## PURPOSE OF MEASUREMENT IN FOREST

1. **VALUATION:** The more intensive the utilization the nearer will the out-turn approaches the total volume of the tree. Measurement will prevent cheating between the seller a buyer and consequently a standard would set.

2. **MANAGEMENT:** Measurement is undertaken to meet a continuous demand, the wood producer is interested in the extent of the forest and also in the quantity of the material standing in the forest.

2. **RESEARCH:** Measurement is adopted to meet future demand in quantity and quality of the forest product i.e. Research is conducted into the system of Silviculture and management which mean result in higher rate of production or in maximum production of the desired material product.

## MEASUREMENT SYSTEMS

There are 2 most important systems of measurement i.e.
(i) British or Imperial and (ii) Metric systems.

Conversion of Measurement Units

a) Conversion factors for linear measures

| | |
|---|---|
| 1 inch = 2.54cm | 1 cm = 0.3937 inch |
| 1 foot = 30.48cm | 1 m = 39.38 inches |
| 1 yard = 91.44cm | 1 m = 3.2808 feet |
| 1 mile = 1.6093km | 1 m = 1.0936 yards |
| | 1 km = 0.6214 mile |

b) Conversion factors for square measures

| | |
|---|---|
| 1 sq. inch = 6.4516$cm^2$ | $1cm^2$ = 0.1550 sq. in. |
| 1 sq. foot = 0.0929$m^2$ | $1m^2$ = 10.764 sq. ft. |
| 1 acre = 0.40469ha | 1 ha = 2.471 acres |
| 1 sq. mile = 2.59 $km^2$ | $1km^2$ = 247.1 acres |
| | $1km^2$ = 0.3861 sq. mile |

c) Conversion factors for cubic measures

| | |
|---|---|
| 1 cu. m = 16.387$cm^3$ | $1cm^3$ = 0.610 cu. in. |
| 1 cu. ft = 0.2832$m^3$ | $1m^3$ = 35.314 cu. ft. |
| 1 cu. yd. = 0.764553 | 1m3 = 1.308 cu. yd |

d) Conversion factors for weight measures

| | |
|---|---|
| 1 oz = 28.35g | 1 g = 0.0252 oz |
| 1 ib = 453.60g | 1 kg = 2.205 lbe. |
| 1 qtr = 12.701 kg | |
| 1 cwt = 50.802 kg | |

# THEORY OF TREE MEASUREMENTS

## 1. DIAMETER:

The diameter of a tree normally decreases from the base to the tip. For purpose of standardization the point of measurement of tree diameter has been kept at breast height practice though the exact point of breast height varies from 1.3m (51 inches) in countries with metric system to 4.5 feet (54 inches) in countries using imperial system such as Canada, U.S.A. Malaya, Ghana, Sierra Leone etc.

General Guide to Nigeria Practice in Breast Height Measurement

a) On sloppy ground, measure breast height from the ground on the uphill side of the tree.
b) Where tree develops a mound of soil and litter around the base, displace this if it is very loose otherwise measure from the highest point.
c) If the tree folks below breast height, treat as 2 stems but if the branching is above breast height treat as 1 stem.
d) Remove any material that is foreign at breast height point i.e. the material which is not an actual part of the tree such as vines, chimbers, loose bark etc.
e) If flanges (plank-like buttresses) develops up to and beyond breast height point, take the diameter or girth measurement where the irregular feature appears to match with the main bole and record the height at which the measurement is taken.
f) If a bump develops at breast height or it is otherwise unrepresentative, measure 2 points subjectively equal distant above and below breast height and find the mean of the two. If there is a tree in which case where the bump develops to as near as possible to the surface of the soil, then we apply the same as if there are flanges.

Basal Area

The cross sectional area at breast height of a tree is called Basal Area and it is usually expressed in square units such as square feet, square metres, square inches and square centimeters.

Basal area is calculated from $\pi D^2/4$ when the Diameter is known of $g^2/4\pi$ when girth is given while $\pi$ is a constant 22/7 of 3.14.

## 2. HEIGHT

Tree height can be distinguished into the following categories:

i) Total Height: Which is the vertical distance between ground level and tip of the tree.

ii) Bole Height: This is the distance between ground level and crow point. The Crown Point is the position of the first crown forming living or dead branch. Bole height expresses the height of the clear main stem of the tree.

iii) Merchantable Height: It is the distance between ground level and the terminal point of the last usable portion of the tree (19cm dbh is adoptable). The upper terminal is dependent on a number of conditions some of which are:

(a) Purpose of which the tree is being felled.
(b) Physical appearance of the stem.

iv) Stump Height: This is the distance from ground level to the basal position of the main stem when the tree is cut.

## 3. CROWN MEASURES

Diameter directly reflects the size of the life functioning crown. The number of surviving trees is in inverse ratio to the size and the spread of the crown. Relationship between crown diameter and tree diameter at breast height over back (dbh ob) is used in deriving stem diameter through the measurement of crown diameter on aerial photographs.

Other important crown variables are crown depth, crown sectional areas, crown volume and crown closure.

### Crown Diameter Determination

To determine crown diameter from the ground, project the edges of the crown to the ground by means of plumb stick and then measure the distance between appropriate projections. More than two measurements of crown diameter may be taken but usually the average of the longest diameter and diameter at right angle to this may be used as a measure of crown diameter.

Crown Depth: Crown depth is determined from the difference between total tree height and height from crown point.

Crown Closure: It is the ratio of the area of the vertical projections to the equivalent ground area of the stand. It is used as a measure of stand density and as an index in aerial photo interpretation.