EFFECT OF SPACINGS ON THE GROWTH OF *EUCALYPTUS CAMALDULENSIS* UNDER AGROFORESTRY SYSTEMS

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INTRODUCTION

Amongst the various species in agroforestry programme, *Eucalyptus* has established itself as a tree most suitable for Agroforestry, as it can grow on a variety of soils under various climatic conditions. It has desirable qualities, such as fast rate of growth, clean straight bole, thin crown, ornamental value and less shade casting. Besides that, it has multiple uses i.e. poles, pulp, fuel, charcoal, fiber board, chipboard etc. and above all it gives high and early return.

Due to these characters *Eucalyptus camaldulensis* has been liked very much by farmers. Planting of Eucalyptus is being done by the farmers on field boundaries, in rows along water channels, on farm approach roads, as woodlots and in compact blocks in fields with agricultural crops at variable spacings.

In this paper results of effect of various spacings on the growth of *Eucalyptus camaldulensis* under agroforestry systems have been presented.

LAYOUT OF THE STUDY

In order to find out the effect of spacing on the growth of *Eucalyptus camaldulensis* in conjunction with agricultural crops, a study was laid out in Research Garden, Punjab Forestry Research Institute, Faisalabad during May, 1990. Six months old Eucalyptus seedlings raised in p/bags were planted at three spacings viz. 1.9×1.9 meters, 1.9×3.2 meters and 1.9×3.8 meters with 126, 70 and 56 plants in each plot of 28×17.2 meters dimension, Randomized Complete Block Design was adopted for planting and was replicated three times.

A variety of agricultural crops, one after the other were raised in between the lines by the farmers. These include Mash beans, Bersim and maize fodder. Irrigation with canal water was given according to the requirements of agricultural crops.

RESULTS AND DISCUSSION

Data for height and diameter growth were recorded during December, 1992 at the age of about 3 years and are compared for various spacings in Table 1.

Table: Height(m) and Diameter (cm) under diffeent spacings:

Repl.	Spacings					
	1.9×1.9m		1.9×3.2m		1.9×3.8m	
	Ht.	Dia.	Ht.	Dia.	Ht.	Dia
R1	9.0	8.1	8.8	8.9	9.0	8.9
R2	10.2	9.4	8.4	9.4	9.3	10.2
R3	9.6	9.1	9.5	9.9	10.3	10.2
Total:	28.8	26.6	26.7	28.2	28.6	29.3
Avg.	9.6	8.9	8.9	9.4	9.5	9.8

Statistical analysis of the above data indicated that the spacings have significant effect on diameter growth while it is non-significant in case of height growth at 95% confidence level. LSD (Least Significant Difference) test showed

1.9×1.9 m spacing gave minimum diameter growth which is logical also.

In order to compare wood production under different spacings, volume per hectare was obtained by using volume table prepared from the mateial removed in thinning. Cubical contents of 89 felled trees were calculated covering diameter range of 4 to 16 cms. The local volume table so obtained is given below:

D.B.H. (cms)	Tree volume (m^3)
4.1 - 6.5	0.0088
6.6 - 9.0	0.0178
9.1 - 11.5	0.0416
11.6 - 11.5	0.0702
14.1 - 16.5	0.1022

The volume per hectare under various treatments (spacings) for all the three replications is given in Table 2.

Table 2. Wood production/ha (cu.m) under different spacings

Repl.	Spacing (Treatment) in m		
	1.9×1.9	1.9×3.2	1.9×3.8
R1	1882.9	1129.8	941.3
R2	4393.4	2636.0	2196.6
R3	4393.4	2636.0	2196.6
Total	10669.7	6401.8	5334.5
Mean	3556.6	2133.9	1778.2

The statistical analysis (F-test) indicated that spacings had significant effect on wood production (volume per hectare) at 95% confidence level. The LSD test showed a significant difference of volume er hector between spacings of 1.9×1.9m and 1.9×3.2m and also between 1.9×1.9m and 1.9×3.8 m. However, there is no significant change in volume when the spacing is increased from 1.9×3.2 m to 1.9×3.8 m.

After taking the growth data in December, 1992 thinning was done as the tree crop became congested and farmers were reluctant to put the area under agri-crops cultivation. To widen the spacings, alternate rows of trees were removed keeping into consideration that more space be made available for smooth agri-crop cultivation by easy soil working in between tree rows.

The felled trees were measured and percentage of trees in various dia classes was determined under different spacings and are given in Table 3.

Table 3. Frequency distribution (in percent) for felled trees under various diameter classes

Spacing	No. of trees measured	Diameter classes (cms)		
		5.1-10.0	10.1-15.0	15.1 and above
1.9×1.9	57	68	32	-
1.9×3.2	50	60	40	-
1.9×3.8	61	44	54	2

The above table indicates that if the spacing between tree rows is wider, more trees fall in bigger diameter classes over a period of time. The percentage of trees fell down from 68 to 44% in case of smaller diameter class (upto 10 cms) and increased from 32 to 54% in case of higher diameter classes as the spacings increased from 1.9×1.9 m to 1.9×3.8 m.

Even under wider spacing of 1.9×3.8 m, 2% trees entered in the biggest diameter classes of 15.1 cms and above where no trees approached to

this class under closer spacing.

CONCLUSION

From the above results and discussion it is concluded that wider spacing between tree rows has a positive and significant effect on tree diameter growth. The spacing of 1.9×3.8 meter is more useful for Eucalyptus plantations which in addition to giving increased number of agriculture crop rotations, also enhances tree volume per unit area. Moreover, wider spacing provides better opportunity to the farmer for soil working and increased utility of his land resources by harvesting crops for longer period of time.