Population Pressure On Forest Cover In Assam

(FROM 2001 TO 2010)

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Abstract:
The impact of population growth on the forest cover has been much debated worldwide. There is a reciprocal relationship between population growth and forest cover. In other words, population growth turns out to be the main cause of deforestation in many parts of the world. There is a strong link between demographic and socio-economic trends on one hand, and the depletion of resources and environmental degradation, on the other (Sinha, B.K and Choudhary, S,2008).. Apart from this, population pressure is directly related to the increase in built up areas, encroachment of land under forest cover and lowlands , urbanization, industrialization, alteration of land classes, etc. Increasing built-ups and encroachment by large population base affects the existing forest cover in different magnitude and direction. In this paper, negative relation between population and forest cover change is found, although magnitude is negligible. Simple linear regression and basic statistics are used to interpret the results. IBM-SPSS24 and MS-Excel is used for calculation of statistic.

Index Terms **– Population pressure, Population growth, Forest cover**

INTRODUCTION

Assam is situated in the north Eastern Region of India between 24°7'0" and 28°00'0" North latitude and between 89°42'0" and 96°02'0" East longitude. Arunachal Pradesh in the North, Mizoram in the South, Nagaland and Manipur in the East and Meghalaya, West Bengal and Bangladesh in the West bound the state. It has river valleys, Plateaus and mountains. The state occupies a total area of 78,438 sq. km. representing about 2.39 % of the total geographical area of India. The total population of the state is 26.66 million (2001 census). Rural population is 87.10% and urban population is 12.90%. The scheduled tribe population constitutes 12.4 % mainly distributed over 8 districts. The population density is 339 persons per kilometer square. The recorded forest area of Assam is 34.21 % of the total geographical area in 2009. To establish relation between growth in population and forest cover change in this paper, secondary data of population is collected from Statistical Handbook of Assam and Forest cover data is collected from digital repository of Forest Survey of India.

METHODS AND DATABASE

I) Secondary data for population is collected from Statistical Handbook of Assam, 2001 and 2011. Data relating to district wise forest cover of Assam for the period of 2001 and 2010 are collected from the digital repositories of Forest Survey of India.

II) Method(s) used to compile and analyze data are,

Simple Linear Regression:

It is used for bivariate data, of which one is independent (X) and the other is dependent (Y). The regression equation is Y= a ± bX, where 'a' is intercept and 'b' is determinant or slope or regression coefficient. Symbolically, $a = \bar{y}\text{-}b\bar{x}$ and $b = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}}$

't' test : For smaller number of observations, student 't' test is conducted.

$$t = \frac{b-0}{S.E(b)}, \text{ where S.E. (b)} = \frac{\delta^2 \mu}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{n}}} \text{ and } \delta^2 \mu = \frac{\sum y^2 \frac{(\sum y)^2}{n} - b\left\{\sum xy - \frac{\sum x^2 - y}{n}\right\}}{n-2}$$

III) Coefficient of Determination (R^2) :

To see how good the assumption of linearity in the relationship is, R^2 is worked out.

$R^2 = \frac{Explained\ Sum\ of\ Squares}{Total\ Sum\ of\ Squares}$, where Total sum of squares = $\sum y - \frac{(\sum y)^2}{n}$

Explained sum of squares = $b\left\{\sum xy - \frac{\sum x \sum y}{n}\right\}$

IV) **Tools used :**

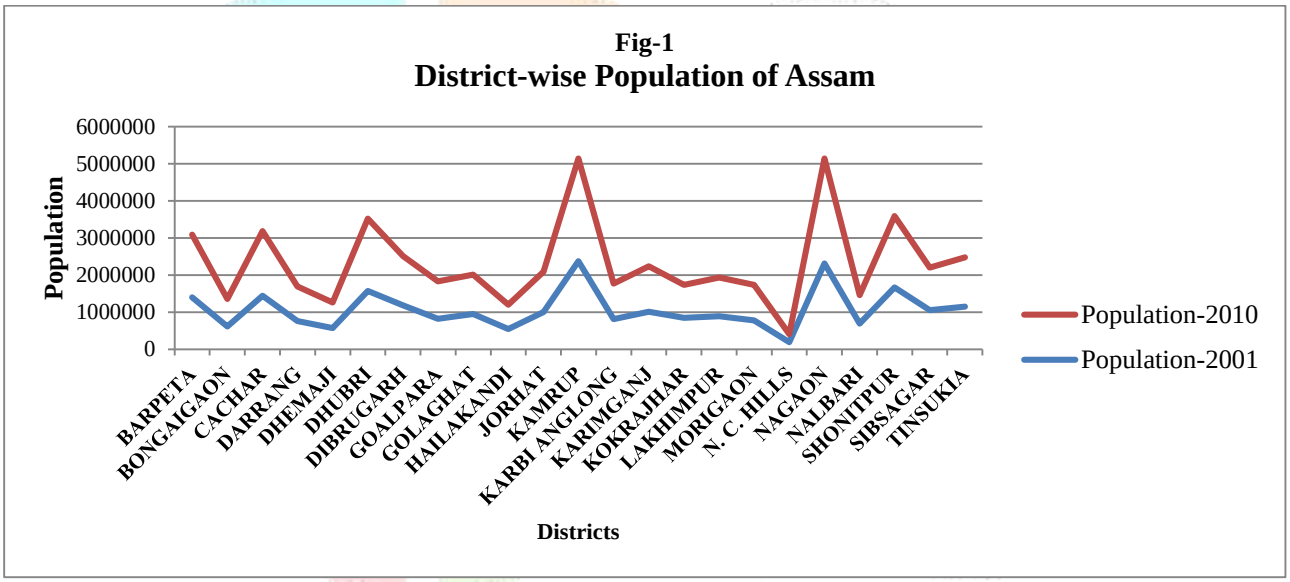
IBM-SPSS24 is used to calculate various tables of Regression, Correlation, ANOVA and Residuals. MS-Excel is also used to draw basic statistical diagrams and scatter plots.

RESULTS AND ANALYSIS

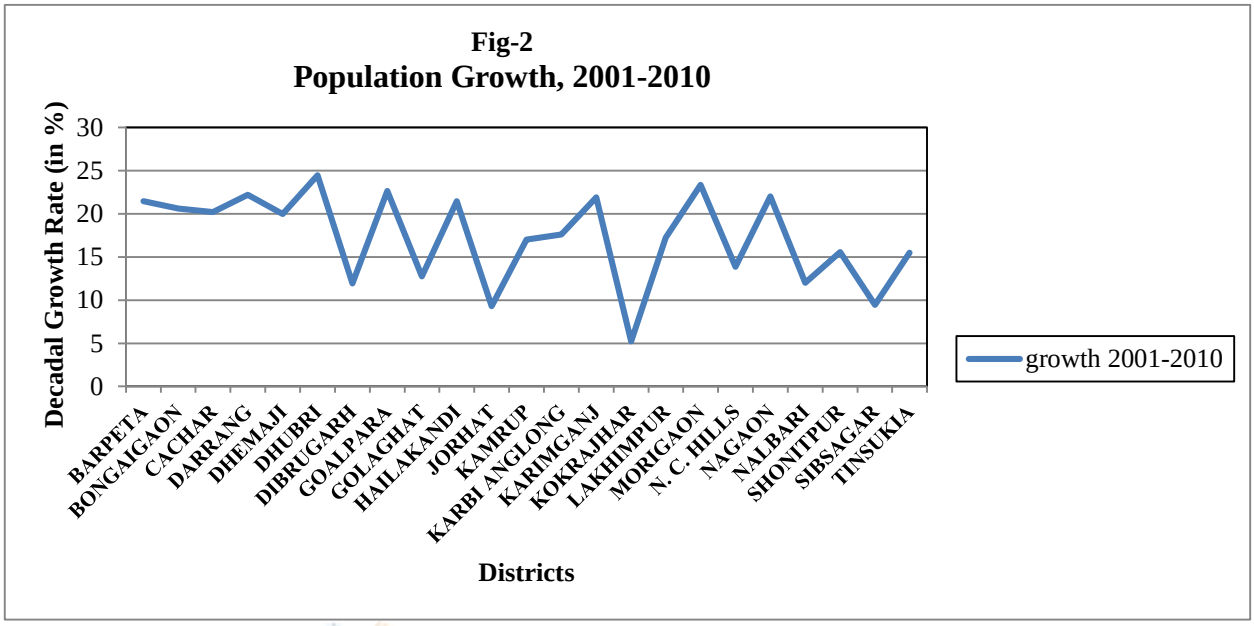
I) Figure-1 shows the district wise population distribution in Assam for 2001 and 2010. Among the districts, Kamrup and Nagaon occupy highest rank with more than 50 lakhs population in both years under reference. Dhubri and Sonitpur are in second rank followed by Cachar with 30 lakhs plus population. North Cachar Hill is in lowest rank with less than 10 lakhs population. Remaining districts show population in between 10 to 30 lakhs population (2010). It is observed that High forest cover is represented by the districts having comparatively less population (below 20 lakhs population).

Fig-1

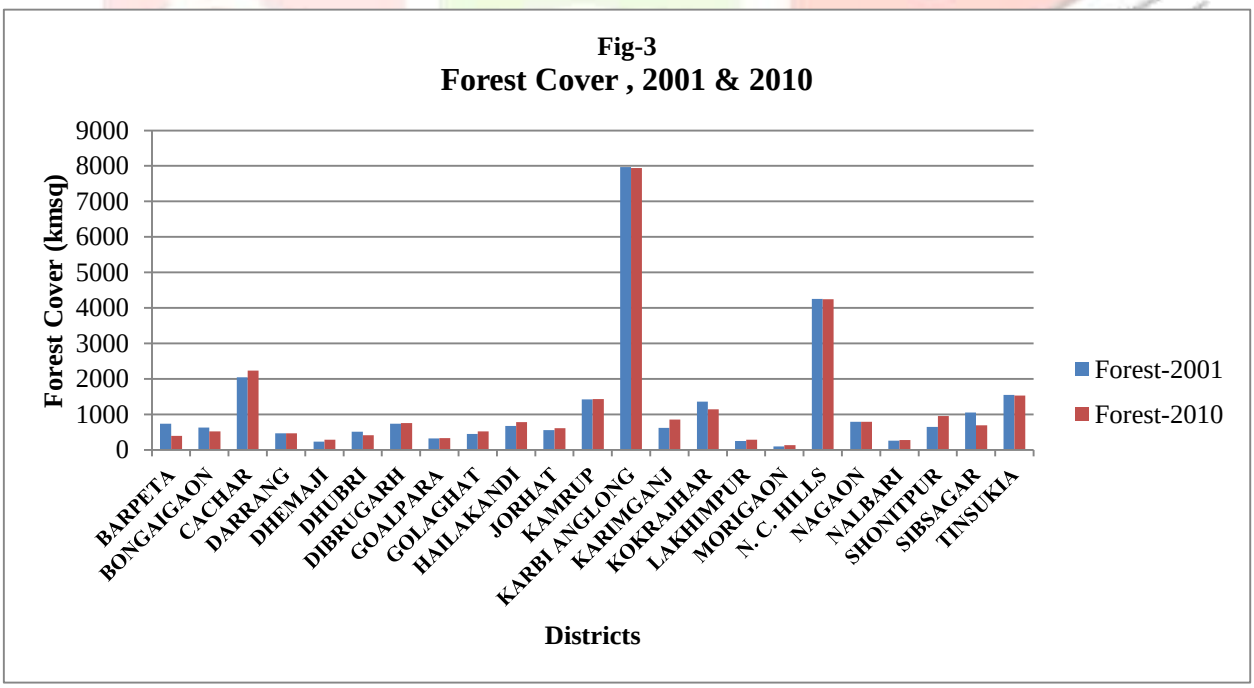
District-wise Population of Assam



II) Figure-2 shows the decadal population growth in the districts of Assam (base year 2001). Highest population growth is exhibited by Dhubri district. It is followed by Morigaon, Nagaon, Karimganj, Hailakandi, Goalpara, Darrang , Barpeta and Bongaigaon with more than 20% growth. Least population growth is shown by Kokrajhar with 5% growth in 2010. Remaining districts show population growth in between 10%-20% growth.



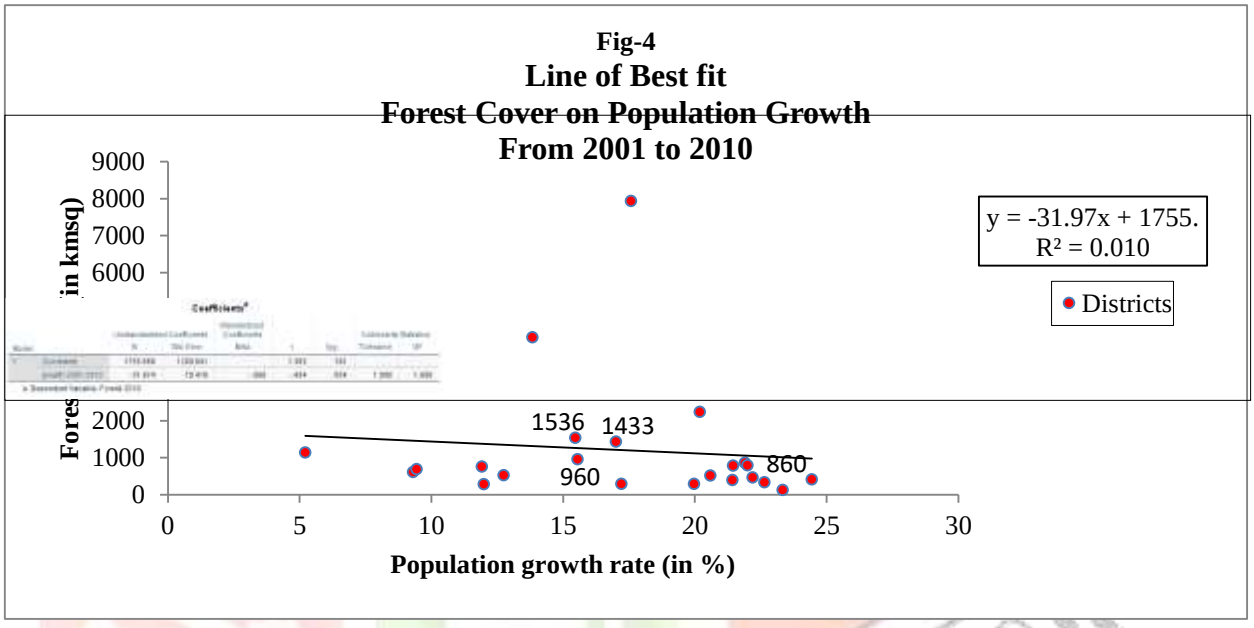
III) Fig-3 shows the district wise area under forest cover in Assam for 2001 and 2010. Karbi Anglong district exhibits first and North Cachar hill district second rank in the state. It is followed by Cachar district. Kamrup, Tinisukia, Kokrajhar , Sibsagar and Sonitpur also show considerable areas under forest cover with slight decadal change. Significant change in forest cover is seen in the districts of Barpeta, Dhubri, Kokrajhar and Sibsagar. Two hill districts of Karbi Anglong and North Cachar Hills show consistency in terms of changes in areas under forest cover. Representing the Brahmaputra river valley, Kamrup district exhibits no change in the decadal data set.



IV) Figure-4 shows the Regression equation with line of best fit. Negative value of 'b'(-31.97) shows negative correlation between Forest cover and the decadal growth. Although Pearson's Coefficient of Correlation (r) is negligibly negative as evidenced from the value of R^2, still the slope of the equation is interpretable. Hence, the regression equation states that one unit change in population causes 31.97 unit decrease in forest cover. The relation is mostly applied in the cases of Tinisukia (y = 1536), Kamrup (y = 1433), Sonitpur (y = 960) and Karimganj (y = 860) only. Most interestingly, there is least relationship between the variables seen in the hill districts of Karbi Anglong (y = 7973) and N.C. Hills (y = 4250). It implies to the fact that forest covers of these hill districts changes due to other factors other than population pressure. Remaining districts show very negligible negative relation between the variables.

Model summary shows that intercept of the regression equation (a) is 1755 and slope (b) is -31.97. The't'-value is significant at 10% level of significance. As it is a simple linear bi-variate regression, tolerance value is 1.00 as expected.

Fig-4
Line of Best fit
Forest Cover on Population Growth
From 2001 to 2010



CONCLUSION

Effective and desired relationship can be achieved if independent and dependent variables are selected on basis of ground reality check. Theoretical or arbitrary selection of variables very often is unable to draw any concrete inferences. The problem stated here is a universal one. In this paper, there is a scope of adding more independent variables to predict the dependent variable, or identifying principal component(s) from sets of variables selected for the purpose.

NO CONFLICT OF INTEREST : There is no conflict of interest in terms of funding and collected data.

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Data Table:

ID	Districts	Forest-2001 (in kmsq)	Population	Forest-2010 (in kmsq)	Population	Population Growth 2001-2010
0	BARPETA	738	1394755	397	1693622	21.43
1	BONGAIGAON	631	612665	521	738804	20.59
2	CACHAR	2049	1444921	2236	1736617	20.19
3	DARRANG	472	759858	470	928500	22.19
4	DHEMAJI	233	571944	291	686133	19.97
5	DHUBRI	518	1566396	418	1949258	24.44
8	DIBRUGARH	739	1185072	758	1326335	11.92
9	GOALPARA	323	822035	337	1008183	22.64
10	GOLAGHAT	452	946279	525	1066888	12.75
11	HAILAKANDI	676	542872	786	659296	21.45
12	JORHAT	562	999221	613	1092256	9.31
13	KAMRUP	1429	2371276	1433	2771480	17.01
14	KARBI ANGLONG	7972	813311	7939	956313	17.58
16	KARIMGANJ	625	1007976	860	1228686	21.9
17	KOKRAJHAR	1364	843243	1144	887142	5.21
18	LAKHIMPUR	256	889010	293	1042137	17.22
19	MORIGAON	104	776256	133	957423	23.34
22	N. C. HILLS	4258	188079	4250	214102	13.84
20	NAGAON	794	2314629	796	2823768	22
21	NALBARI	267	689053	282	771639	11.99
24	SHONITPUR	649	1665125	960	1924110	15.55
23	SIBSAGAR	1054	1051736	695	1151050	9.44
25	TINSUKIA	1549	1150062	1536	1327929	15.47