

## VOLUME ESTIMATION OF LOPPED TREES

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### Abstract

A study was conducted along the 5/R distributory, Haroonabad where trees of shisham (*Dalbergia sissoo*) and kikar (*Acacia nilotica*) were heavily lopped. The study revealed that total volume including timber and small wood of shisham tree with the Quarter Girth formula (Field practice) came to be 60% on an average of the Local Volume Table figure. But the total volume of the same tree with the Cylindrical formula came to be 71% of the Local Volume Table figure. Along the same distributory, total volume including timber and small wood of a kikar tree with the Quarter Girth formula came to be 45% on an average of the Local Volume Table figure while this volume came to be 58% of the Local Volume Table figure when calculated with the Cylindrical formula. Hence, the average lopping loss estimated in case of shisham was 29% while the figure reached to 42% in case of kikar.

**Keywords:** Volume estimation, *Dalbergia sissoo*, *Acacia nilotica*.

### Introduction

A valuable tree wealth is available along canalside plantations in Punjab province. Where high priority is given for raising of new plantations, exploitation of the mature and older plantations is equally important to make maximum utilization of the existing tree growth. Volume of standing trees along the canals is estimated to have an idea about the value of such trees before these are put to open auction for sale. Since measurement of actual volume of each and every tree at site is not possible, dependence has to be made on the existing volume tables for major species like Shisham, Kikar, etc. These volume tables provide an estimation of the volume of individual tree for calculating the total volume. Nevertheless, Howard (1925) and Bakshi (1941) recorded height and diameter growth figures in computing yield tables for *Dalbergia sissoo*. Furnival (1961) tried different regression models to select the best one for preparation of the volume tables. Similarly Afzal *et al.* (2004) evaluated different formulae for volume measurement of shisham logs. This volume so calculated is bound to differ from the actual volume of the trees at site and this variation will depend upon the extent of damage of trees due to lopping, de-topping, browsing, etc. The field officers are expected to bring out volume yield equivalent to the yield shown by volume tables. This can probably never happen because almost each and every individual tree is found damaged in actual practice at a stage when their harvest generally becomes due.

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In order to find out genuine variation between the actual out turn and the yield shown by volume tables, a study was taken up in Bahawalpur Forest Division. Only the two major species, i.e. shisham and kikar growing along canalside plantations were taken up for this study.

## Materials and Methods

A team from Punjab Forestry Research Institute (PFRI), Faisalabad, surveyed 5/R distributory at Haroonabad and took 15 sample trees for each species. The data collected cover a range of 26.3 to 59.8 cm and 41.3 to 76.0 cm diameter at breast height (DBH) for shisham and kikar, respectively. Yield was calculated with Cylindrical as well as Quarter Girth formula. Timber volume was calculated under bark upto 20 cm thinner end overbark dia in Cylindrical volume while in Quarter Girth volume, it was calculated upto 71 cm overbark thinner end girth by giving 2.5 cm bark allowance per 30 cm of girth as per field practice. Small wood volume was calculated overbark upto 5 cm thinner end dia in both of the methods. In Cylindrical yield, volume of the Butt log was calculated with respect to its DBH in standing position while in Quarter Girth yield, volume of Butt log was calculated with respect to its mid-girth after conversion. Volume with Cylindrical formula was taken before conversion but the volume with Quarter Girth formula was calculated after converting a tree into pieces.

## Results and Discussion

Standard timber, small wood and total volumes for all the sample trees of shisham and kikar were recorded against their diameters at breast height from the printed Local Volume Tables for shisham and kikar. These volume table figures were summed up separately for each species to compare with the Cylindrical and Quarter Girth volumes of these sample trees calculated from the actual field measurements (Tables 1 & 2).

Table 1. Total standard and actual volumes of shisham sample trees

Parameters	DBH Range (cm)	Standard Volume from Vol. Table (cu.m)	Actual Cylindrical Volume (cu.m)	Actual Quarter Girth Volume (cu.m)
Timber	26.29-59.82	8.81	7.15	5.26
Small wood	"	4.07	1.93	2.57
Total	"	12.88	9.08	7.83

Table 2. Total standard and actual volumes of kikar sample trees

Parameters	DBH Range (cm)	Standard Volume from Vol. Table (cu.m)	Actual Cylindrical Volume (cu.m)	Actual Quarter Girth Volume (cu.m)
Timber	41.28-76.00	19.47	12.91	7.69
Small wood	"	11.44	4.90	6.36
Total	"	30.91	17.81	14.05

Then the average actual standard volumes of shisham and kikar species along 5/R distributory and the lopping loss were estimated as a percent of their Local Volume Table figures (Table 3 & 4).

Table 3. Estimated volume of shisham trees along 5/R distributory, Haroonabad

Parameters	Volume Table Figure (cu.m)			By Quarter Girth Formula (cu.m)			By Cylindrical Formula (cu.m)		
	Timber	Small Wood	Total	Timber	Small Wood	Total	Timber	Small Wood	Total
$\bar{x}$	0.59	0.27	0.86	0.35	0.17	0.52	0.48	0.13	0.61
SD	-	-	-	0.26	0.08	0.34	0.30	0.06	0.36
CV (%)	-	-	-	74	47	65	63	46	59
Estimated Volume (%)	-	-	-	59	63	60	81	48	71
Lopping Loss (%)	-	-	-	-	-	-	19	52	29

Table 4. Estimated volume of kikar trees along 5/R distributory, Haroonabad

Parameters	Volume Table Figure (cu.m)			By Quarter Girth Formula (cu.m)			By Cylindrical Formula (cu.m)		
	Timber	Small Wood	Total	Timber	Small Wood	Total	Timber	Small Wood	Total
x	1.30	0.76	2.06	0.51	0.42	0.93	0.86	0.33	1.19
SD	-	-	-	0.53	0.37	0.90	0.67	0.42	1.09
CV (%)	-	-	-	104	88	97	78	127	92
Estimated Volume (%)	-	-	-	39	55	45	66	43	58
Lopping Loss (%)	-	-	-	-	-	-	34	57	42

### Source of variation in quarter Girth & Cylindrical volumes

- ❖ Both of the Quarter Girth and Cylindrical formulae vary in their derivations:

$$\text{Quarter Girth formula} = (G/4)^2 \times L$$

$$\text{Cylindrical formula} = (\pi D^2/4) \times L$$

- ❖ In Quarter Girth volume, timber was measured upto 71 cm overbark girth (22.6 cm overbark dia) while in Cylindrical volume; it was measured upto 20 cm overbark dia of the thinner end.
- ❖ Underbark timber volume was calculated by giving 2.5 cm bark allowance per 30 cm of the girth with Quarter Girth formula while with Cylindrical formula it was calculated by deducting actual bark thickness from overbark diameter.
- ❖ In Quarter Girth yield, volume of the Butt log was calculated with respect to its mid-girth after conversion but in Cylindrical yield, Butt log volume was calculated with respect to the DBH of the tree in standing position.
- ❖ Quarter Girth volume was calculated after converting a tree into pieces but Cylindrical volume was taken prior to conversion, i.e., conversion losses were not accounted for in this method.

- ❖ Under size timber with more defects was converted into small wood in Quarter Girth volume but it remained as timber in Cylindrical volume.

## References

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