



ANALYSIS OF STATE AND NATIONAL LEVEL PERFORMANCE OF INDIAN FORESTRY

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Abstract : The forestry sector in India has been playing a pivotal role in the economy both because of being the habitation for tribals and also being the host for several flora and fauna that contribute in many respects. The forests contribute direct and indirect revenue to the nations across the globe. India has three out of the 18 global biodiversity hotspots that are primarily part of forests. In view of the significance of this sector to the local economy, a study was done on assessing the area changes across States, forest produce production pattern, institutional arrangements for forest management and the scenario of the future. Five States – Madhya Pradesh, Chattisgarh, Maharashtra, Andhra Pradesh and Orissa accounted for almost 45 per cent of the country's forest area. The per capita income has decreased over the years due to population increase. The national wastelands development board and subsequently the national afforestation and eco-development board gave the much needed fillip to social forestry besides the States taking the initiative on their own under various multinational and donor based social forestry programmes. The value of output from forestry in 2011 as proportion of contribution to agriculture and allied sectors varied between 3.8 and 22.4 per cent. India had almost one third forest area under joint forest management with the local communities as conservation and development partners, with more area under such system in States like Madhya Pradesh and Jharkhand. Despite formidable increase in forest produce production, the imports of wood and forest products continued over the years. Besides these material contributions, the forests contribute to various environmental services, which are vital for human survival. All these have been discussed in some detail.

Key words : Afforestation, Wastelands, Forest revenue, Value of output, Joint forest management.

1. Introduction

Globally forests are reported to contribute direct revenue of US \$ 100 billion annually by way of round wood and that of non-wood forest products, which are of significant value. There are several other indirect and habitation contributions of the forests whose value far exceeds the direct product contributions. The sector contributes about 13 million people in direct employment and another 50 odd million people in indirect employment. The other important contribution of this sector is the ecosystem services, which are of immense value to the human and other systems of life on the earth. Globally the average revenue from forests is estimated at \$4.5 per ha while the expenditure far exceeds at \$7.5 per ha. In the Asian continent in 2005, the expenditure was the highest at around \$ 20 per ha. India with its significant area under forests is also transforming by gains in area from the last two decades,

which has some social and economic species under natural and planted areas such as eucalypts, subabul, bamboo and rubber. Therefore, in a country that has diverse agro-climatic conditions, it is worth considering the status, growth and future of forests in India.

With only 2.4% of the world's land area, India accounts for 7 to 8% of the world's plant and animal species. It is one of the 18 mega diverse countries, which contain three global biodiversity hotspots. India shows a high degree of endemism, which is why conserving its biodiversity as it is essential for the future. As a developing country, our dependence on natural capital is more than higher-income countries. Transforming these resources into other forms, wealth is essential for our development, but it must be in a sustainable manner to ensure continued growth and survival of our resources. FAO's Global Forest Resources Assessment (2010) estimated that the global

forest area was 4.033 billion hectares, almost exactly the same as FAO's first global estimate in 1948. The ten most forest-rich countries (the Russian Federation, Brazil, Canada, United States of America, China, Democratic Republic of the Congo, Australia, Indonesia, Sudan and India) account for 67 per cent of total forest area [FAO (2010)]. The forest area accounts for about 31 per cent of the geographical area with a per capita of 0.60 ha in the globe.

Deforestation is a widely prevalent phenomenon across the globe, but its pace is gradually coming down. The major causes of deforestation are increased demand for agricultural and industrial purposes. Around 13 million hectares of forest were converted to other uses or lost through natural causes each year in the last decade compared with 16 million hectares per year in the 1990s. Both Brazil and Indonesia, which had the highest net loss of forest in the 1990s, have significantly reduced their rate of loss, while in Australia, severe drought and forest fires have exacerbated the loss of forest since 2000. Another significant development that has contributed to compensate the forest area loss is the plantations happening in a large scale. Globally afforestation and growing of trees outside forest for various purposes like pulp wood, energy/ wood fuel and other uses has been taking place. India and several other developing countries have been aggressively pursuing this trend with domestic and external funding. These have happened in India under special focus and thrust of government support through the national wastelands development board, which subsequently transformed into the national afforestation and eco development board. Globally the planted forest area accounts for about 7 per cent of forest area with larger areas in the Asian region during the period 2000-10.

The services of forests have tremendous local and global impacts such as economic services, ecological services, socio cultural services, scenic and landscape services. Economic services of forests form the basis of a variety of industries including timber, processed wood and paper, rubber and fruits. However, they also contain products that are necessary to the viability of rural agricultural communities. These products include fuel and fodder, fruits, building materials, medicines and herbs. Additionally, grazing occurs within forests and local woodlands are used to satisfy the basic needs. Rural people also grow crops on temporary plots within the forest, often on a rotational basis. These forest

products contribute to a diverse rural economy and security when times are difficult. The ecological services include regulation of water regimes by intercepting rainfall and regulating its flow through the hydrological system, maintenance of soil quality, provision of organic materials, soil erosion control and climate modulation [FAO (1997)].

In view of the developments such as globalization, crises of different nature and the climate change have rejuvenated the importance of forests globally and very specifically in developing countries like India. It may be mentioned here that the share of the forest sector in GDP has declined over the years from 2.6% in 1950s to 1.7% in 2008-09 due to higher growth in other sectors and also due to under valuation of the forest products and services. Therefore, it is relevant to critically take a stock and assess the status in terms of area, production, trade and other services of the forests in India.

2. Data and Methodology

The paper is based on the hypothesis that the dynamics of forests is changing and that the contribution in terms of products and reliance on imports continues. However, the valuation of services, social and the vibrancy of institutional mechanisms is the most valuable aspect that requires attention. Under these perspectives the objectives of the present study were (1) to analyse the forest area, especially after the introduction of advanced technologies for area estimation and the changes in the same during the last quarter century. (2) to assess the pattern of production of major forest products and other products/services and the trend of imports (3) to analyse the institutional mechanism for forest management and (4) to project the forest scenario for the future. For testing and achieving these objectives data were collected from various sources viz. FAO forest stat, ICFRE and Forest survey of India. The data were analysed for working out the shares in (%) and growth rates (CAGR).

3. Results and Discussion

Forest area

The forests of southern Asia, including those in Afghanistan, Bangladesh, Bhutan, India, Nepal and Pakistan were cleared to provide cropland to support a rapidly expanding human population. In 1500, India's population of 100 million more than twice that of Europe

required a steady expansion of the agricultural frontier. Deforestation accelerated during European colonization in the nineteenth and early twentieth century. During the most intense colonial exploitation of timber resources, from 1850 to 1920, as much as 33 million hectares of forest was cleared in India [FAO (2010)]; today only around 77 million hectares (769538 sq km) of forest remains as presented in Table 1.

The forest area accounts for about 23.41% of the geographical area in India in 2011. This includes about 2.76% area under trees outside forests [IFSR (2011)]. The absolute forest area has marginally increased in India in the last 24 years from 751847 to 769538 sq. km, a gain of 17691 at an annual average increment of 73700 ha (1 sq. km = 100 ha). Vietnam and China are on top of annual average area gain in forests for the period 2000-10, while Nigeria (-3.67%) and Zimbabwe (-1.88%) with higher annual area losses lead from the bottom. The forest area afforestation and trees outside forests area, especially with about 7 world bank funded projects till the early 1990s (Canadian International Development Agency, Swedish International Development Agency (5 projects), USAID, ODA (DFID) and subsequently national afforestation plans, contributed for forest plantations.

At the regional level, Madhya Pradesh and the carved out State from it Chattisgarh together account for the largest area of forests in the country with 20% share followed by Andhra Pradesh with 8.3% in the country's total forest area during 2011. In terms of percentage of geographical area under forests Manipur (78%) followed by Himachal Pradesh (66%), Uttarakhand (65% had more area under forests than any other land use). Being the thinly populated States Arunachal Pradesh and Tripura had a very high per capita forest area figures of 3.72 and 1.52 ha, respectively. On the other hand, States like West Bengal and Uttar Pradesh had a meagre forest area of 0.01 ha. per capita in 2011. Among the States that gained the forest area, Himachal Pradesh stood first with almost at an annual average growth of 3%.

Bamboo is one of the forest plant that have several species in it. India is a home for almost one sixth of the bamboo area in the world that is led by Brazil and China. The bamboo bearing area is estimated at 13.96 million ha. Among the planted trees rubber is a significant species that has over 10 million ha in the globe. India

ranks sixth among the rubber growing countries that are led by Indonesia and Malaysia. Indian forests have some unique species like *Pterocarpus santalinus* (red sanders), *Santalum album* (sandal wood) and *Dalbergia latifolia* (rose wood). Species like eucalypts and subabul are the two most prevalent agro forestry species in India.

Afforestation and Social Forestry Programmes

Globally afforestation area accounted for 264 million ha. Countries like China, USA, Russian Federation, Japan and India together account for 53% of such area. In India, afforestation under various schemes both domestic budgetary programmes and externally funded commenced around 1970 and continued till recently. The cumulative area afforested in India since the 1960s till 2005 was to the tune of 35 million ha [Ravindranath *et al.* (2008)]. The long-term average annual rate of afforestation over the period 1980-2005 is 1.32 million ha. assuming the average rate of 1.32 million ha. from the period of 2006-30, the total area that would be afforested is 33 million ha.

National Afforestation and Eco-development Board (NAEB) of the Ministry of Environment and Forests monitors tree plantation and afforestation activities within the forest land done by the SFD's including the achievements of National Afforestation Programme (NAP). Tree plantations outside the forest land are done by other Departments of the State Governments under 20-Point Programme (TPP). As per the compilation by MSPI, tree plantations in the country under 20-point programme by all the departments including Forests during 2005-2010 was of the order of 1.5 to 1.6 million ha. per year, and the average number of seedlings raised was about 120 million per year. The total area under teak plantation is estimated to be about 1.673 million ha. of which major contribution comes from Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka, Chhattisgarh, Gujarat, Tripura and Mizoram.

Many States launched Social Forestry/Community Forestry Programmes during late 1970's and early 1980's under externally aided projects for undertaking afforestation in private and community owned barren and degraded lands with the active co-operation and involvement of local population, which created Social Forestry wings. The external aid to different States continued for different periods of time, but most of the projects ended by 1992, after which the social forestry

Table 1 : Forest Area in Indian States : 1987-2011.

States	1987				2011			
	Area (sq. km)	Share (%)	% to geo area	Per capita area (ha)	Area (sq. km)	Share (%)	% to geo area	Per capita area (ha)
India	751847	100	22.8	0.11	769538	100	23.41	0.06
Madhya Pradesh	155414	20.67	35.1	0.3	94689	12.30	30.72	0.13
Maharashtra	64055	8.52	20.8	0.1	61939	8.05	20.13	0.06
Andhra Pradesh	63771	8.48	23	0.12	63814	8.29	23.2	0.08
Chattisgarh					59772	7.77	44.21	0.23
Orissa	59555	7.92	38.2	0.23	58136	7.55	37.34	0.14
Arunachal Pradesh	51541	6.86	61.7	8.15	51540	6.70	61.55	3.72
Uttar Pradesh	51269	6.82	14.7	0.05	16583	2.15	6.88	0.01
Karnataka	38644	5.14	20.1	0.1	38284	4.97	19.96	0.06
Uttarakhand					34651	4.50	64.79	0.34
Rajasthan	31151	4.14	9.1	0.09	32639	4.24	9.54	0.05
Assam	30708	4.08	39.1	0.15	26832	3.49	34.1	0.09
Jharkhand					23605	3.07	29.61	0.07
Bihar	29230	3.89	16.8	0.04	6473	0.84	6.87	0.01
Tamilnadu	22319	2.97	17.2	0.05	22877	2.97	17.59	0.03
Himachal Pradesh	21325	2.84	38.3	0.5	37033	4.81	66.02	0.54
Jammu & Kashmir	20892	2.78	9.9	0.34	20230	2.63	9.1	0.16
Gujarat	18777	2.50	9.6	0.05	18297	2.38	9.66	0.03
Mizoram	15935	2.12	75.5	3.2	16717	2.17	79.3	1.52
Manipur	15155	2.02	67.8	1.07	17418	2.26	78.01	0.68
West Bengal	11879	1.58	13.5	0.02	11879	1.54	13.38	0.01
Kerala	11222	1.49	28.9	0.04	11265	1.46	28.99	0.03
Nagaland	8625	1.15	52.2	1.11	9222	1.20	55.62	0.47
Meghalaya	8514	1.13	37.9	0.64	9496	1.23	42.34	0.32
Other states	21866	2.91			26147	3.40		

programmes continued in a different form, on a lower scale, with the additional financial support of the State governments.

Joint Forest Management

Management of forests especially in areas where community interaction already exists with forest resources either for livelihood or by way of inhabitation, became a compulsion for the forest departments. Hence, the inevitable need to intensely involve the local communities. In fact in 1931, the initiative came up in Uttarakhand, where, Management of forests was done by Van Panchayats. Now the concept is widespread with almost one third of the forest area under management of JFM committees as shown in Table 2. Madhya Pradesh, Maharashtra and Orissa lead the movement with large number of such committees. On the other hand, some States like Jharkhand and Bihar have greater share of area under the joint management of communities and the forest departments.

Forest Production

The value of output from forestry in 2011 as proportion of contribution to agriculture and allied sectors varied between 3.8 (Punjab) and 22.4 per cent (Jharkhand). Similarly, the per capita value of output from forestry was the highest in Himachal Pradesh (Rs. 2324) with the lowest in Bihar (Rs. 275) during 2011 (Table 3).

The production of wood from forests in India is categorized into two types based on the final use – i.e. measured as volume and weight. The weight based products production increased from 17 million tonnes during 2002 to 32 million tonnes in 2011 with a CAGR of 7.77%. This works out to approximately 64 million cubic meters of wood by volume. Paper and paper board and other printing paper accounted for almost 64% of the total. Their production grew at an annual average growth of around 13% during this period. The production of other forest wood products that are

Table 2 : Status of JFMs in India - 2010.

State	No. of Joint Forest Management Committees	Area under JFM (sq km or 100 ha)	% of total forest area under control of JFM
Andhra Pradesh	7718	15910	24.9
Arunachal Pradesh	362	214	0.4
Assam	700	1000	3.7
Bihar	682	4560	70.4
Chattisgarh	7887	33190	55.5
Gujarat	3125	4120	22.5
Himachal Pradesh	1023	2051	5.5
Jammu & Kashmir	3334	1480	7.3
Jharkhand	8779	19364	82.0
Karnataka	3848	8080	21.1
Kerala	576	2074	18.4
Madhya Pradesh	15228	66874	70.6
Maharashtra	12054	24033	38.8
Orissa	11995	11363	19.5
Rajasthan	5316	7800	23.9
Tamil Nadu	3487	7564	33.1
Uttar Pradesh	3014	7246	43.7
Uttarakhand	12089	5450	15.7
West Bengal	4386	6458	54.4
India	112816	246472	32.0

Source: ICFRE, 2010.

Table 3 : Value of Output from Forestry across the States.

State	Share in Value of agri & allied sector output (%)	Per capita VOP from forestry (Rs.)
Andhra Pradesh	5.3	588
Assam	10.0	637
Bihar	8.0	275
Gujarat	8.5	871
Haryana	4.5	609
Himachal Pradesh	17.0	2324
Karnataka	10.4	991
Kerala	12.4	834
Madhya Pradesh	8.3	629
Maharashtra	13.0	1114
Orissa	11.0	777
Punjab	3.8	632
Rajasthan	9.5	892
Tamil Nadu	4.9	303
Uttar Pradesh	6.9	434
West Bengal	4.5	355
Jharkhand	22.4	894
Chattisgarh	16.2	1383
Uttarakhand	22.1	1847
India	8.9	689

measured in volume (cubic meters) increased from 683 million cubic meters in 2002 to 723 million cubic meters in 2011 at an annual growth rate of 0.59%. Round wood and wood fuel accounted for almost 89% of the total production (Table 4).

Import of Wood by India

India is a net importer of wood for several uses. Wood items that were imported on weight basis increased from 3.0 to 8.7 million tonnes during 2002-2007 with a CAGR of 11%. Among the wood products imported by volume basis, the quantity increased from 6.6 to 20 million cubic meters during the same period at a similar growth rate. The proportion of imports to total consumption (production + imports) accounted for 21.3% and 2.8% in the respective categories during 2011. The same were 17.9% and 1.0% during 2002. This indicates that reliance of India on forest products imports is increasing. Further in terms of monetary value, the imports were worth US \$ 1123 million during 2002, which increased to 5728, *i.e.* more than five times in a span of 9 years. This not only makes the country dependent on others, but also depletes the already precarious foreign exchange with us. Thus, there is a case for aggressively promoting agroforestry to reduce the dependence on imports (Table 5).

Non Wood Forest Products

There are at least 10 categories of non-wood forest products for which countries report data. These are food, exudates (gums/ resins), other plant products, honey/ bees wax, ornamental plants, medicinal and aromatic plant products, wild meat, raw material for utensils, handicrafts, construction, living animals, hides, skins etc. Very specific products that fetch revenue to the State are tendu leaves used for beedi making, bamboo used for food, handicrafts items manufacture and industrial uses and resins for several uses. These three products alone had contributed about Rs.1530 crores during 2010. It was estimated by FSI that 15.5% of adult cattle units of the country are totally dependent on forest for their feed. Further other livestock like goats and sheep also graze or browse in the forest areas. CSO estimated the fodder value from forests and added to GDP of forests under minor forest products (MFP), which was about Rs. 12,500 crores in 2008-09. The domestic trade in ayurvedic and herbal products in India is estimated to be around Rs. 2,300 crore. This is a very valuable contribution that helps

Table 4 : Production of Forest Products in India.

Products	Units	2002		2011		Growth rate (%)
		Quantity	% share	Quantity	% share	
Paper and paperboard	000 tonnes	4,286	25.20	10,870	33.88	12.29
Wood charcoal	000 tonnes	2,780	16.34	2,880	8.98	0.19
Other paper and paperboard	000 tonnes	1,980	11.64	5,380	16.77	13.58
Printing and writing paper	000 tonnes	1,606	9.44	4,170	13.00	12.78
Wood pulp	000 tonnes	1,605	9.44	2,308	7.19	3.47
Other fibre pulp	000 tonnes	1,599	9.40	1,995	6.22	2.08
Chemical wood pulp	000 tonnes	950	5.58	1,407	4.39	3.75
Recovered paper	000 tonnes	850	5.00	850	2.65	0.00
Newsprint	000 tonnes	700	4.11	1,320	4.11	7.03
Mechanical wood pulp	000 tonnes	299	1.76	479	1.49	4.48
Dissolving wood pulp	000 tonnes	255	1.50	255	0.79	0.00
Semi-chemical wood pulp	000 tonnes	101	0.59	166	0.52	4.69
Sub total	17,011	100	32,080	100	7.77	
Roundwood	000 cu m	3,19,389	46.73	3,31,969	45.94	0.42
Wood fuel	000 cu m	3,00,564	43.97	3,08,776	42.73	0.31
Industrial roundwood	000 cu m	18,825	2.75	23,192	3.21	2.09
Sawlogs and veneer logs	000 cu m	18,350	2.68	22,390	3.10	2.00
Sawnwood	000 cu m	10,990	1.61	14,789	2.05	2.83
Sawnwood (coniferous)	000 cu m	7,520	1.10	9,900	1.37	2.63
Sawnwood (non-coniferous)	000 cu m	3,470	0.51	4,889	0.68	3.24
Wood-based panels	000 cu m	1,969	0.29	2,964	0.41	4.44
Plywood	000 cu m	1,600	0.23	2,521	0.35	4.94
Pulpwood (round and split)	000 cu m	306	0.04	624	0.09	7.17
Veneer sheets	000 cu m	234	0.03	290	0.04	2.36
Other industrial roundwood	000 cu m	169	0.02	178	0.02	0.48
Fibreboard	000 cu m	109	0.02	130	0.02	1.68
Sub total		6,83,495	100	7,22,612	100.00	0.59

in stabilizing the livelihoods of forest dwellers and other rural populace. Some of the forest products are also exported. The prominent among them are ayush and herbal products, which accounted for 618 crores in 2005-06 and increased to 1335 crores in 2009-10.

Other Services of Forests

The ecological and environmental services of forests have an immense impact on the overall climate, natural resources, agriculture and general livelihoods of that and related ecosystems. Ecosystem services of forests have been valued by several researchers [Ninan and Inoue (2013), LEAD India (2007)]. Taking the clues from the study by the latter who estimated the value of ecosystem services at about US \$1150 per ha for Uttarakhand, it may safely be taken as half of that value for the total forest area in India. Thus, the total ecosystem services value would work out to about Rs. 442 million per annum. Now that the carbon trading

and carbon markets are emerging globally, the carbon stock in the Indian forests need to be looked at. According to a latest estimate by FAO total forest carbon stock in India is 10.01 GtC (10⁹ t). Almost half of this is in the form of soil carbon. In the carbon emission reduction regime and carbon credits trading era, India with vast opportunities has to utilize these opportunities.

4. Conclusion

India being a developing country will primarily depend on agriculture and forestry for the next few decades. This is the reason of sourcing raw material domestically for the industry/ manufacturing sector. Globally forests are playing a key role in terms of providing the much needed industrial raw material and indirectly providing the eco system services. India's case is no different. In India, the forest area has marginally

Table 5 : Imports of Forest Products by India.

Products	Units	2002		2011		Growth rate (%)
		Quantity	% share	Quantity	% share	
Recovered paper	000 tonnes	1,200	39.25	2,079	23.79	6.13
Paper and paperboard	000 tonnes	636	20.80	2,494	28.54	14.40
Newsprint	000 tonnes	447	14.62	1,407	16.10	10.76
Wood pulp	000 tonnes	324	10.60	876	10.03	10.26
Chemical wood pulp	000 tonnes	175	5.72	646	7.39	15.55
Printing and writing paper	000 tonnes	98	3.21	647	7.40	24.82
Other paper and paperboard	000 tonnes	92	3.01	441	5.05	16.72
Dissolving wood pulp	000 tonnes	85	2.78	148	1.69	4.96
Sub total		3,057	100	8,738	100	11.14
Roundwood	000 cu m	2,144	32.52	6,326	31.59	10.79
Industrial roundwood	000 cu m	2,144	32.52	6,321	31.57	10.85
Industrial roundwood (non-coniferous)	000 cu m	1,671	25.35	4,522	22.58	9.52
Industrial roundwood (coniferous)	000 cu m	473	7.18	1,799	8.98	16.93
Wood-based panels	000 cu m	84	1.27	600	3.00	19.53
Sawnwood	000 cu m	76	1.15	456	2.28	19.33
Sub total		6,592	100	20,024	100	11.08

increased in the last 24 years (1987-2011) by 0.074 million ha. per annum, thanks to the eternally aided afforestation programmes subsequently supplemented by the national programmes. Judicious management of forests through schemes like JFM will enable prevention of poaching encroachment and illegal felling. It may be noted that under JFM the forest departments and the local communities will join hands both for conserving and production of forests resources.

Although, the production has increased over the years, India continues to be a net importer of with almost \$ 5728 million during 2011, the growth of import being 11% per annum during the period 2002-11. Hence, it is imperative that we must curtail this trend to save the much needed foreign exchange. Another focus area of forest development is the contributions of non-wood forest products. Of these the grazing/browsing by the large/small ruminants account for a significant contribution. This is one area which requires greater community accountability since the grazed areas are not allowed to rejuvenate with regular growth by over exploitation. Hence, greater responsibility be fixed with the community, who graze/browse their livestock in such areas in a controlled/ regulated manner and wherever possible by planting/ sowing fodder saplings and forage species. Even in the case of NWFP, organized collection, processing and marketing as is done in Girijan Cooperative Corporation in Andhra Pradesh. This not

only benefits the communities involved, but also improves productivity besides forest conservation.

As regards the ecosystem services of forests, greater awareness need to be brought among the stakeholders to improve on the quality and quantity in this regard. Further, proper accounting of the ecosystem services and promoting payment for ecosystem services (PES) as is being done in countries like Kenya, Indonesia and Costa Rica needs to be pushed by the government involving NGOs and the communities [FAO (2011)]. Another key area that require a policy push is minimum support price for pulp wood produced from agroforestry as was introduced in Andhra Pradesh government for Subabul and eucalyptus [The Hindu (2011)]. This and several other initiatives in the liberalized forest policy regime (post National Forest policy-1988), which would encourage greater dynamism and vibrancy in the forestry sector in India to make it a competitive one and improve its contributions gradually.

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