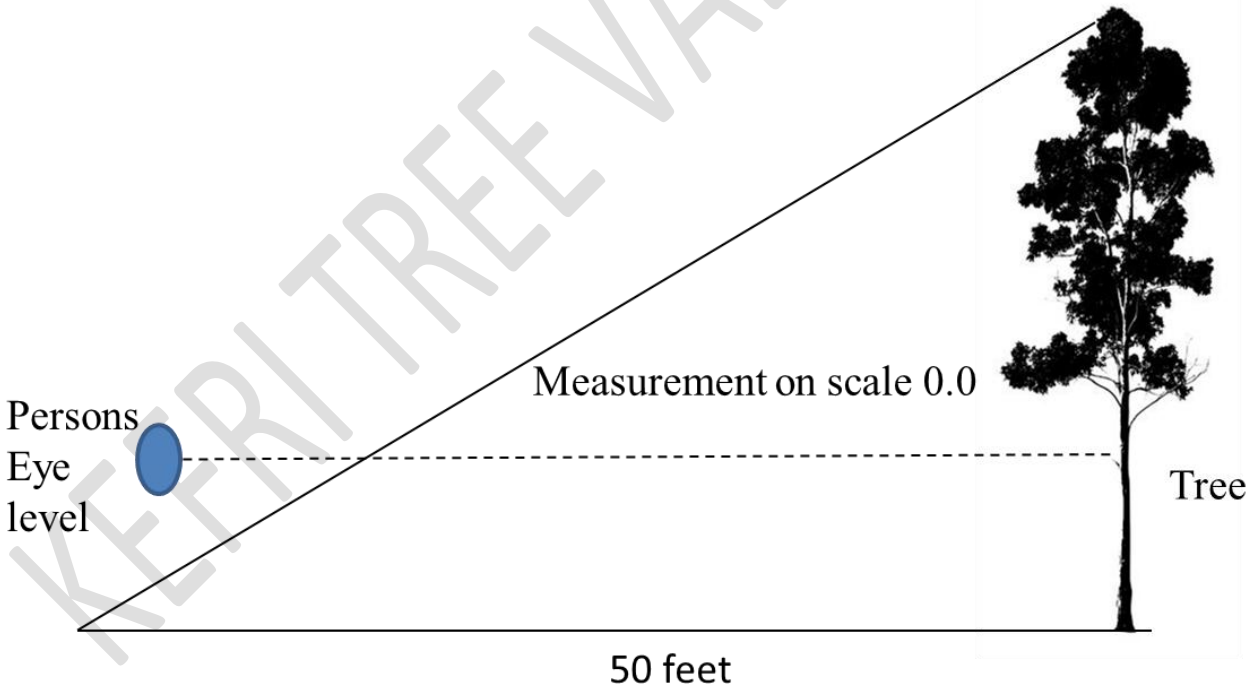


Figure….d: Measuring forked trees (N.B: Forking below 1.3 m above ground, stems are measured separately)

How to determine a tree's height using a Suunto clinometer

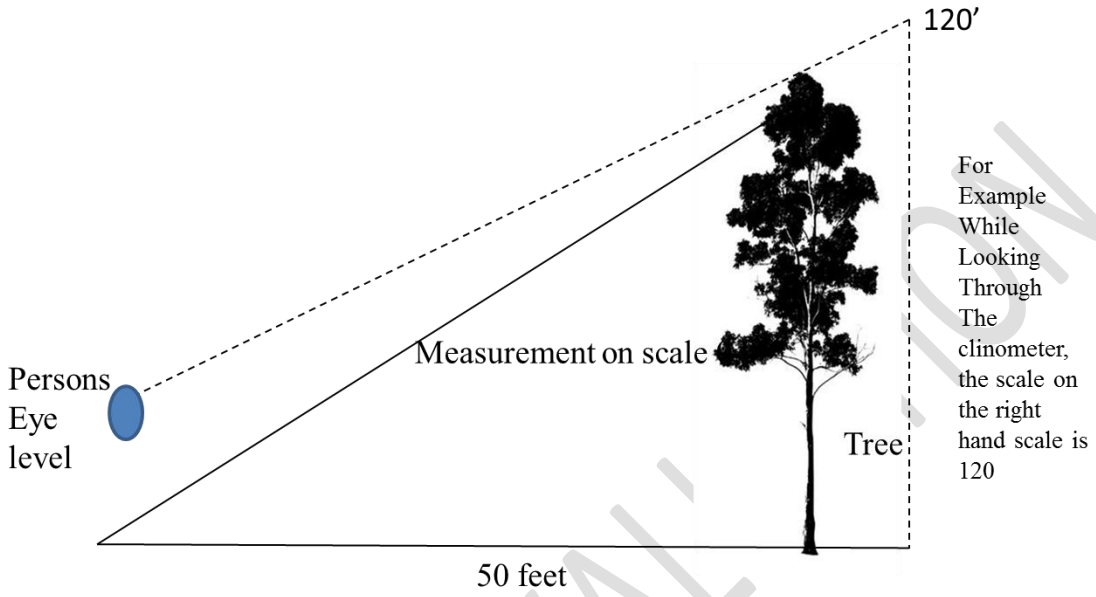
Foresters mostly use a Suunto clinometer to determine a trees height by following the steps below:

1. Hold the clinometer with the red dot pointing away from you. The red dot marks your line of sight between your eye and the object you are measuring
2. Look through the glass meter. The glass meter contains a dial with two rows of measurements, a left-hand scale and a right-hand scale. Keep **BOTH EYES OPEN**
3. Walk away from tree 50 feet. (Use a measuring tape.)
4. Face tree. Hold the clinometer near your eye with red dot pointing away from you. (You may want to put a finger on the red dot to remind you that this is the line of sight you are following to the top and bottom of tree.)
5. Look through the level clinometer until you see the scale reads "0" on both sides

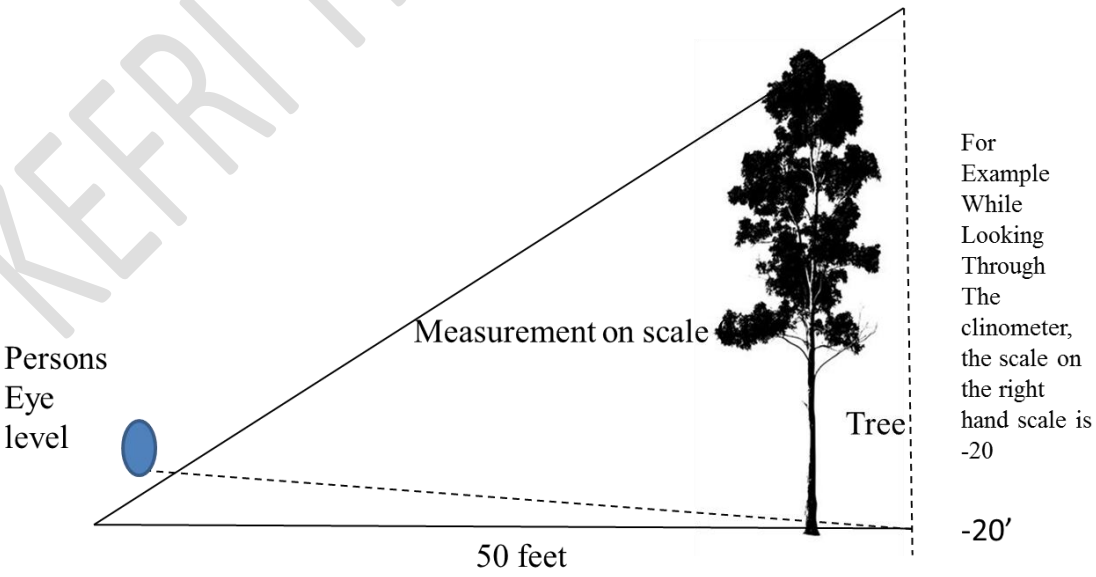


Point the clinometer at the top of the tree. Record the number from the right-hand scale that corresponds with your line of sight at the top of the tree

KERI TREE VALUATION



Without moving your head, tilt the clinometer down to the base of the tree. Try to keep the glass eyepiece steady in at the same point from where you took the top reading. Record the number from the right-hand scale that corresponds with your line of sight at the bottom of the tree



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Add the numbers for example

Top measurement =120

Bottom measurement = 20 (ignore the negative sign)

140

140’ is the estimated height of the tree using the clinometer

Since you took the measurements at 50 feet away, you will have to divide your total by 2. For example, 140 divided by 2 is 70 feet. The tree is actually 70 feet tall.

Once the tree DBH and Height is determined the details are recorded.

Suunto clinometer uses the principle of trigonometry when measuring tree heights. It consists of degree and percentage scale which can be incorporated in one equipment or different gadgets.

Sample Suunto clinometer

KEF EVALUATION

Step 1

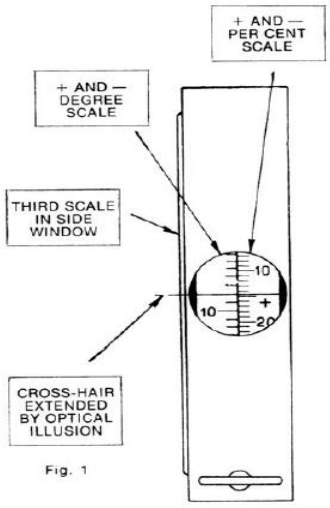


Fig. 1

Keep both eyes open

Step 2

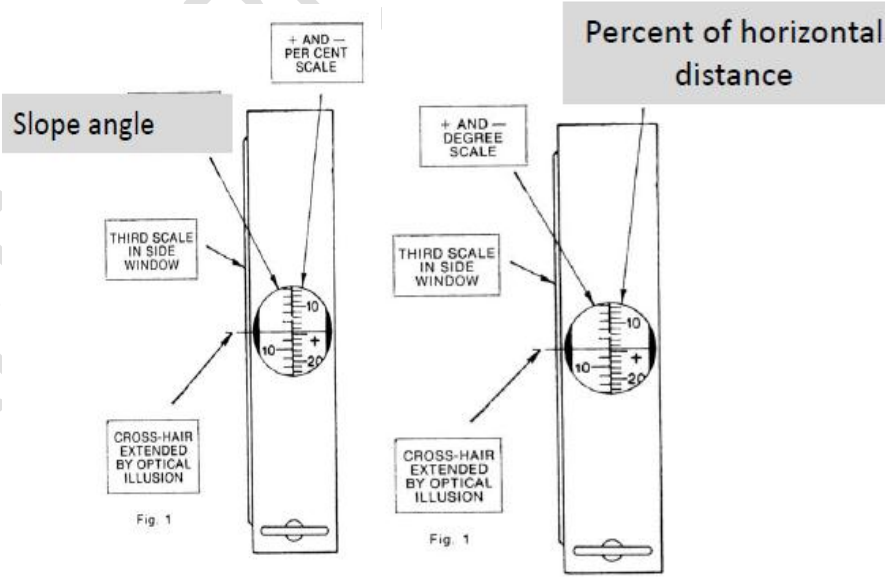
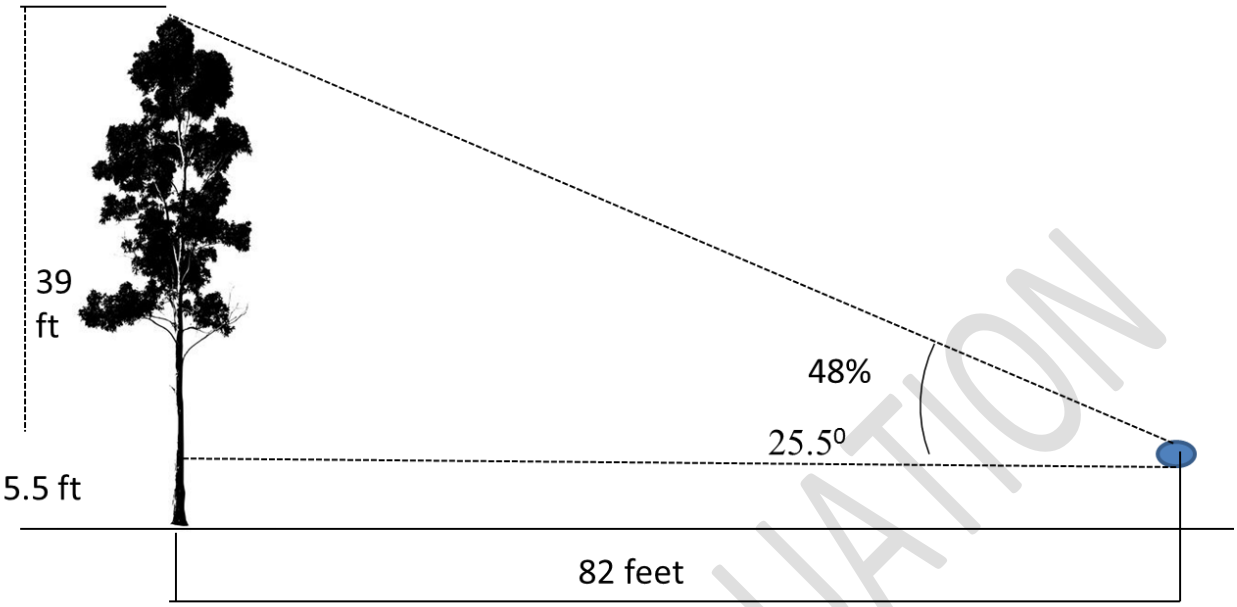


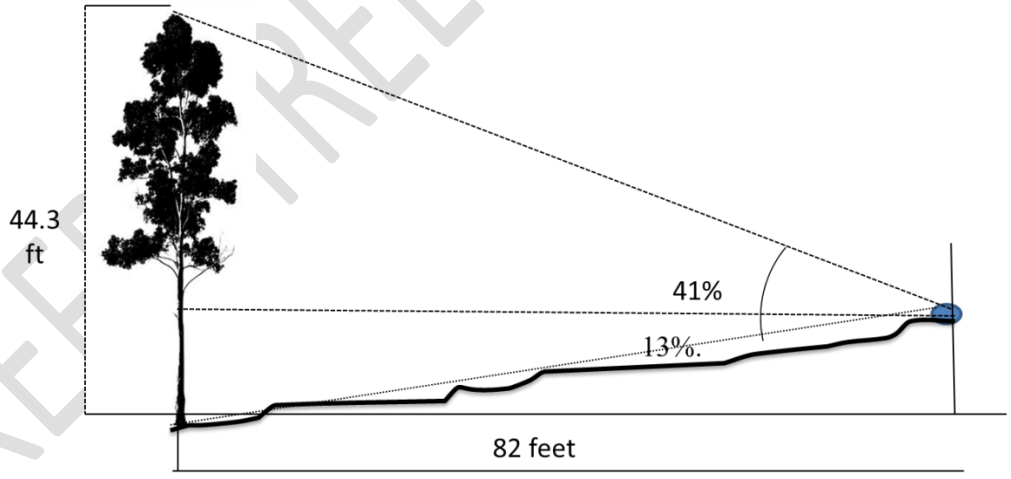
Fig. 1 Fig. 1

Degree Scale



Tan 25.5 = adjacent length (82ft) * opposite length (height)
Height = tan 25.5 * 82 ft
Height = 39.11 ft

Percentage Scale

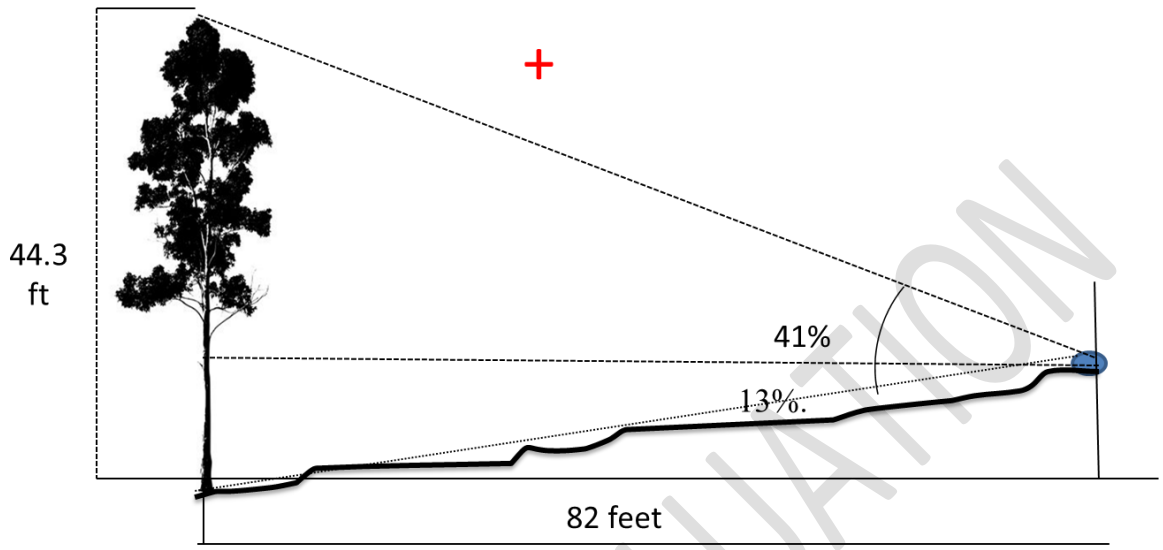


Height = 0.41 * 82 ft + 0.13*82
Height = 44.3 ft

KEE TREE VALUATION

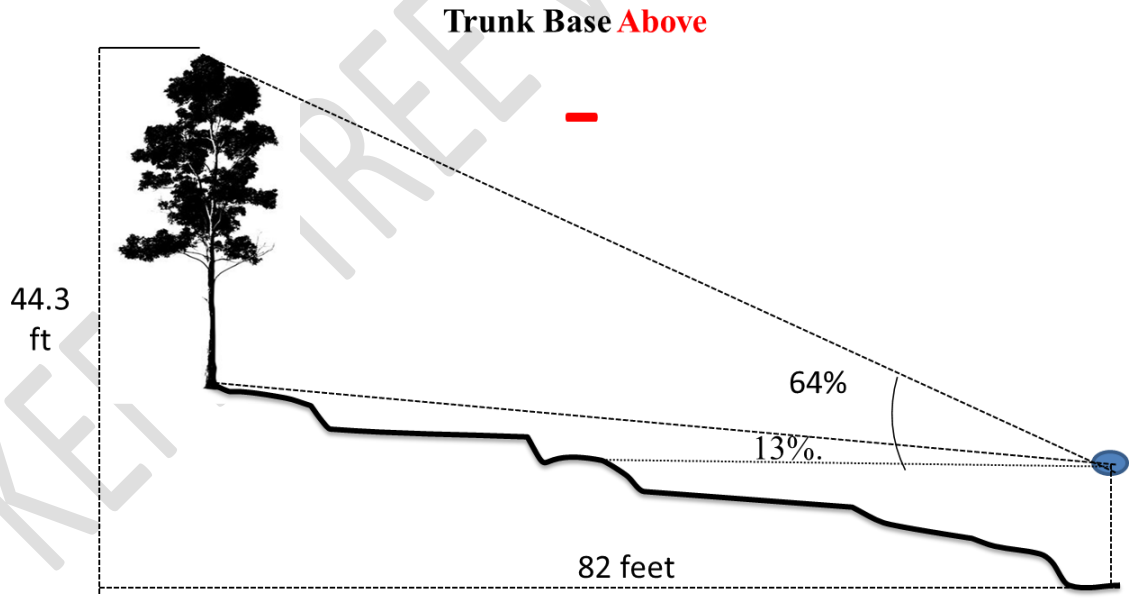
Special considerations

Trunk Base Below



Height = 0.41 * 82 ft + 0.13*82 ft
Height = 44.3 ft

Trunk Base Above



Height = 0.64 * 82 ft - 0.14*82 ft
Height = 41 ft

KEY TREE VALUATION

Valuing Forest Stands

To determine the value of a large plantation one has to do tree sampling which must be a true representation of the whole forest plantation. For the purpose of quick inventory a land size of below 2.5 acres with a density of about 650 trees per acre, one plot of 20 trees per sample plot is suggested. This can be increased progressively, however topography, plantation age and other site factors should be considered when locating the sample plots. Therefore plot size will depend on stand stocking rates. The more sparse the trees the larger the plot will need to be to include sufficient trees. Tree stocking can be quickly estimated from average spacing or, alternatively, the size of the plot can be gradually increased through counting the trees during inventory.

Once the sample plots have been established, the trees need to be measured in a systematic way across all the plots in the stand. The aim is to have at least a given number of trees (20)

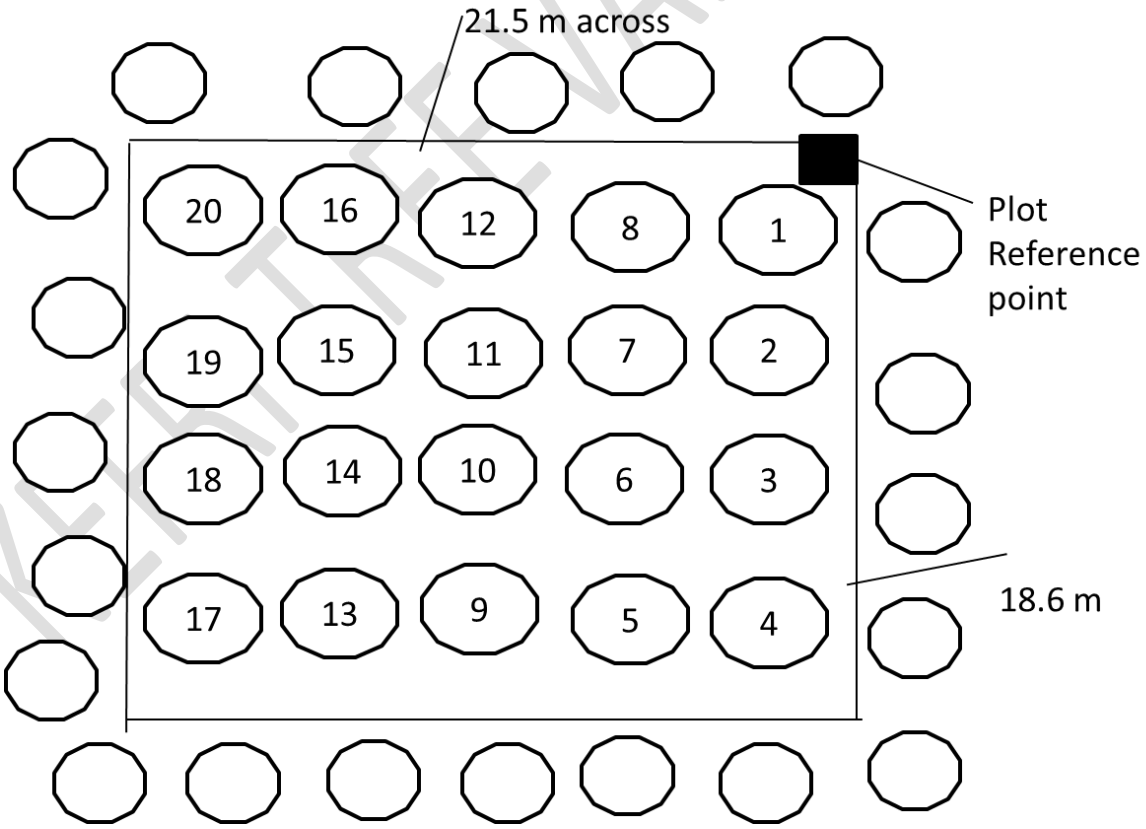


Figure 2: Sampling using the rectangular plot

KEBS TREE VALUATION

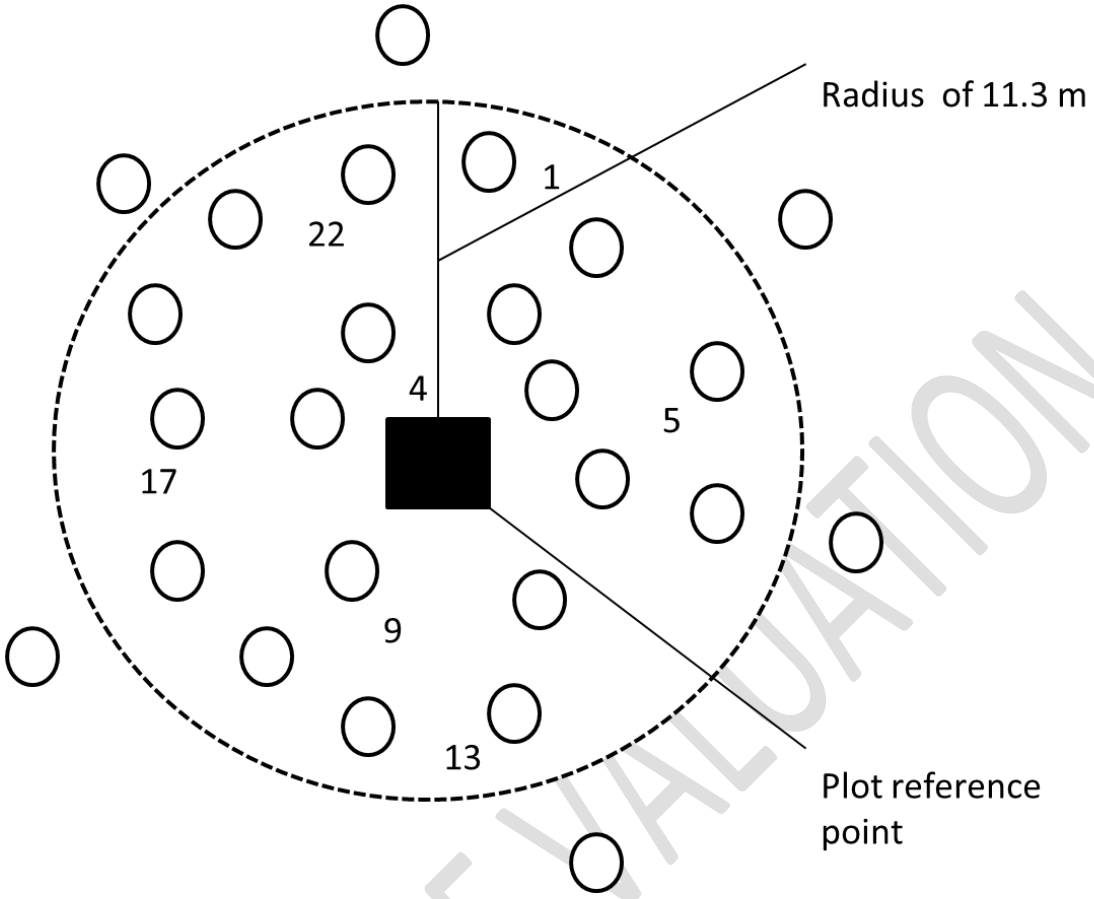


Figure 3: Sampling using the circular plot

Setting up sample points

In a plantation sampling points are positioned such that they are 150 m apart on the N-S and 125m on the E-W direction

- The 1st sampling point is located randomly in the plantation.
- The subsequent sampling points are determined by use of compass and measuring tape
- The assessment must be done in such a way that it can be verified, it is therefore necessary that the plot centers are clearly marked (usually with wooden pegs in the ground painted RED at the top)
- The measured trees in a plot are marked with numbers and recorded in the field forms. Key details to be recorded include; County or Sub County, Location, Land/Block size (acres), , Tree species , Planting year, Plot Number

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