

# A Mathematical Model for Forest Growth

Dr Rashmi Chaudhary<sup>1</sup> Dr. A.K. Yadav<sup>2</sup>

Dr. S.S Tomar<sup>3</sup> Dr. Sushil Kumar<sup>4</sup>

<sup>1</sup>Govt.K.R.G P.G. College, Gwalior (M.P)

<sup>2</sup>Department of Mathematics, Govt. P.G. College, Datia, (M.P.)

<sup>3</sup>Govt.K.R.G P.G. College, Gwalior (M.P)

<sup>4</sup>Department of Mathematics, C.C.S. P.G. College, Heonra, Etawah (U.P.)

**Abstract:-** Presented herein is the studies growth of forest. The ideal model is to produce the result consistent which those in normal situation. It has been observed that the growth rate of forest depends upon parameter  $\alpha$ ,  $\beta$  and  $x$ . It has been observed that the growth of forest depends upon afforestation.

**Keywords:-** Afforestation, Deforestation, Resources, Growth Rate of Forest.

## I. INTRODUCTION

Forest play a very vital role in environment and socio-economy. Besides economy forest check air pollution and soil erosion, they save the hill slopes from landslides. Forest attract rainfall too. Forests are major factor of environmental concern afford protection to wild life against strong, cold or hot and dry winds. Forest constitutes the largest, complex and most important natural resources. About one third area of the earth's land area is covered with forest.

India is vast country having all types of climate, so the forests of our country also very lot according to climate. Variation is also found in degree of progress and exploitation of forest in different zones of India. But as far as the scientific attitude towards the progress of forestry is concerned.

Today forest is any land managed for the diverser purpose of forestry whether covered with trees shrubs climber etc. Forests are one of the most striking feature of the land surface. They are greatly in composition and density and stand in marked contrast to meadow and pastures. It will be seen that man was evolved only a million years ago when he lived in dense forests with other denizens. Palaeo-botanists have examined the fossils of plant fund in rocks of various ages and then deduced what kind of vegetation grew in particular geological periods.

The forests are one of man's very important natural renewable resources. They can be used for recreation, for utilization of the products obtained from them. Forests converge naturally the soil, the water, the flora and fauna. The purpose of the forests, in which the foresters should be most interested, is its total utilization.

Man is the most dynamic component of the environment, especially among all the living organisms. From the birth life starts with forests and end with it after

death. Since forest management is a complete problem involving various disciplines. The rate of trees growth is the next step to find out to fix the yield to be removed without diminishing the forest capital.

Establish of plantations, afforestation of barren lands and creation of man made forests require the study of a host of factors, selection both in the nursery and fields, subsidiary silvicultural operations like weeding, cleaning, thinning, pruning etc to maximize productivity. Thus the managing the forest is the practical application of science, technology and economics to a forest estate for the achievement of certain objectives.

Efforts to maintain and increases forest cover and forest productivity should be under taken in ecologically, economically. Development of forest resources is an integral part of the programme for optimum land utilization. Forest have important protective as well as productive function. The subject of forests is related to the entire range of environmental and development issues and opportunities including the right to socio-economic development on a sustainable basis.

Today those who live in or near the forests as a rule dislike the restraints and regulations imposed by foresters, as they can not see any justification for this with increase in population people have begun to cast covetous eyes on culturable land covered with forests, as the realisation is lacking that forests are equally essential to meet certain basic needs. By imitating and coasing nature to dynamic orchard silviculture that is creation of large-scale plantations of fast-growing and high yielding valuable species.

Forest annual yields equal to the increment can be realized indefinitely, without endangering future yields. Normal forest is a conception of forest management based on the principle of sustained yields. A normal forest is an ideally constituted forest with such volumes of trees of various ages so distributed and growing in such a way that they produce equal annual volumes of the produce. Sharma and Kesarkar[3] discussed the impact of forest on climate. Yadav A.K. and Chaudhary .R.[4] said that the expression of density depends on the utilization of forest. Agrawal and Mishra[2] discussed the impacts on growth the plant has yet not been taken in account. Chaudhary R.[1] discussed the growth of forest.

The purpose of this paper is to develop a mathematical model to increase the forest.

### II. FORMULATION OF THE PROBLEM

The proposed model be considered the forest growth model.

Let the deforestation is at a rate proportional forest size, the effect is equivalent to increasing in forest.

If afforestation and deforestation take place at constant rate  $a$  and  $b$  respectively, The rate of change.

$$\frac{dx}{dt} = \alpha x + a - b \tag{1}$$

$$\frac{dx}{dt} = \alpha x + \beta, \text{ where } a - b = \beta \tag{2}$$

Or

$$\frac{dx}{\alpha x + \beta} = dt \tag{3}$$

This solution of the equation subject to the boundary conditions;

$$x = x_0 \text{ at } t = 0 \tag{4}$$

### III. SOLUTION OF THE PROBLEM

Integrating equation (3) under the boundary condition (4) is

$$\log\left(\frac{\alpha x + \beta}{\alpha x_0 + \beta}\right) = \alpha t \tag{5}$$

$$\frac{\alpha x + \beta}{\alpha x_0 + \beta} = e^{\alpha t} \tag{6}$$

$$\alpha x + \beta = (\alpha x_0 + \beta)e^{\alpha t} \tag{7}$$

$$x = \left(x_0 + \frac{\beta}{\alpha}\right)e^{\alpha t} - \frac{\beta}{\alpha} \tag{8}$$

Or

$$x(t) = \left(x_0 + \frac{\beta}{\alpha}\right)e^{\alpha t} - \frac{\beta}{\alpha} \tag{9}$$

### IV. RESULT AND CONCLUSIONS

The present paper proposes a more realistic model. The solution gives the growth of forest plantation at a time  $t$  in the presence of afforestation and deforestation. We observed that the growth of forest plants depends upon two parameters  $x_0 e^{\alpha t}$  and  $\frac{\beta}{\alpha}(e^{\alpha t} - 1)$  which is also rapidly increasing. It has been observed that the growth of forest depends upon afforestation. It has been also observed that  $\alpha$  and  $\beta$  both are depends on afforestation.

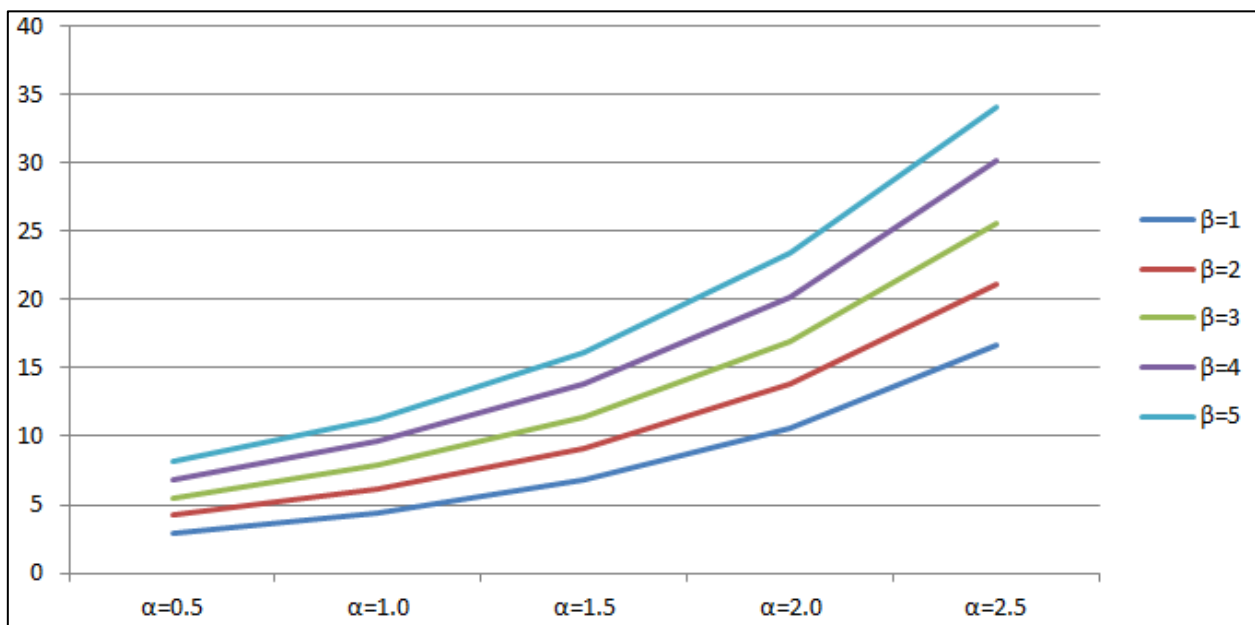


Fig 1

Variation of forest growth at  $t=1$  and  $x_0=1$ , Graph between  $x(t)$  and  $\alpha$

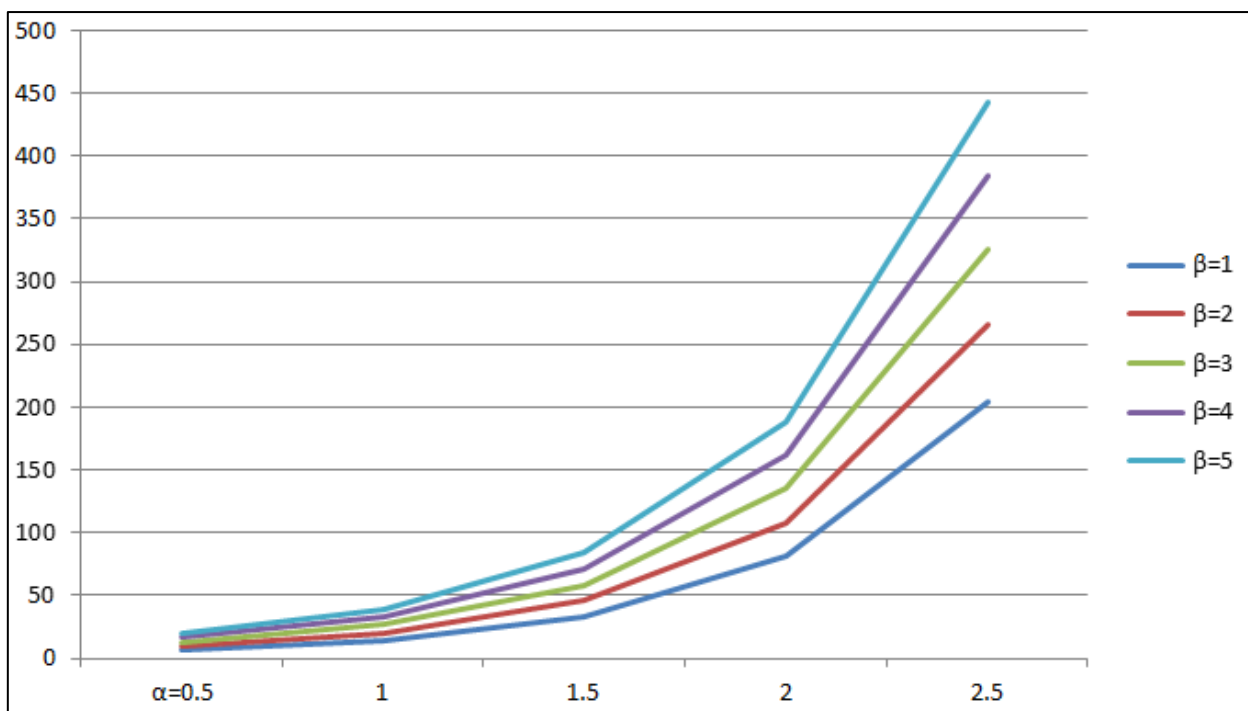


Fig 2

Variation of forest growth at t=2 and x<sub>0</sub>=1 , Graph between x(t) and α

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