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Growth and Price Trend of *Eucalyptus camaldulensis* in Central Punjab

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ABSTRACT

Present research work was initiated to suggest proper rotation of farm-grown *Eucalyptus camaldulensis* based on maximum volume production and ultimate economic return. *Eucalyptus camaldulensis* achieved maximum MAI (volume) in 8th year of its 10 years life span in various ecological zones of central Punjab. As a whole, maximum volume was achieved during 7th year. Prices of the trees did not increase in proportion to volume per year. In spite of gradual increase in price per tree, the per cu. ft prices continued to decrease with increase in volume per year. This suggested that trees should be harvested during early years (within 7-8 years) for getting more income per annum.

Key Words: *Eucalyptus camaldulensis;* Growth; Price trend

INTRODUCTION

Pakistan is basically an agricultural country having 25% of total area under crops. However, forest has quite meager part, which is about 4.8%; whereas, the recommended ratio for balanced economic development, and environmental stability of the country is 20-25% (Malik *et al*., 1994; Quraishi, 2000). Due to over population stress, natural forest areas are being withdrawn from production to be placed in reserves. Everything points to a growing imbalance between demand and supply. Pakistan is suffering from acute shortage of timber wood and wood products. Share of forestry in GDP in 1983-84 was 0.35%, whereas in the year 2000, it has been reduced to 0.1% only. Growth rate of firewood during 1988-93 was 8.8% whereas during 1993-98 it was 2.9% only (Anonymous, 2000a).

Presently, public forests of Pakistan contribute only 10% of fuel wood and just 14% of the commercial timber. Farm grown wood provides 90% fuel wood and 65-70% of timber wood requirements (Mohyuddin, 1998). The remaining 15-20% of timber requirement is being fulfilled by the import of wood and wood products (Ahmad, 1991; Khan, 1989) and Rs. 9163.9 million per annum is being spent on the import of wood and wood products. The total demand of wood in the year 2000 was 844600 m^3 and the contribution of *Eucalyptus camaldulensis* to fulfill the gap was 61% i.e., 5191000 m^3 (Khan & Khan, 2001).

To ensure the required supply of wood, the level of production can be enhanced through more planting, shortening rotation, and intensive management. In order to meet the shortage of wood requirement, farmer should be motivated for boosting up the wood production through agro-forestry practices. The only possible way to convince the farmer is through demonstration of good return by raising fast growing trees with proper rotation.

Eucalyptus camaldulensis has been widely adapted in Pakistan and is the third largest farm-grown hardwood after *Dalbergia sissoo* and *Acacia nilotica* (Anonymous, 2000b). It is fast growing and is best suited to all types of soils and climates of Pakistan as it can tolerate pH up to 11, 9.2 and 8.8 in sandy, clayey and loamy soils, respectively (Gupta *et al*., 1990). It does not compete the crop because of its peculiar conical crown, less shade and pronounced tap root system and never become a host for any major pest (Sun & Dickinson, 1995; Hunter, 2001). As a timber it is straight, tall, medium to high density (Skog *et al.,* 1995) and its growth is quite desirable to our farmer as it is grown for short rotation.

In view of the above facts, a research study was carried out to know the rotational period of one of the fast growing tree species i.e., *Eucalyptus camaldulensis* with good economic return. The results may enable the researcher to propose suggestions for the farmer to increase planting of *Eucalyptus camaldulensis* in their farmlands.

MATERIALS AND METHODS

Different ecological zones of central Punjab comprising the districts of Gujranwala, Sheikhupura, Lahore, Kasoor, Faisalabad, Sargodha, Jhang, Toba Tek Singh, Sahiwal, Mianwali, Khushab etc were surveyed in 2000 to measure "Height and DBH (Diameter of tree at Breast Height or 4.5' above ground)" of farm grown *Eucalyptus camaldulensis* of known ages. A suitable number of agro foresters were contacted in this regard. About 500 trees were selected to measure the required parameters. The data of 500 trees were consolidated and tabulated for statistical analysis to determine arithmetic means of height and DBH and price per tree. Volume of the tree was calculated by applying combined variable formula:

$V = 0.5570 + 0.002079\ D^2H$

Where;
- 0.5570 = Regression constant.
- 0.002079 = Regression co-efficient for the parameters.
- D = Diameter of the tree at breast height (Independent variable).
- H = Height of the tree (Independent variable)
- V = Volume of the tree (Dependent variable)

(Muhammad, 1991; Hussain, 1980)

The volume, Mean Annual Increment (MAI), Current Annual Increment (CAI) and price per unit volume were calculated to find out the relations of various parameters with age of tree. The regression relations 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)

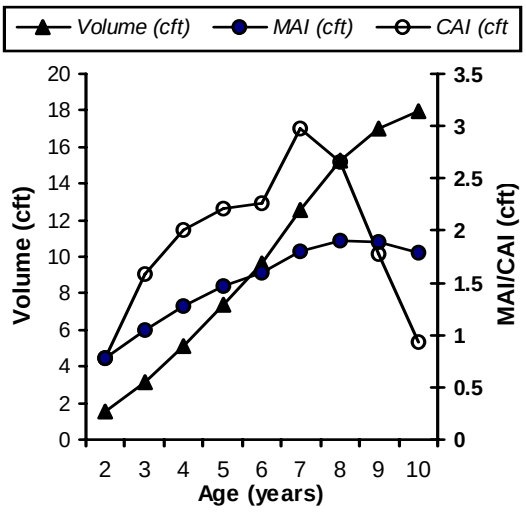
RESULTS AND DISCUSSION

Its is clear from the Fig. 1 and Table I that *Eucalyptus camaldulensis* attained its maximum biomass (volume, MAI and CAI) and growth and price etc. during early age (up to five years) of its growth, respectively. Height of the tree increased very rapidly for the first four years later on the height increment was quite low showing comparatively slow growth. Beadle *et al.* (1991) and Otegbeye (1990) also observed that growth of tree species was rapid in early years of their growth and then it gradually slowed down.

DBH of *Eucalyptus camaldulensis* increased rapidly with more or less constant rate from 1 to 8 years (Table I). Later on the increment was very low and somewhat constant up to the 10th year. The results are in line with Chaturvedi (1986).

As the Fig. 1 shows, volume of the tree increased rapidly and steadily up to 8 years whereas 9th year of the tree life marked the beginning of decline in the rate of volume production. Similar results have been documented by Rezende and Ferraz (1986). The growth curves of volume, Mean Annual Increment (MAI) and Current Annual Increment (CAI) of *Eucalyptus camaldulensis* intersected each other just before the point of 9th year showing the maximum growth rate during 8th and 9th year of growth (Fig. 1). The point of intersection suggests the rotation of 8-9 years of *Eucalyptus camaldulensis* for maximum volume production. Hunter (2001) also mentioned the maximum growth rate of eucalyptus species during 8th and 9th year of their growth. Following regression equation gives the best explanation of MAI up to 9th year.

Fig. 1: Age-volume (MAI /CAI) relationship of *Eucalyptus camaldulensis*



$MAI\ (vol.\ cft) = 0.8236 + 0.1365\ (years)$

$R^2 = 0.87$

Data of the present study revealed that prices of the trees did not increase in proportion to CAI of volume. Decline in price in relation to volume was due to miscommunication of the farmer with the timber market. Usually trees are sold on per tree basis irrespective of their volume. So after every year the price / cft decreased with the increase in total volume. Ahmad (1991) also found similar trend in the volume and prices of *Eucalyptus camaldulensis* in an earlier study.

Table I. Growth and price trend of *Eucalyptus camaldulensis* during 10 years of its life span

Age (years)	2	3	4	5	6	7	8	9	10
Height (ft)	25	32.2	39.1	41.2	42.7	44.5	46.7	47.2	48
Relative % Ht	52.08	67.1	81.4	85.8	88..96	92.7	97.29	98.33	100
DBH (inches)	4.37	6.2	7.5	8.9	10.2	11.21	12.3	12.95	13.2
Relative % DBH	33.10	46.96	56.81	67.42	77.27	84.92	93.18	98.10	100
Price/tree (Rs.)	175.4	257.8	304.05	391.1	407.1	516.8	573.05	628.15	660.6
Price/cft (Rs.)	113.16	82.36	59.27	53.28	42.41	41.08	36.6	36.93	36.82

LSD values for Height, DBH, Price/ tree and Price /cft. = 0.97, 0.24, 049 and 0.45, respectively.

CONCLUSION

All available data of *Eucalyptus camaldulensis* has strongly suggested that the tree should be grown for very short rotation (4-5 years) because it would ensure early and maximum income at the cost of minimum harm to crop. Our farmer is very lucky having excellent and unique price trend for *Eucalyptus camaldulensis* in Punjab under farm conditions. The favourable situation of more income for the tree crop in early year is offering a good chance to our farmer for enjoying more and more benefits by planting of *Eucalyptus camaldulensis* in their farmlands.

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