DETERMINATION OF BIOMASS OF CROP AND TREES USING DESTRUCTIVE METHOD

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The production of an organism either in part or whole is termed as biomass. It is also termed as the total weight at a given time of living trees or tree parts per unit area In case of plant, the whole growth is collectively known as biomass. The biomass of plants plays an important role in supplying food, fibre, fuel and other daily necessities of human being. The biomass of crops and trees also supply raw materials to many industries like paper, pulp and timber industries. It also adds organic matter to the soil making it fertile and also served as fodder for the animals.

The biomass of herbaceous crops is usually determined by dry matter basis. For this purpose after harvesting of the whole plants, they are kept in a hot air oven preferable at 70-80^{0}C until the whole mass attains a constant weight. Then the weight is taken and expressed in g/plant or calculated as kg/ha.

In case of large plant/trees, the total volumes of plants may be converted from sample volume records. The calculation also varies for different shapes of trees e.g. cylindrical, conical, spherical etc. The volume of the cylindrical surface is calculated using the formula $\pi r^2 h$.

Where, r = Radius of the cylindrical base; h = height of the tree and π = constant ($\frac{22}{7}$)

Thus calculating the sample volume of a tree, its proportionate dry weight may be calculated either drying of whole mass or taking a small fraction of it which then can be used for calculation of whole biomass of a tree. The above procedure of biomass determination is known as destructive method. However, the biomass of growing trees without destructing it can be determined by volumetric measurement of the canopy as well as the trunk and conversion of these into weight. The tree canopy shape or the crown of trees can be conveniently classified as:

1. Conical as in the case of Australian oak and Mast tree
2. Cylindrical as in *Eucalyptus*
3. Spherical as in mango, Margosa tree, Tamarind etc.

Therefore, the volumetric measurement of these different crown shapes may be done as follows:

a. The volume of the conical shaped crown can be determined by the following formula:
   Volume = $\frac{1}{3}\pi r^2$h (units of volume)

b. The volume of the cylindrical shaped crown can be determined by the following formula:
   Volume = πr^2h (units of volume)

c. The volume of the spherical shaped crown can be determined by the following formula:
   Volume = $\frac{4}{3}\pi r^3$ (units of volume)

Fig. Conical shaped canopy

$V = \frac{1}{3}\pi r^2 h$

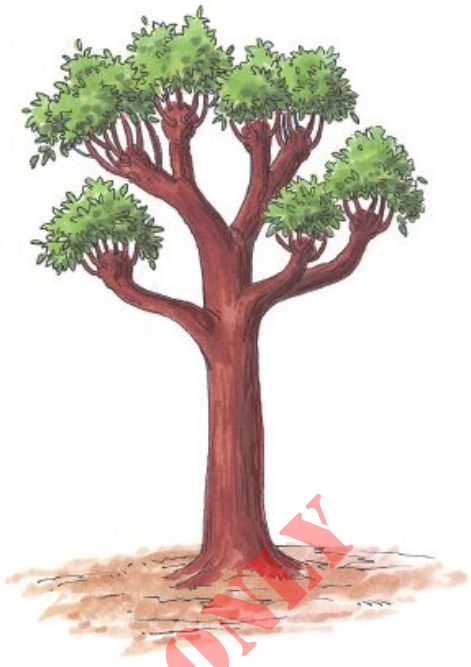

Fig. Cylindrical shaped canopy

$V = \pi r^2 h$

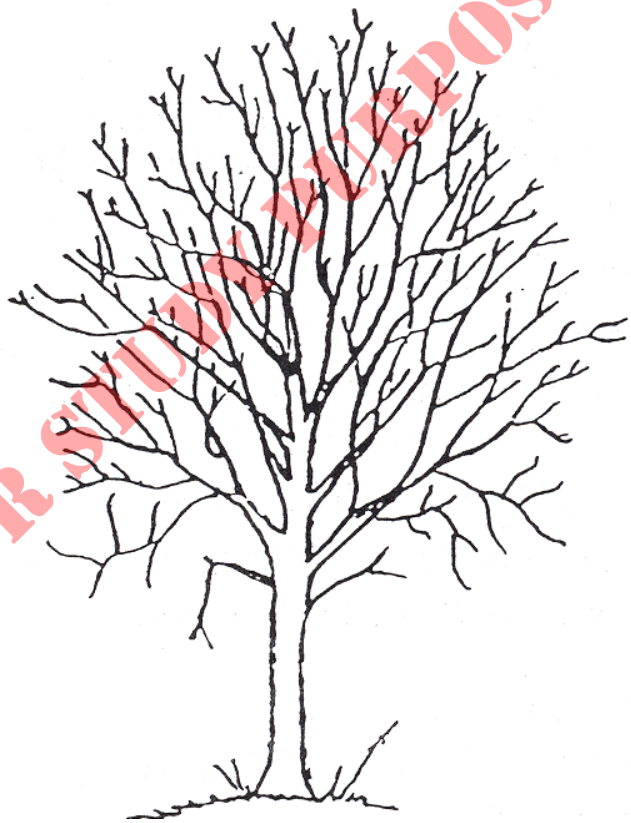

Fig. Spherical shaped canopy

$V = \frac{4}{3}\pi r^3$

How to Measure the Height of a Tree

1. Shadow Method

a. Know your exact height in the shoes you will be wearing to perform this method.
b. Stand next to the tree or the object to be measured. For best results, do this method on a bright, sunny day. If the sky is overcast, it may be difficult to tell exactly where the shadow's tip is.
c. Measure the length of your shadow. Use a tape measure or yardstick (meter ruler) to measure your shadow from your feet to the tip of your shadow. If you don't have someone to assist you, you can mark the end of the shadow by tossing a rock onto it while you're standing. Or better yet, place the rock anywhere on the ground, and then position yourself so the tip of your shadow is at the rock; then measure from where you're standing to the rock.
d. Measure the length of the tree's shadow. Use your measuring tape to determine the length of the tree's shadow from the base of the tree to the tip of the shadow. This works best if the ground all along the shadow is fairly level; if the tree is on a slope, for example, your measurement won't be very accurate. You want to do this as quickly as possible after measuring your shadow, since the sun's position in the sky (and hence the shadow length) is slowly but constantly changing. If you have an assistant, you can hold one end of the measuring tape while he or she measures the tree's shadow, and then you can immediately measure your shadow.
e. Calculate the tree's height by using the proportion of your shadow's length to your height. Since you know the length of the tree's shadow, and you also know that a certain height (your height) produces a certain shadow length (the length of your shadow), you can determine the tree's height with a little math. Multiply the length of the tree's shadow by your height, and then divide the resulting number by the length of your shadow. For example, if you are 5 feet (1.5 meters) tall, your shadow is 8 feet (2.4 meters) long, and the tree's shadow is 100 feet (30.48 meters) long, the height of the tree is (100 x 5) / 8 = 62.5 feet (30.48 x 1.5 meters) / 2.4 meters. Note that the order of your multiplication does not matter.

2. Pencil Method: Requires an Assistant
3. Angle of Elevation Method
4. Fixed Angle of Elevation Method