A Synthesis of Information on State-Wise Forest Cover Change for the Period 2000-2017 in India

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Abstract - *India ranks 10th in the list of most forested nations in the world with 76.87 million ha of forest and tree cover. Like other forests of the world, our forests also provide critical ecosystem goods and services. In this paper we study the changes that have been occurring in forest covers of different states of India from the year 2001 to 2017 and in the nation as a whole. The negative changes in the forest cover indicate deforestation. The analysis of variance technique is used to compare and analyze the forest cover data over the years as well as over different States of India. Also regression equations are fitted for each States of India for the period 2001 - 2017 to study the trends of deforestation and compare the trends.*

Key words - *Forest cover, deforestation, SFR, Analysis of variance, trend line.*

I. INTRODUCTION

Assessment of forest cover using satellite data on a two-year cycle has been one of the most important activities of Forest Survey of India (FSI) since 1986. FSI carries out assessment and monitoring of forest cover of the country on a two-year cycle and publishes the findings in the form of 'State of Forest Report' (SFR) on biennial basis. The first SFR was brought out in 1987 and the latest one is the SFR 2017, which is the sixteenth in the series. The forest cover is assessed and monitored by interpreting the latest satellite data procured from National Remote Sensing Agency (NRSA), Hyderabad. The SFRs provide valuable information for policy formulation and planning both at national and state levels. The National Forest Policy (1988) sets out a definite quantitative stipulation for the forest and tree cover for the country and the periodical information provided by SFRs keeps the nation informed of gaps between the actual status and the goals set[1].

Deforestation is said to occur while there is a decrease in the forest cover. It will be appropriate here to explain what is meant by forest cover in this article. The normal perception is that forest cover would include areas covered by the canopy of naturally occurring forests, while manmade tree crops and plantations should constitute tree cover. When interpreting satellite imagery for a small area followed by intensive ground verification, it may be possible to distinguish natural forests from plantations. Several articles and research studies dealing with limited areas provide detailed outputs about different land uses and classes of forest cover. However, there is no robust technique available for this that can be applied universally. Moreover, considering the limited time and manpower resources available with FSI, it is not possible to carry out such an exercise for the whole country. Therefore, FSI has used technology-based definitions for forest cover and tree cover.

According to Forest Survey of India (FSI), all tree canopies that could be delineated and assessed from satellite data (sensor LISS III of IRS satellite 1C/1D) is termed as forest cover. It includes canopy of all forest and tree crops, larger than 1 ha in extent, irrespective of land ownership, land use and type of tree species. With spatial resolution of 23.5 m of sensor LISS III aboard Indian Remote Sensing satellite 1C/1D and using digital image processing technique, land cover could be mapped at a larger scale of 1:50,000. At this scale, forest cover down to 1 ha could now be delineated. However, even with the present capability, countrywide identification and mapping of different tree species is not possible. Also, it is not possible from satellite data to determine what kind of land use is being practiced under the tree canopy or who owns the land. Thus forest cover cannot be classified into natural forests, orchards, coffee/tea plantations, public parks, agro-forestry plantations, etc. On the other hand the area under canopy of all other tree crops not captured by satellite data is termed as tree cover. These were assessed by conducting field inventory. Only trees having diameter of 10 cm or more at breast height were included. A statistically sound stratification and sampling design was developed for assessing tree cover at the national level. The country was

stratified into zones constituting such geographic areas that exhibit broad similarity in the factors responsible for tree growth (e.g., altitude, geographic location, soil, precipitation, temperature, soil moisture, etc.) and thus support fairly homogenous tree vegetation. These zones were termed as physiographic zones and the country was stratified into fourteen zones. The data obtained from inventory of trees in sampled rural and urban units was processed and aggregated to estimate number of trees of different diameter classes and species for all physiographic zones. Where actual area under tree crops was not possible to determine (e.g., trees in urban areas or scattered trees in rural areas), relationships between the diameter and crown area of trees for different species were used to convert the number of trees into "notional" area under tree cover.

Substantial increases in human activities over the last century have resulted in forest decline, in this world. Forest decline manifests as both deforestation—that is, depletion of the tree crown cover to less than 10 percent—and degradation, or negative structural or functional changes that reduce forest quality (e.g. through over-exploitation, repeated fires, or disease)[2]. Some of the key research in this area has focused on the precise assessment of deforestation rates, while another central challenge has been to understand the proximate and underlying drivers of deforestation [3].

Increasing realization of the fact that forest not only provides multiple benefits to mankind but also help in conserving the environment have created global concern for their protection and preservation. Destruction and degradation of forest resources may have detrimental effect on soil, water and climate and hence on human and animal life on the earth. However, for formulating appropriate policies and drawing effective management plans it is essential to monitor the changes in the status of forests and make accurate and periodic assessments of forest resources [4].

Our aim in this article is to analyze and compare the data provided by FSI on changes in forest cover of different states of India statistically and to understand the trend of deforestation occurring in the different states over a period of about two decades by fitting mathematical equations. This study gives a clear picture of the deforestation scenario of India which is not possible to have from the different FSRs published in different years. Analysis of Variance (ANOVA) technique is used for the comparison of the changes in forest covers or in other words volume of deforestation. The two-way ANOVA is a technique which compares the mean differences between groups that have been split on two independent variables (called factors)[11]. The primary purpose of a two-way ANOVA is to understand if there is an interaction between the two independent variables on the dependent variable. The two factors in our study are the different time periods and the different states of India and the changes in forest cover is the dependent variable. This follows a multiple comparison of the forest cover change figures of India over different years by using Tukey's test.

II. PRESENT FOREST COVER SCENARIO IN INDIA

The total forest of the country, as per current assessment is 708273 sq km which is 21.54% of the geographic area of the country[9]. In terms of density classes, area covered by Very Dense Forest (VDF) is 98,158 sq km that with Moderately Dense Forest (MDF) is 308318 sq km and Open Forest (OF) is 301797 sq km corresponding to 2.99, 9.38 and 9.18 percent respectively of the total geographical area of the country[9].

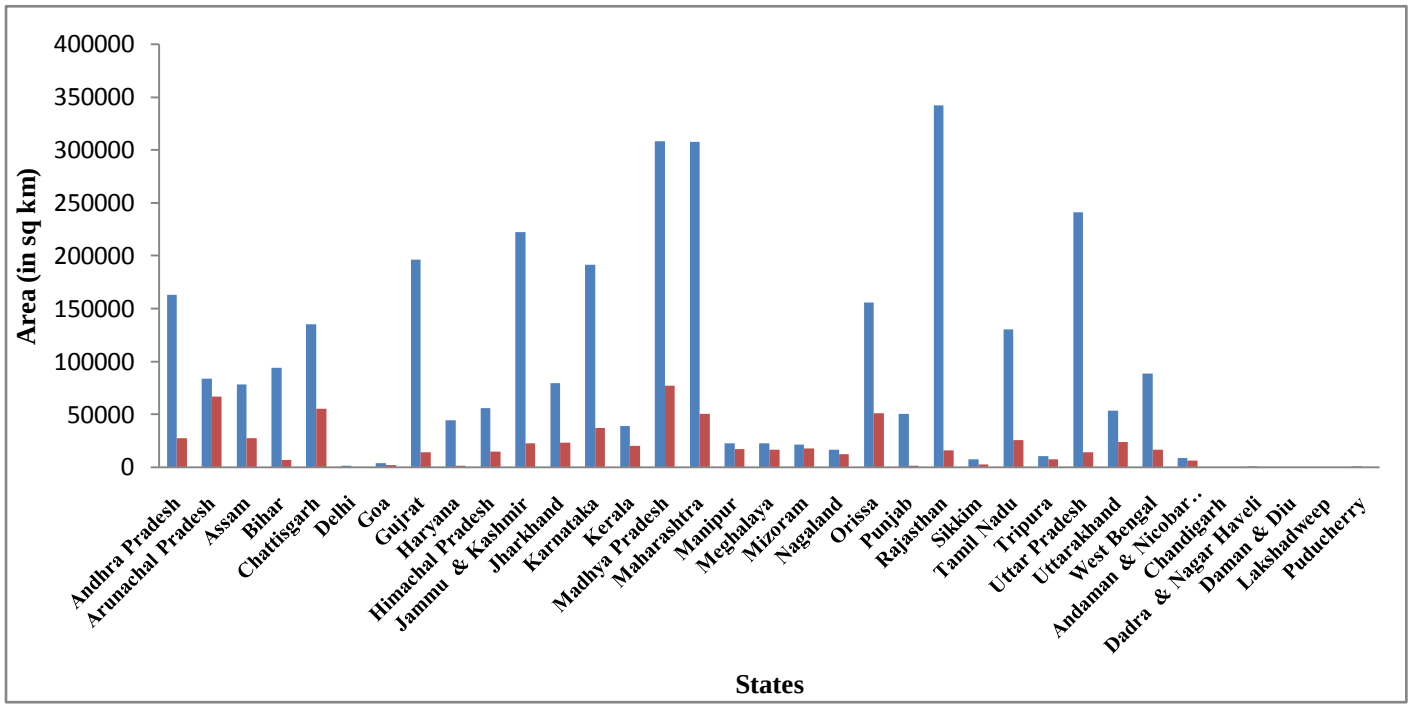
Forest covers of different States and Union Territories of the country have been depicted in FIGURE I and presented in TABLE I. From the figure and table it is clear that area wise, Madhya Pradesh has largest forest cover in the country followed by Arunachal Pradesh, Chhattisgarh, Orissa and Maharashtra. While in terms of percentage of forest cover with respect to total geographical area, Lakshadweep leads at 90.33% followed by Mizoram at 86.27%, Andaman and Nicobar Islands at 81.73%, Arunachal Pradesh at 79.96% Manipur at 77.69%, Meghalaya at 76.45%, Nagaland at 75.33% and Tripura at 73.68%[9].

TABLE I

GEOGRAPHICAL AREA AND FOREST COVER AREA IN DIFFERENT STATES OF INDIA (AS PER ISFR 2017)

Sl. No	State	Geographic Area (in sq km)	Forest Cover (in sq km)
1.	Andhra Pradesh	162968	28147
2.	Arunachal Pradesh	83743	66964
3.	Assam	78438	28105
4.	Bihar	94163	7299
5.	Chhattisgarh	135192	55547
6.	Delhi	1483	192
7.	Goa	3702	2229
8.	Gujarat	196244	14757
9.	Haryana	44212	1588
10.	Himachal Pradesh	55673	15100
11.	Jammu & Kashmir	222236	23241
12.	Jharkhand	79716	23553
13.	Karnataka	191791	37550
14.	Kerala	38852	20321
15.	Madhya Pradesh	308252	77414
16.	Maharashtra	307713	50682
17.	Manipur	22327	17346
18.	Meghalaya	22429	17146
19.	Mizoram	21081	18186
20.	Nagaland	16579	12489
21.	Orissa	155707	51345
22.	Punjab	50362	1837
23.	Rajasthan	342239	16572
24.	Sikkim	7076	3344
25.	Tamil Nadu	130060	26281
26.	Tripura	10486	7726
27.	Uttar Pradesh	240928	14679
28.	Uttarakhand	53483	24295
29.	West Bengal	88752	16847
30.	Andaman & Nicobar Island	8249	6742
31.	Chandigarh	114	22
32.	Dadra & Nagar Haveli	491	207
33.	Daman & Diu	111	20
34.	Lakshadweep	30	27
35.	Puducherry	490	54

FIGURE I
GEOGRAPHICAL AREA AND FOREST COVER AREA IN DIFFERENT STATES OF INDIA (AS PER ISFR 2017)



III. STATISTICAL ANALYSIS

We have considered data for analyzing the change in forest covers in 35 different states of India from the FSR of India for the period from 2001 to 2017. Statistical analysis is made in three stages as discussed in the following subsections respectively.

A. Comparison with respect to mean change of Forest Cover

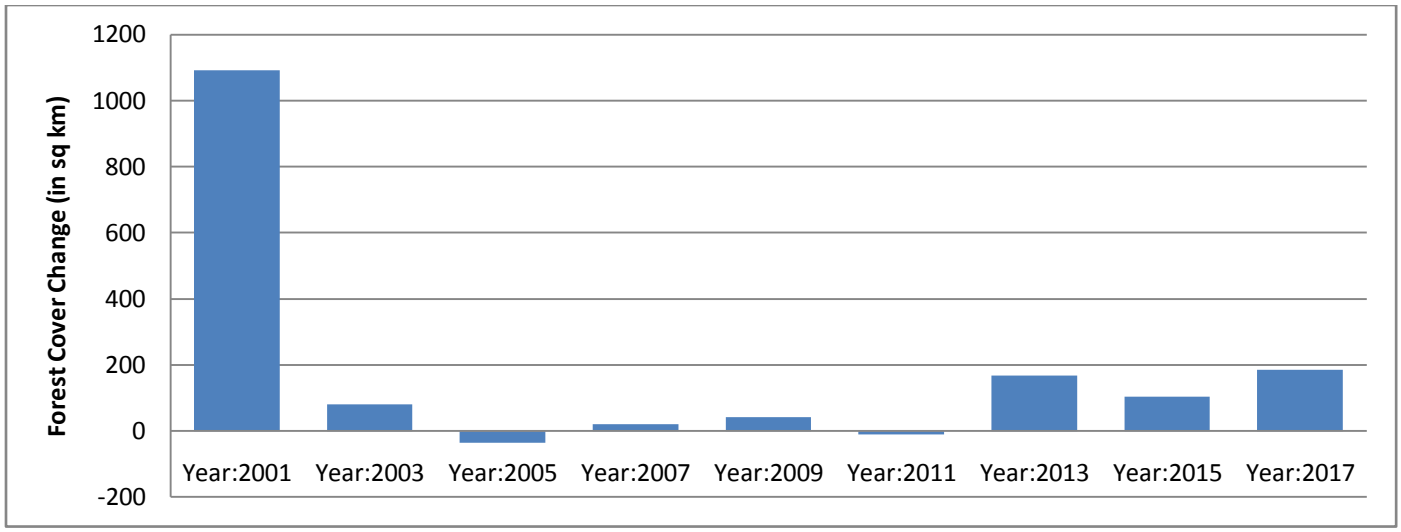
The following tabulations and the diagrams present the average changes of forest covers for the period under consideration in the states of India.

TABLE II
AVERAGE FOREST COVER CHANGE IN INDIA : YEAR WISE (PERIOD 2001-2017)

Year	Mean forest cover of all States
2001	1092.229
2002	79.857
2005	-35.571
2007	20.800
2009	42.714
2011	-10.457
2013	167.771
2015	104.629
2017	185.743

Above results, diagrammatically presented below :

FIGURE II
AVERAGE CHANGE IN FOREST COVERS OF INDIA : YEAR WISE (PERIOD 2001 – 2017)



The above tabulation as well as figure reveal that increase in the forest cover was maximum during the period 1999 to 2001while deforestation in India was maximum during 2003 to 2005.

Now, the average changes in forest covers in different states of India for the period under consideration are presented below:

TABLE III

AVERAGE CHANGE IN FOREST COVERS OF INDIA: STATE WISE (PERIOD 2001 – 2017)

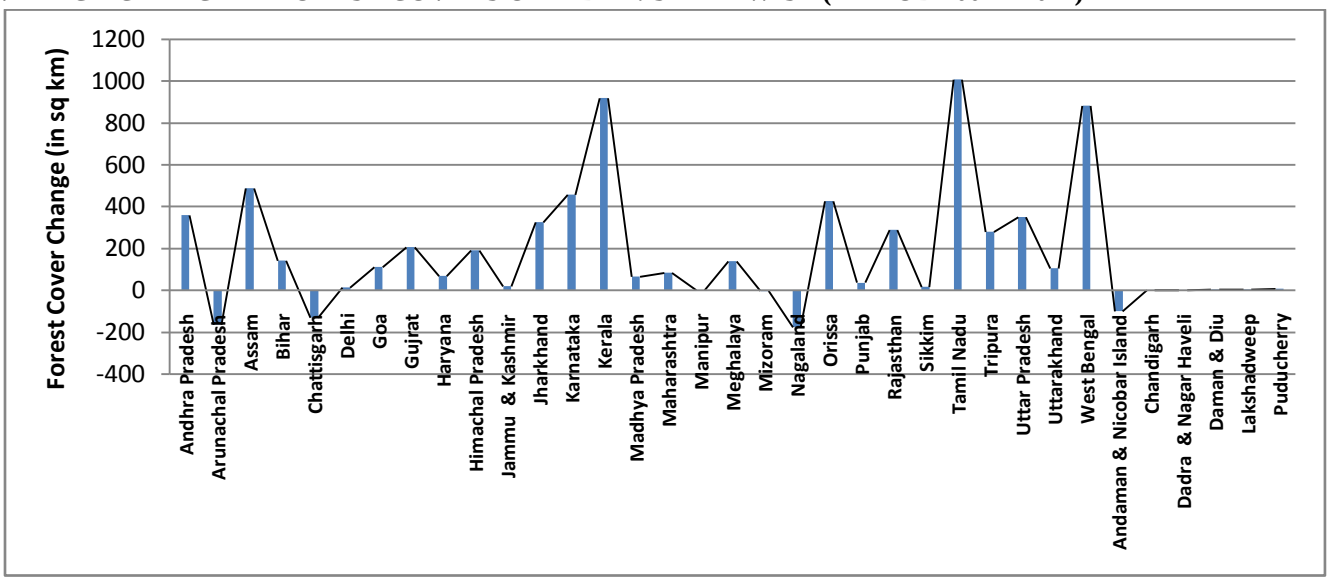
State	Mean forest cover over the period 2001-2017(in sq km)
Andhra Pradesh	359.556
Arunachal Pradesh	-164.889
Assam	487.667
Bihar	141.667
Chhattisgarh	-131.667
Delhi	11.667
Goa	111.111
Gujarat	205.889
Haryana	67.889
Himachal Pradesh	190.000
Jammu & Kashmir	17.889
Jharkhand	326.111
Karnataka	456.222
Kerala	918.889
Madhya Pradesh	65.222
Maharashtra	83.778
Manipur	.778
Meghalaya	139.000
Mizoram	-4.111
Nagaland	-177.111
Orissa	425.000
Punjab	35.889
Rajasthan	289.333
Sikkim	15.000
Tamil Nadu	1007.778
Tripura	277.778
Uttar Pradesh	350.556
Uttarakhand	105.778
West Bengal	881.111
Andaman & Nicobar Island	-99.778
Chandigarh	1.556
Dadra & Nagar Haveli	1.111

Daman & Diu	2.444
Lakshadweep	2.889
Puducherry	5.778

Diagram below gives a more vivid picture of the above tabulation.

FIGURE III

AVERAGE CHANGE IN FOREST COVERS OF INDIA : STATE WISE (PERIOD 2001 – 2017)

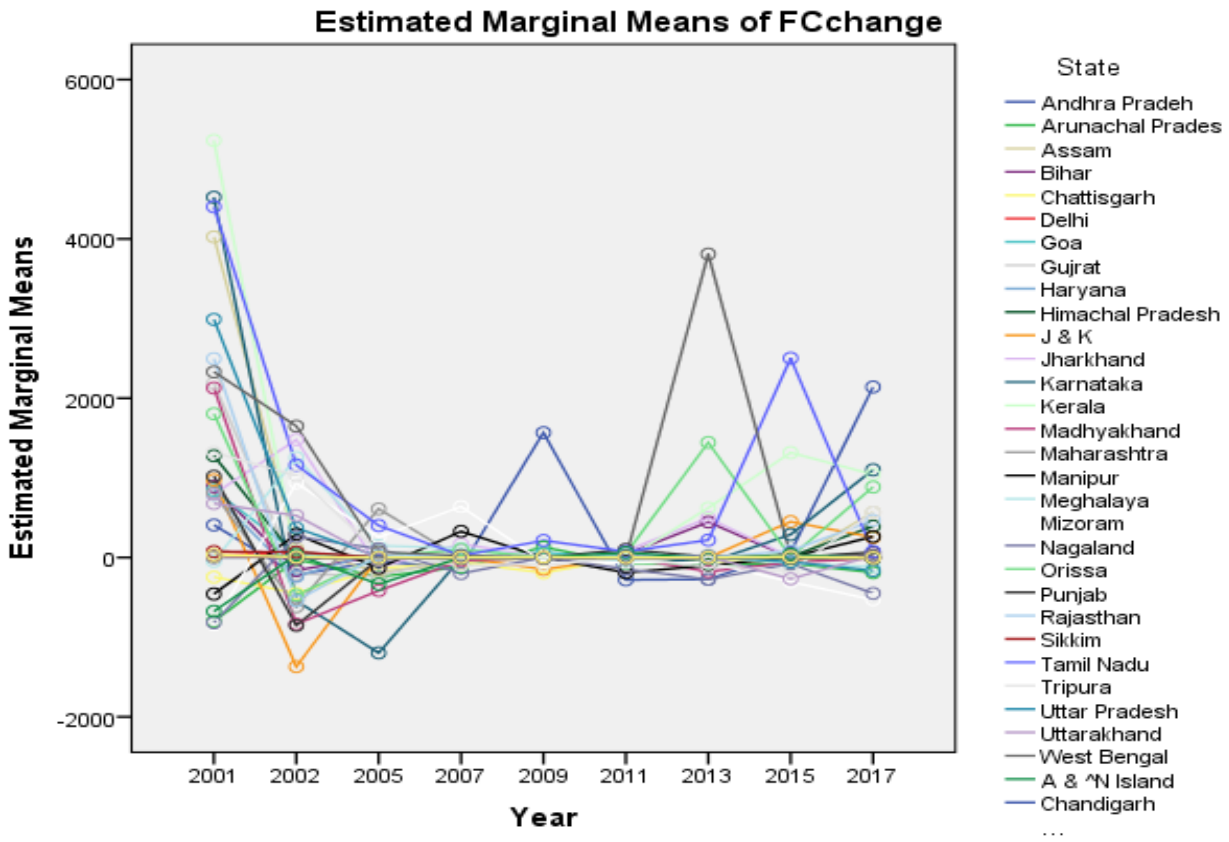


It is clear from the above that Kerala among all the states of India has been recorded as the state where forest growth is maximum over the period under consideration whereas in Arunachal Pradesh deforestation is found to be maximum during 2001 to 2019.

A diagrammatic comparison of forest cover changes, considering the marginal means (estimate) for different States of India is shown in FIGURE IV.

FIGURE IV

ESTIMATED MARGINAL MEANS OF FOREST COVER CHANGE (FCCHANGE)



B. Analysis of Variance and Multiple Comparison

While applying the ANOVA, we consider the following null hypotheses -

H1 : There are no significant differences in the means of change of forest cover/deforestation of India during different time periods and

H2 : There are no significant differences in the means of change of forest cover/deforestation in various states of India over the period 2001-2017.

The variance ratio tests are performed to test the above hypotheses and the test-results are presented in TABLE IV, below

TABLE IV
ANALYSIS OF VARIANCE TABLE

Source	Sum of Squares	d.f.	Mean Squares	F-statistics	p-value
Corrected Model	59810860.102	314	1424068.098	3.359	0.000
Intercept	10558186.984	1	10558186.984	24.903	0.000
Year	34121659.530	8	4265207.441	10.060167	0.0001
State	25689200.571	34	755564.723	1.78211	0.007
Error	115319786.914	272	423969.805		
Total	185688834.000	315			

Corrected Total	175130647.016	314			$R^2 = 0.342$

Level of significance = 0.05 ; d.f. = Degrees of Freedom

Results in TABLE IV, depict that the values of the test statistics are highly significant as since both the p-values against the independent variables 'Year' and 'State' are < 0.05. Therefore, we reject the null hypotheses and infer that forest change or deforestation scenario is different in different States of India and with respect to time also deforestation patterns are different. This leads to the suggestion that the different State Governments of India should adopt different State specific policies to handle the issue of deforestation.

Also the value of the coefficient of determination, R^2 indicates that almost 34% variability of the response data around the means are explained by the model under consideration.

Post hoc test suggested Tukey has been applied for multiple comparisons of amount of Forest Cover changes over different years (2001 – 2017) and the results are presented in the following table (TABLE V)

TABLE V

MULTIPLE COMPARISON TABLE

Dependent Variable: Forest Cover change

(I) Year	(J) Year	Mean Difference (I-J)	Standard Error	P - values	95% Confidence Interval	
					Lower Bound	Upper Bound
2001	2003	1012.37*	155.650	.000	525.66	1499.08
	2005	1127.80*	155.650	.000	641.09	1614.51
	2007	1071.43*	155.650	.000	584.72	1558.14
	2009	1049.51*	155.650	.000	562.80	1536.23
	2011	1102.69*	155.650	.000	615.97	1589.40
	2013	924.46*	155.650	.000	437.75	1411.17
	2015	987.60*	155.650	.000	500.89	1474.31
	2017	906.49*	155.650	.000	419.77	1393.20
2003	2001	-1012.37*	155.650	.000	-1499.08	-525.66
	2005	115.43	155.650	.998	-371.28	602.14
	2007	59.06	155.650	1.000	-427.65	545.77
	2009	37.14	155.650	1.000	-449.57	523.85
	2011	90.31	155.650	1.000	-396.40	577.03
	2013	-87.91	155.650	1.000	-574.63	398.80
	2015	-24.77	155.650	1.000	-511.48	461.94
	2017	-105.89	155.650	.999	-592.60	380.83
2005	2001	-1127.80*	155.650	.000	-1614.51	-641.09
	2002	-115.43	155.650	.998	-602.14	371.28
	2007	-56.37	155.650	1.000	-543.08	430.34
	2009	-78.29	155.650	1.000	-565.00	408.43
	2011	-25.11	155.650	1.000	-511.83	461.60
	2013	-203.34	155.650	.929	-690.05	283.37
	2015	-140.20	155.650	.993	-626.91	346.51
	2017	-221.31	155.650	.889	-708.03	265.40

2007	2001	-1071.43*	155.650	.000	-1558.14	-584.72
	2002	-59.06	155.650	1.000	-545.77	427.65
	2005	56.37	155.650	1.000	-430.34	543.08
	2009	-21.91	155.650	1.000	-508.63	464.80
	2011	31.26	155.650	1.000	-455.45	517.97
	2013	-146.97	155.650	.990	-633.68	339.74
	2015	-83.83	155.650	1.000	-570.54	402.88
	2017	-164.94	155.650	.979	-651.65	321.77
2009	2001	-1049.51*	155.650	.000	-1536.23	-562.80
	2002	-37.14	155.650	1.000	-523.85	449.57
	2005	78.29	155.650	1.000	-408.43	565.00
	2007	21.91	155.650	1.000	-464.80	508.63
	2011	53.17	155.650	1.000	-433.54	539.88
	2013	-125.06	155.650	.997	-611.77	361.65
	2015	-61.91	155.650	1.000	-548.63	424.80
	2017	-143.03	155.650	.992	-629.74	343.68
2011	2001	-1102.69*	155.650	.000	-1589.40	-615.97
	2003	-90.31	155.650	1.000	-577.03	396.40
	2005	25.11	155.650	1.000	-461.60	511.83
	2007	-31.26	155.650	1.000	-517.97	455.45
	2009	-53.17	155.650	1.000	-539.88	433.54
	2013	-178.23	155.650	.967	-664.94	308.48
	2015	-115.09	155.650	.998	-601.80	371.63
	2017	-196.20	155.650	.942	-682.91	290.51
2013	2001	-924.46*	155.650	.000	-1411.17	-437.75
	2003	87.91	155.650	1.000	-398.80	574.63
	2005	203.34	155.650	.929	-283.37	690.05
	2007	146.97	155.650	.990	-339.74	633.68
	2009	125.06	155.650	.997	-361.65	611.77
	2011	178.23	155.650	.967	-308.48	664.94
	2015	63.14	155.650	1.000	-423.57	549.85
	2017	-17.97	155.650	1.000	-504.68	468.74
2015	2001	-987.60*	155.650	.000	-1474.31	-500.89
	2003	24.77	155.650	1.000	-461.94	511.48
	2005	140.20	155.650	.993	-346.51	626.91
	2007	83.83	155.650	1.000	-402.88	570.54
	2009	61.91	155.650	1.000	-424.80	548.63
	2011	115.09	155.650	.998	-371.63	601.80
	2013	-63.14	155.650	1.000	-549.85	423.57
	2017	-81.11	155.650	1.000	-567.83	405.60

2017	2001	-906.49*	155.650	.000	-1393.20	-419.77
	2003	105.89	155.650	.999	-380.83	592.60
	2005	221.31	155.650	.889	-265.40	708.03
	2007	164.94	155.650	.979	-321.77	651.65
	2009	143.03	155.650	.992	-343.68	629.74
	2011	196.20	155.650	.942	-290.51	682.91
	2013	17.97	155.650	1.000	-468.74	504.68
	2015	81.11	155.650	1.000	-405.60	567.83

Based on observed means.
The error term is Mean Square(Error) = 423969.805.
***. The mean difference is significant at the .05 level.**

Results in the above table (TABLE V) reveal an interesting fact that the differences in the amount of Forest Cover change in the year 2001 is statistically highly significant with that of all the changes occurred in the remaining years i.e., 2003,2005, 2007, 2009, 2011, 2013, 2015 and 2017. Also, the positive differences (when I = 2001 in TABLE V) indicate that in comparison to 2001, deforestation occurred in each of the subsequent years till 2017.

C. Linear Trend Analysis

For each of the states, linear trend lines are fitted which is of the form $Y = \alpha + \beta X$, where Y is the random variable that represents the time period while the independent variable X denotes the forest cover changes in different states of India. Results are shown in TABLE VI.

TABLE VI
FITTED LINEAR TREND LINES AND THE CORRESPONDING VALUES OF THE TEST STATISTICS

Sl. No	Dependent Variable	A	B	T	p-value
1.	Andhra Pradesh	59.85	0.370	1.055	0.327
2.	Arunachal Pradesh	22.150	0.513	1.583	0.158
3.	Assam	-115.925	-0.469	1.406	0.203
4.	Bihar	-16.742	-0.284	0.783	0.459
5.	Chhattisgarh	19.967	0.761	3.102	0.017*
6.	Delhi	-1.917	-0.559	1.782	0.118
7.	Goa	-28.933	-0.571	-1.838	0.109
8.	Gujarat	-61.733	-0.444	-1.31	0.231
9.	Haryana	-21.525	-0.417	-1.214	0.264
10.	Himachal Pradesh	-29.125	-0.374	-1.066	0.322
11.	Jammu & Kashmir	21.425	0.189	0.510	0.626
12.	Jharkhand	-52.808	-0.544	-1.717	0.130
13.	Karnataka	-74.275	-0.235	-0.235	0.543
14.	Kerala	-97.767	-0.316	-0.881	0.408
15.	Madhya Pradesh	-47.642	-0.312	-0.868	0.414
16.	Maharashtra	-22.600	-0.279	-0.768	0.468
17.	Manipur	13.042	0.272	0.748	0.479
18.	Meghalaya	-39.000	-0.504	1.543	0.167
19.	Mizoram	-31.783	-0.311	0.867	0.415
20.	Nagaland	-2.192	-0.036	0.097	0.926
21.	Orissa	4.808	0.034	0.091	0.930
22.	Punjab	-9.225	-0.107	0.286	0.783
23.	Rajasthan	-52.208	-0.331	0.927	0.385
24.	Sikkim	-4.567	-0.767	3.165	0.016*
25.	Tamil Nadu	-113.483	-0.416	1.211	0.265

26.	Tripura	-57.183	-0.572	1.846	0.107
27.	Uttar Pradesh	-115.758	-0.634	2.170	0.047*
28.	Uttarakhand	-41.133	-0.754	3.033	0.019*
29.	West Bengal	-55.533	-0.218	0.591	0.573
30.	Andaman & Nicobar Islands	28.275	0.608	2.025	0.032*
31.	Chandigarh	-0.075	-0.175	0.469	0.653
32.	Dadra & Nagar Haveli	-0.717	-0.534	1.672	0.138
33.	Daman & Diu	0.083	0.132	0.351	0.736
34.	Lakshadweep Islands	-0.825	-0.495	1.507	0.176
35.	Puducherry	-1.325	-0.618	2.082	0.036*

* p value < 0.05 indicates that the relationship of the dependent and independent variables are statistically significant at 5% level of significance else it is not significant.

IV. CONCLUSIONS

As our aim in this paper is to study the changes that have been occurring in the forest cover area which may lead to a serious concern of the world as a whole namely deforestation, it is very much essential to analyze the factors responsible for such changes. Many researches have been made to quantify the effects of different factors or to identify the factors responsible for the changes [12]. After analyzing the Government Forest reports over the last two decades and other research articles, we shall try to summaries various theoretical reasons working behind the forest cover changes for individual state of the country in the last two three years as follows :

Andhra Pradesh – The main reason for a net increase of 2141 sq km in forest cover may be attributed to plantation and conservation activities both within and outside the recorded forest areas. The decrease in the forest cover in East Godavari and Prakasam districts are mainly due to rotational felling of commercial plantations.

Arunachal Pradesh – A decrease of 190 sq km observed in the forest cover of the state can be attributed to shifting cultivation and developmental activities.

Assam – An increase of 567 sq km in the forest cover is mainly due to the plantations mostly outside the forest areas. The decrease in forest cover in some districts is mainly due to rotational felling in the tea gardens, shifting cultivation and developmental works.

Bihar – A positive change of 45 sq km observed in the state could be attributed to plantations and conservation.

Chhattisgarh – A small decrease of 12 sq km is observed in the state can be attributed to mining activities and developmental works.

Delhi - An increase of 3.64 sq km can be attributed to plantation and conservation where as in some places there is decrease due to developmental works.

Goa – An increase of 19 sq km in forest cover observed in the state is mainly due to expansion of tree cover outside recorded forest areas. However there is a decrease within recorded forest are due to mining and other developmental activities.

Gujarat - An increase of 47 sq km can be attributed to plantation and conservation both within and outside of recorded forest areas as well as conservation and expansion of Mangrove cover.

Haryana - A net increase of 8 sq km is observed in the state mostly due to increase in tree cover outside the recorded forest areas and decrease occurred in certain pockets is due to rotational felling.

Himachal Pradesh – The main reason for a net increase of 339 sq km can be attributed to plantation and conservation both within and outside of recorded forest areas as well as improvement in interpretation due to better radiometric resolution of the recent satellite data Resourcesat-2.

Jammu and Kashmir - The main reason for a net increase of 253 sq km can be attributed to plantation and conservation both within and outside of recorded forest areas as well as improvement in interpretation due to better radiometric resolution of the recent satellite data Resourcesat-2.

Jharkhand – A net increase of 29 sq km can be attributed to plantation and conservation both within and outside of recorded forest areas as well as improvement in interpretation due to better radiometric resolution of the recent satellite data Resourcesat-2.

Karnataka - The main reason for a net increase of 1101 sq km can be attributed to plantation and conservation both within and outside of recorded forest areas as well as improvement in interpretation due to better radiometric resolution of the recent satellite data from Resourcesat-2. Large scale increase in commercial plantation of palms outside forest areas, density improvement in scrub forests and expansion mangrove cover due to conservation and rehabilitation efforts are also major reasons for the increase observed in the state.

Kerala - A net increase of 1043 sq km in the state can be attributed to commercial plantation outside the recorded forest areas as well as improvement in interpretation due to better radiometric resolution of the recent satellite data Resourcesat-2.

Madhya Pradesh – A net decrease of 12 sq km has been observed in the state which could be attributed to expansion of agriculture, developmental activities, submergence, mining and rotational felling.

Maharashtra - A net decrease of 17 sq km has been observed in the state which could be attributed to expansion of agriculture, developmental activities, submergence, mining and rotational felling.

Manipur - A net increase of 263 sq km has been observed in the state due to plantation and conservation, as well as re-growth in the shifting cultivation areas.

Meghalaya - A net decrease of 116 sq km has been observed in the state which is due to shifting cultivation, rotational felling and developmental activities.

Mizoram - A net decrease of 531 sq km has been observed in the state which could be attributed to shifting cultivation and developmental activities. Marginal increase in certain pockets is due to regeneration of Bamboo and other plantations.

Nagaland - A net decrease of 450 sq km has been observed in the state which could be attributed to shifting cultivation and developmental activities.

Orissa - A net increase of 885 sq km can be attributed to plantation and conservation both within and outside of recorded forest areas as well as improvement in interpretation due to better radiometric resolution of the recent satellite data Resourcesat-2.

Punjab – An increase of 66 sq km can be attributed to increase in tree cover outside recorded forest areas.

Rajasthan - A net gain of 466 sq km in the state can be attributed to plantation and regeneration of fast growing species.

Sikkim – A net loss of 9 sq km can be attributed to developmental works.

Tamil Nadu - A net increase of 73 sq km can be attributed to plantation and conservation efforts within the recorded forest areas.

Tripura - A net decrease of 164 sq km of forest cover has been observed in the state can be attributed to shifting cultivation, harvesting of mature rubber plantations and developmental activities.

Uttar Pradesh - A net increase of 278 sq km can be attributed to plantation and conservation efforts.

Uttarakhand - A net increase of 23 sq km can be attributed to expansion of tree cover outside forests.

West Bengal - A net increase of 21 sq km has been observed in the state can be attributed to plantation activities mostly outside recorded forests areas as well as due to conservation of mangroves.

Andaman & Nicobar Island - A net loss of 9 sq km is mainly due to developmental activities.

Chandigarh – A small negative change of 0.01sq km in the forest cover of UT could be attributed to developmental activities.

Dadra & Nagar Haveli - A net increase of 1 sq km is due to expansion of tree cover outside the recorded forests areas.

Daman & Diu - An increase of 0.88 sq km is due to expansion of tree cover outside the recorded forests areas.

Lakshadweep – A small negative change of 0.04 sq km observed is due to felling of trees outside forests

Puducherry – The main reason of decrease of 3.28 sq km in forest cover can be attributed to harvesting of trees outside forests.

The forest cover in the country has increased by about 1% according to the biennial State of Forest Report 2017 indicating a marginal decrease in the volume of deforestation. This may be regarded as a positive sign for the country but the question is whether this increase is more due to a classification exercise.

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