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Growth Behaviour and Price Variations of Farm Grown *Bombax ceiba* (Simal) in Punjab

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ABSTRACT

The research work was conducted to know the growth behavior and price trend of Simal (*Bombax ceiba)* under farm conditions in the Punjab Province. There was a substantial increase in height and DBH up to 10th year (almost three times more than the 2nd year). The study has shown rapid increase in height and DHH in early growth stages of the tree up to the age of 10 years. The trend of gaining volume (MAI) was found to correlate with height and DBH. As the volume increased, market value of tree increased accordingly up to 14th year. Later on, the growth rate as well as systemic increase in price showed negative trend. However, the price per unit volume constantly increased throughout life span of 15 year showing high demand in later years. The highest MAI in volume fetched more price per unit volume before 14th year and suggested that harvesting of trees should not be delayed further to get maximum wood volume production and income on per year basis.

Key Words: *Bombax ceiba;* Age; Height; Price per tree; Forestry

INTRODUCTION

Farm grown trees play a significant role to meet the domestic wood requirements. In Pakistan, only 2% area of farmland is covered by trees, which produce 7.7 mm^3 of wood annually. It has been noted that introduction of fast growing trees commercially in farmland enhance wood production (Quraishi, 2000). It is further estimated that farmers can increase 8 to 10% trees cover by planting along farm boundaries without affecting the annual crop yield (Mohyudin, 1998). Trees grown on farmlands of Punjab and NWFP include Shisham (*Dalbergia sissoo*) and Kikar (*Acacia nilotica*) etc. Their wood is well reputed for their strength, durability and multiple uses.

Due to slow growth rate and heavy crown, Shisham is hardly compatible with farm crops. Same is the case with other local tree species. It is interesting to note that our farmers are taking keen interest in planting exotic tree species like eucalyptus, poplar, Simal etc. because of their shorter rotation, wide range of adaptability to the existing climatic and various ecological conditions of the country (Siddiqui, 1997).

Bombax ceiba (Simal) is one of the most promising tree species, which casts less shade being deciduous in nature, and for its specific arrangement of branches in whorls (4-5 in each) (Quraishi *et al.,* 2000). Its root system does not extend laterally to a long distance and hence does not compete for water and nutrients with agricultural crops (Hussain *et al.,* 199I). Simal tree is indigenous to Pakistan, India, China and Nepal. In Pakistan, it is found in sub-Himalayan tract from Hazara eastward through Punjab to Sindh under irrigated conditions (Sheikh, 1993). Its wood is used in furniture making, carving, canoes and its silky cotton is an excellent filling material for pillows and quilts. (Siddiqui, 1997).

Viewing the importance of *B. ceiba* in agro–forestry, a research project was designed to investigate its growth behavior and marketing trends in Punjab. The major objective of the study was to find out proper age of tree for rotation at which maximum wood production in volume and high increment can be achieved. More over relationship between price per tree vs. price per unit volume was developed to have proper recommendations for the farmer to get maximum economic return per unit volume.

MATERIALS AND METHODS

Research study under the present project was carried out in all districts of Punjab. Survey was conducted in different ecological zones to measure "height and DBH of farm grown *B. ceiba* of known ages. For this purpose, a questionnaire was developed to record information about trees of various age classes (2-15 years). A simple random technique was used for the selection of respondents. About 1000 trees were measured for the said parameters. The data were consolidated and tabulated for statistical analyses to determine arithmetic means of height and DBH and price per tree. These arithmetic means were used to calculate other parameters like mean annual increment (MAI), current annual increment (CAI) and price per unit volume etc. Following combined variable formula was used to calculate the volume:

$TV= -0.01323+0.0001864\ D^2+0.00002663\ D^2H$

Where, D = Diameter of the tree at breast height (independent variable).

H = Height of the tree (independent variable)

TV= Total volume of the tree (dependent variable)

The regression relationships were determined by using the following equation (Muhammad, 1991).

$$Y = a + bX$$

Where, X= Independent variable
Y= Dependent variable
a= regression constant (to be determined)
b= regression coefficient (to be determined)

RESULTS AND DISCUSSION

Height and DBH increased linearly with increasing age of *B. ceiba* (Table I). Data revealed that tree height increased up to 4.04 m in 2 years and up to 13.12 m (73% of total height) within 10 year. This steady growth indicates that the ability of tree to gain height is more rapid during early years. It is also evident from Table I that the increase in height is somewhat constant throughout the total life span up to 15 years where as the mean annual increment in DBH was maximum during first 10 years. This increase in DBH determines high growth rate of the tree in early years, which give more wood volume production up to 14 years of age. After this age the increment started to decline showing reduction in growth rate in later years. Tanvir *et al.* (2002) also found rapid increase in DBH in fast growing trees during early years of growth. It is also evident from the data given in Table I that farm grown *B. ceiba* attained maximum (38.54 cm) DBH in 10 years which is 86% of the total DBH (44.86 cm) in 15 years and only 14% DBH was attained during rest of the 5 years of its growth period. Shah *et al*. (2002) reported 30 cm DBH of *B. ceiba* at the age of 12 years, which is 30% less as compared to the DBH calculated in the present study. Low DBH might be due to compact planting. Results of the present study are in conformity with Hussain *et al.* (1999) who reported 44% more DBH in linearly planted Simal trees.

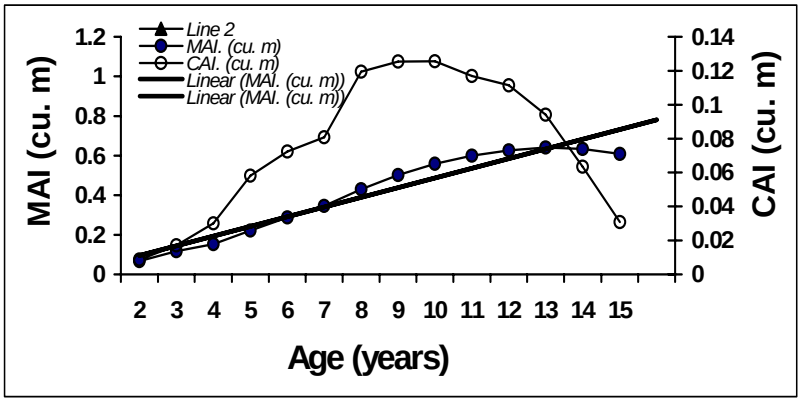
Hussain *et al*. (1999) observed that *B. ceiba* attained the DBH of 23 cm after 6 years in linear plantation. They also stated that the growth could be better if the trees are planted along the watercourse.

Volume of the tree increased rapidly and constantly up to 13th year. Data revealed that after mid of thirteenth year, DBH and volume started to decline. The Fig. 1 showed the growth curves of mean annual increment (MAI) and current annual increment (CAI) of wood volume. These two curves are intersecting each other at 13th year. This reflected high growth rate of the tree up to 13th year of age. The point of intersection at mid of 13th year shows the decline in MAI, which suggested that the tree should be harvested up to 14th year to get maximum volume production with high increment. The regression line shown in Fig. 1 gives clear relationship between age and MAI at 14th year of Simal growth.

Table I. Growth and price trend of farm grown *Bombax ceiba* (2-15 years of age)

Age (year)	Height (m)	Height (%)	DBH (cm)	DBH (%)	Vol (m^{-3})	Price/Tree	Pr m^{-3}	Price/Year
2	4.04	22	10.39	27	0.015600	2.00	128.18	1.00
3	5.59	31	13.47	34	0.040880	5.99	146.52	2.00
4	6.01	34	17.58	42	0.071026	13.69	192.7	3.42
5	6.97	39	20.91	49	0.129164	27.99	216.7	5.60
6	8.31	46	24.68	55	0.201522	94.41	468.41	15.73
7	9.81	55	27.8	62	0.282302	201.35	713.24	28.76
8	10.5	59	32.37	73	0.401682	404.59	1007.24	50.57
9	11.8	66	35.77	80	0.527153	965.96	1832.41	107.33
10	13.12	73	38.54	86	0.652820	1643.62	2517.74	164.62
11	14.89	83	40.3	90	0.769821	2307.25	2997.13	209.75
12	15.42	86	42.59	95	0.877397	2927.59	3336.69	243.96
13	16.3	91	43.85	98	0.971418	3406.77	3552.39	262.06
14	17.14	96	44.53	99.9	1.034930	3603.47	3484.75	257.39
15	17.86	100	44.6	100	1.065776	3706.42	3477.67	247.09

Fig 1. Age-volume (MAI, CAI) relationship of *Bombax ceiba*



MAI. Vol (m^3) = + 0.0055+0.0057 (years)
R^2 = 0.9344

Data (Table I) revealed that prices of the trees increased steadily in accordance with gain in CAI and the price / m^3 increased every

year with increase in total volume. Hussain *et al.* (1999) found similar trend of volume and price variations of *B. ceiba* in their studies. Low prices in early years (up to 9 years) were due to lack of proper use of *B. ceiba* at this stage. However, market demand of higher volume wood of the tree paid very high prices to the farmer in later years up to mid of 13^{th} years. Later on price/m^3 started declining as shown in the Table I. It means that the average of both volume and price would be low in the coming years after 14^{th} years. This phenomenon strongly suggests harvesting the tree after 13 years. So, the rotation of the tree age up to 13 or 14 years is desirable giving reasonable market price. Hussain *et al.* (1999) found in their study that the trees having DBH of 40 cm or more got more price per tree because of their higher demand in plywood industry. They also quoted the example of trees with same diameter that were sold at the rate of Rs. 5,000 per tree (in wood lot of 1000 trees at Mandi Bahauddin in 1999). Trees with less diameter (below 38 cm) are used as firewood only. Therefore they fetch low price and have the least market value.

CONCLUSION

All available data of *B. ceiba* and its statistical manipulation has strongly suggested that the tree should be grown for rotation between 13-15 years as it ensures maximum income and timely wood volume felling of the tree provides opportunity for next tree crop. The price trend computed for this tree species will help to motivate the farmers in Punjab to grow Simal on commercial basis to get maximum income according to the above said rotation. It has been further concluded that rotation of 14 years is the best for harvesting the tree if the same price per unit volume is available for either sizes, otherwise it should be harvested just after 12 years.

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