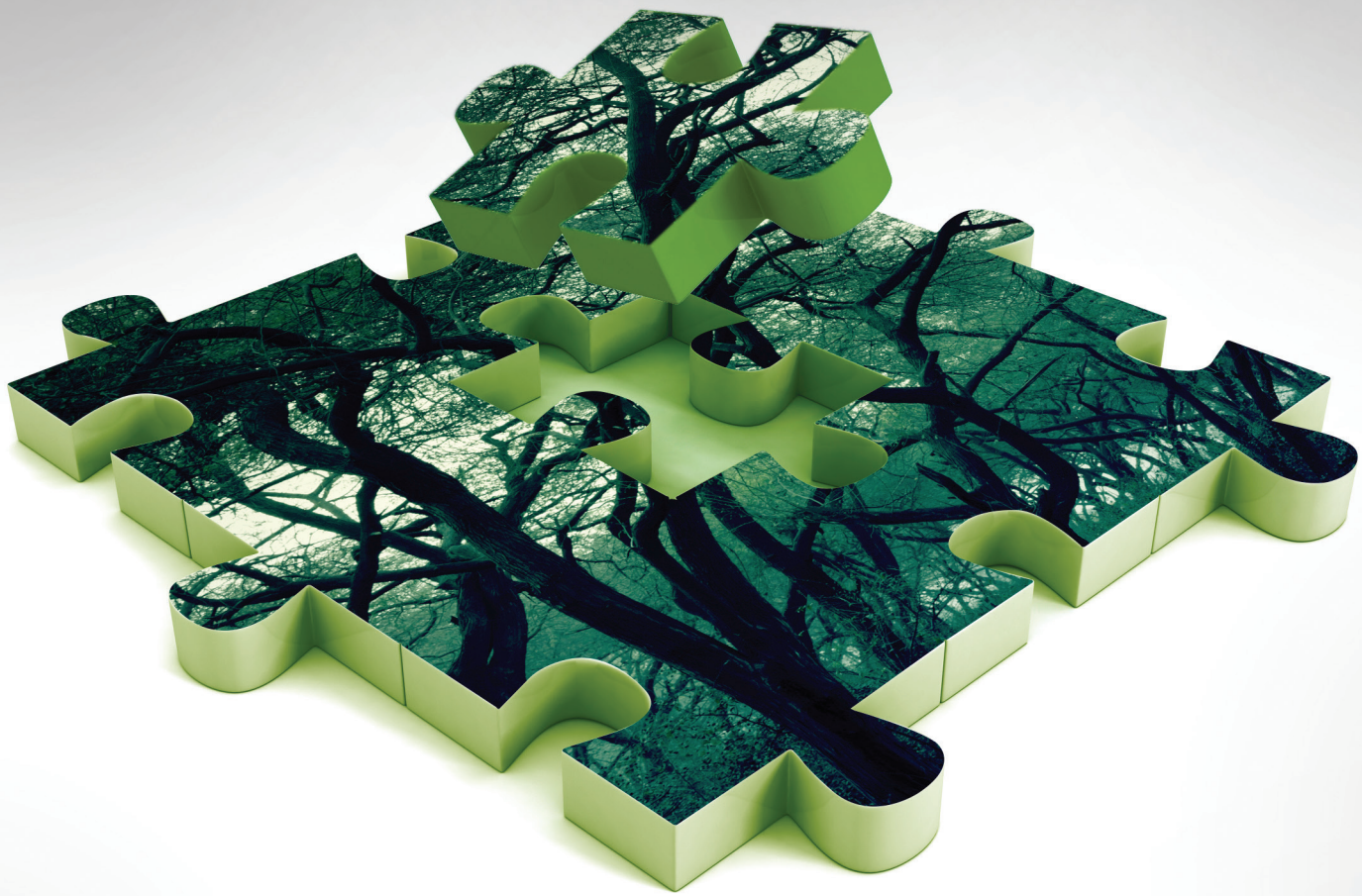

THE PUZZLE OF FOREST PRODUCTIVITY

Are Forest Development Corporations Solving It Right?

Centre for Science and Environment

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Preface

This report is an outcome of another report. In 2015, the Ministry of Environment, Forest & Climate Change (MoEF&CC) issued guidelines for the participation of the private sector in afforestation of degraded forests. The guidelines argued that poor productivity of forests has led to a shortage of raw materials to industry. Centre for Science and Environment (CSE) argued against the 2015 guidelines on the ground that the proposal would destroy the flourishing farm-forestry and agroforestry sectors in the country, which are more than capable of meeting the raw material demands of the industries. In its report titled *Fumbling with Forests: Why We Should Not Handover Forests to the Private Sector*, CSE also flagged concerns that the proposal would convert vast stretches of forestlands into large monoculture plantations that would only be of use to wood-based industries, not the forest-dependent communities or the ecology.

The government had made a similar argument in the 1970s, which led to the establishment of bodies to improve the productivity of Indian forests. These bodies, called Forest Development Corporations (FDCs), were envisaged to meet the demand of wood for industries in the country. FDCs in India have been working under a model similar to the one proposed in the aforesaid MoEF&CC guidelines where forestlands are leased out to FDCs for improving productivity. The only difference is that while FDCs are agencies of the government, the 2015 proposal wanted to hand over forestland directly to the industry. CSE undertook a review of the FDC model of production forestry by assessing the performance of existing FDCs in improving forest productivity and benefitting forest-dependent communities.

CSE's analysis has found that FDCs have not been able to significantly improve the productivity of leased forestlands. In fact, their productivity is far below the productivity of farm forestry. In addition, FDCs have failed to be an important player in the wood market of the country. Their contribution to meeting the wood requirement of the country is currently less than 5 per cent.

Most of CSE's concerns with the MoEF&CC's guidelines of 2015 were found to be true in the assessment of FDCs also. Large areas of mixed forests have been converted by FDCs into monoculture plantations, with high ecological costs that have not been documented. The benefit to forest-dependent communities has not been significant and conflicts between FDCs and local communities are on the rise, especially after the enactment of the Forest Rights Act, 2006.

At a time when India's forest cover has stabilized but the quality of forests has declined with continued diversion of forests for 'development' projects, India needs a strategy to increase production of timber and pulp wood without destroying natural forest ecosystems. Increasing the productivity of forestland under the control of FDCs will be an important part of this strategy, more so because FDCs have more than a million hectares of forestland under their control. If we increase the productivity of this land, at least 25 per cent of India's wood requirement can be met. To meet the remaining 75 per cent, there is a need to aggressively promote alternative sources of wood production in the country, such as farm forestry and agroforestry. We also need to ensure that existing natural forests are not set aside for industrial plantations at the cost of a range of ecosystem services they provide. Emphasis needs to be laid on restoring degraded forests in partnership with local communities, and sharing benefits with them. FDCs can play a crucial role here also.

I hope that the findings in this report will provide a compelling case for rethinking the FDC model and revamping it to improve the existing production forestry mechanism in the country.

Chandra Bhushan

Executive summary

The National Commission on Agriculture (NCA) suggested in 1972 that a dynamic production forestry programme should be implemented in India to meet the demand of wood-based industries. This led to the establishment of Forest Development Corporations (FDCs) in various states of India. FDCs, which are registered under the Companies Act or the Corporation Act of respective states, serve as commercial and production wings of State Forest Departments. As of March 2016, the number of functional FDCs carrying out timber-related operations in the forests of India stands at 19.

As we will discuss in this report, there is disparateness in the functioning of FDCs across various states of India. In some states such as Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Karnataka, Kerala, Tamil Nadu and Maharashtra, FDCs have been leased out forestlands where they are raising commercially valuable tree species through conversion of mixed natural forests as well as harvesting and marketing timber. On the other hand, in Himachal, Jammu and Kashmir, Uttar Pradesh, and Uttarakhand, the FDCs were created to harvest and market timber from forests in the states to eliminate the contractor system. All the timber from the forests in these states is extracted by their respective FDCs. In Arunachal Pradesh and Andaman and Nicobar Islands, the primary objective of the FDC was to supplement forest departments in harvesting and marketing of timber. In Haryana and Punjab, FDCs were created to support farmers grow trees by providing reasonable price for their trees, besides supporting the forest departments in harvesting and marketing of timber.[1] The FDC in Gujarat was set up for the collection and marketing of Non-Timber Forest Produce (NTFP).

In general, the establishment of FDCs has invariably resulted in large scale conversion of natural forests into pure stands of mainly teak, eucalyptus, casuarina and sometimes cash crops such as cashew, coffee and rubber. FDCs engaged in harvesting and marketing timber from earmarked forestlands also carried out rampant felling of native trees between the late 1970s and the early 1980s. However, the NCA's vision to boost timber production from forests did not materialize in the 1980s with increasing restrictions imposed on clear felling of forests as well as on green felling of trees across various states.[2] The National Forest Policy of 1988 emphasized conservation of forests and marked a shift in approach from revenue oriented forest management to conservation forestry. As a consequence, the annual production of timber from forests declined from 10 million cum in the 1970s to about 4 million cum by 1990.[3] Following the Supreme Court order in 1996 to ban felling of trees without an approved Working Plan, timber production from forests further reduced to about 2 million cum annually. The average timber production from forests during 2005–10 was about 2.38 million cum per year.[4]

The new forest policy and the restrictions on felling also adversely affected the timber production from FDCs. Some FDCs such as Andaman and Nicobar Islands and Arunachal Pradesh have been piling up losses as a result of the ban on clear felling. Arunachal FDC could not manage to pay salaries to its staff and had to shut down. The FDC in Andaman and Nicobar Islands took up rubber and red oil palm plantations as a substitute activity—this proved to be unprofitable and the FDC is now in the process of being closed down. FDCs engaged in clear felling natural forests to raise commercial plantations were also impacted by the ban on clear felling across various states. The success of plantations, especially teak, raised after the ban without cutting down natural

forests was not optimum due to competition with native species for nutrients. Several FDCs have had to diversify their activities and cultivate cash crops or medicinal plants or promote ecotourism, which are now the major revenue sources for some of these corporations.

Currently, 11 FDCs manage approximately 1.28 million ha of forestland, out of which they have raised plantations on approximately 1 million ha. Eight of the eleven FDCs have raised predominantly timber and pulpwood plantations and are producing nearly 0.92 million cum of wood (excluding fuel wood) per annum from the leased land in their possession. FDCs in the remaining three states (Tripura, West Bengal and Odisha) are engaged mainly in raising cash crop plantations on allotted forestlands, while also harvesting and marketing timber from earmarked forestlands. In addition, six FDCs are engaged in harvesting and marketing timber from natural forests as well as plantations of the forest departments. Together with FDCs engaged in raising cash crop plantations (Tripura, West Bengal and Odisha), these FDCs produce 1.04 million cum of timber per year, taking up the total annual production of timber from 17 FDCs to 1.97 million cum.

According to the Forest Sector Report of 2010, FDCs produce and harvest nearly 60 per cent of the total timber from the forests in India.[5] CSE calculated that the average annual production of wood from 17 FDCs (excluding Telangana and Jharkhand FDCs for which data was not available) has been 1.97 million cum from 2010–11 to 2014–15. Using the figure of 60 per cent production from forests by FDCs, this CSE study suggests that the total production of wood from the forests would be approximately 3.26 million cum per year which compares well with the figure of 3.175 million cum per year in the State of Forest Report 2011 by the Forest Survey of India.[6]

Wood productivity from the lands of eight FDCs raising timber and pulpwood plantations has been calculated to be 0.77 cum per hectare per year. This is far lower than other productive land uses, such as farm forestry, where the productivity is approximately 3.06 cum/ha/year. State FDCs engaged in harvesting and marketing wood claim that they have developed expertise in logging operations, which has resulted in improved extraction, transportation and marketing of wood from trees earmarked for felling by the state forest departments.[7]

Further, it would be wrong to compare the performance of FDCs in terms of wood production with that of natural forests as the two serve entirely different objectives. It is quite obvious from this CSE study that compared to other productive land uses in the country like farm forestry, the performance of FDCs has not been especially impressive. Also, the idea of forest 'development' has been limited to improving the production of wood from forests. The ecological and social costs of raising commercial plantations have often been overlooked. The process of conversion of natural forests into plantations has been exempted from obtaining environment and forest clearance. There has been little study on the environmental impact of monoculture plantations on the complex forest ecosystems. Conflict between communities and FDCs has been exacerbated, more so with the enactment of the Forest Rights Act 2006, which the FDCs have largely ignored in their Working Plans. Also at a time when the consumption of wood in the country has been escalating while supply of wood from forests, including FDCs, has stagnated at 2.5–3.5 million cum, forests or FDC plantations are no longer being relied upon for meeting the demand for industrial wood.

1. Background

After an era of indiscriminate exploitation of Indian forests by British rule, India's National Forest Policy of 1952 re-emphasized the '*need for sustained supply of timber*' and '*need for realization of maximum annual* revenue'[1] from forests. Hence, Indian forests continued to be exploited for timber and remained the main source of timber until the 1970s. At that time, the total production of timber from forests was 10 million cum per year and the country's requirement was about 15 million cum.[2] With the country's increasing population, the demand for timber was expected to grow and widen the demand–supply gap. Taking cognizance of the staggering gap and in consonance with the 1952 forest policy, the National Commission on Agriculture (NCA) recommended in its interim report in 1972 that a dynamic production forestry programme should be implemented to meet the growing demand of wood-based industries. NCA also noted that the forestry sector in India had not been able to make its full contribution to the country's economic and social growth and argued that each hectare of forestland should be in a position to yield a net income many times more than what was being obtained.[3]

In 1972, the National Commission on Agriculture recommended the establishment of FDCs to launch an aggressive production forestry programme which would improve the productivity of India's forests and meet the raw-material demand for wood-based industries

In 1969, a first-of-its-type project was initiated in Maharashtra. The creation of a Forest Development Board, which converted 13,522 hectares (ha) of '*poor quality*' forest in Vidharbha region into teak plantations, received wide acclaim from forestry experts and forest economists in the country. This model formed the basis for the recommendation of the NCA to establish Forest Development Corporations (FDCs) in India to launch an aggressive production forestry programme. NCA envisaged that such forestry programmes could get the forestry sector out of the rut of low productivity and meet the demand for essential forest based industrial products.[4]

The interim report on production forestry laid down the following objectives:

- Raise the per hectare productivity both in respect of volume and value;
- Create much more employment for skilled as well as unskilled hands;
- Give substantial support to the economy of the backward areas and the tribal population which depends on growth of forestry activities;
- Expand or establish a large number of industries based on raw material from the forests;
- Enter the export market in wood and wood products and
- Have a sustaining impact on employment in secondary and tertiary sectors.

By the time the final report of NCA was published in 1976, many states had already established FDCs. FDCs are registered bodies under the Companies Act, or any such similar Act, with a memorandum and articles of association of the company. The powers of managing the FDC are vested with a board of directors which are constituted by the state government. The board consists of official and non-official directors.[5] State FDCs come under the purview of the regional offices of the Ministry of Environment, Forest & Climate Change (MoEF&CC), while those in Union Territories are managed directly by MoEF&CC. As of March 2016, the number of functional FDCs carrying out timber-related operations in the forests stands at 19.

2. Overview of state FDCs

Based on the current activities, FDCs can be classified into the following three broad categories:

i) **FDCs dealing with replacement of allotted natural forests by industrially important wood species through plantations:** These FDCs have been leased out large tracts of forestland for conversion of 'depleted productive forests to fully productive extremely valuable stands, multiple in value and productivity'.[1] They also carry out harvesting and marketing of timber, which includes timber from felled natural forests as well as from raised plantations on allotted forestlands. The state forest departments identify and lease out the forestlands to their FDCs. Approval of the Working Plan from the regional offices of the MoEF&CC is necessary for these FDCs before they can carry out any felling or plantation activity. Examples of such FDCs are Andhra Pradesh, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh Maharashtra and Tamil Nadu.

ii) **FDCs that were created with the aim of replacing forest contractors in the harvesting and disposal of forest produce:** Such FDCs have not been allotted any forestland and therefore do not engage in raising plantations. These FDCs have their sale depots where the harvested produce is transported and sold through auctions and tenders. Examples of such FDCs are Uttar Pradesh, Uttarakhand, Himachal Pradesh, Jammu and Kashmir, Punjab, Haryana and West Bengal.

iii) **FDCs that deal in cash crops or run industries based on forest product:** Examples of such FDCs are Tripura, Odisha and Gujarat. Tripura FDC raised rubber plantations for restoration of degraded forests, while Gujarat FDC runs forest industries which processes timber and non timber forest produce into finished products and markets them.

As of March 2016, FDCs engaged in timber- and pulpwood- related operations were functional in nineteen states of the country

Seventeen functional FDCs (excluding Telangana and Jharkhand for which information could not be obtained) are engaged in timber- and pulpwood-related activities in the country as on March 2016. Of these, all except Himachal Pradesh have registered profits during 2005–15. Many FDCs have diversified their objectives to include activities that fall in more than one of the three categories outlined above. The primary objective for diversification has been to maximize the corporation's revenue. For instance, Karnataka FDC raises plantations of pulpwood species like eucalyptus, acacia and bamboo as well as cash crops like rubber. The sale of rubber latex and, more recently, that of over-mature rubber trees are the major sources of revenue for the corporation, contributing to approximately 82 per cent of the total revenue from 2001 to 2015. Similarly, Kerala FDC has started ecotourism as well as cash crop plantations of tea, coffee and cardamom in addition to pulpwood species. Odisha FDC was set up as a trading agency to harvest and market timber and non-timber forest products (NTFPs) on behalf of the state forest department, but has also taken up commercial plantations of rubber and cashew. Gujarat FDC was established to trade NTFPs collected by the tribals, which used to be the biggest source of revenue for the corporation until 2000 but has diversified into eucalyptus plantations, ayurvedic products and timber processing to manufacture and sell school benches. As a result, the revenue for Gujarat FDC from NTFPs declined from 74 per cent in the 1990s to 15 per cent in 2001–10.

A brief summary of the functional state FDCs is provided in *Table 1: A summary of functional FDCs.*

Table 1: A summary of functional FDCs

State	Year of establishment	Area under possession (ha)	Major activities	Annual turnover* (Rs)
Andhra Pradesh	1975	83,700**	Commercial plantations of eucalyptus, bamboo and coffee	100 crore
Chhattisgarh	2001	1,97,322	Commercial plantations of teak and bamboo	50 crore
Gujarat	1976	5,714	MFP collection and trade, value addition of herbal medicine, eucalyptus plantations, wood processing	38 crore
Haryana	1989	Not applicable	Harvest and trade of wood from earmarked forestlands	67 crore (in 2014–15)
Himachal Pradesh	1974	Not applicable	Harvest and trade of wood from forest lands, resin extraction, ecotourism	150 crore
Jammu and Kashmir	1978	Not applicable	Harvest and trade of wood from earmarked forest lands	60 crore
Karnataka	1971	41,663	Commercial plantations of eucalyptus and rubber	52 crore
Kerala	1975	10,500	Plantations of eucalyptus, teak and cash crops like cardamom, coffee	20 crore
Madhya Pradesh	1975	4,25,000	Commercial plantations of teak and bamboo	85 crore
Maharashtra	1974	3,63,000	Commercial plantations of teak and bamboo, medicinal plants cultivation, ecotourism	120 crore
Odisha	1962	25,000	Collection and trade of tendu and bamboo, commercial plantations of eucalyptus, rubber, cashew, harvest and trade of wood from earmarked forestlands	100 crore (excluding the sale of tendu)
Punjab	1983	Not applicable	Harvest and trade of wood from earmarked forestlands	34 crore
Tamil Nadu	1974	75,000	Commercial plantations of pulpwood species like eucalyptus, casuarina	60 crore
Tripura	1976	8,184	Plantations of rubber, rehabilitation of tribal families engaged in shifting cultivation	45 crore
Uttar Pradesh	1974	Not applicable	Harvest and trade of wood from earmarked forestlands and social forestry	300 crore
Uttarakhand	2001	Not applicable	Harvest and trade of wood from earmarked forestlands, minor mineral mining from rivers, ecotourism	300 crore
West Bengal	1974	44,000***	Harvest and trade of wood from earmarked forestlands, collection and sale of honey, ecotourism	90 crore

** Source: Forest Sector Report India, 2010*

*** The bifurcation of Andhra Pradesh has meant that some of the originally leased-out forestland is now in the possession of Telangana. At the time of reporting, Andhra Pradesh FDC had not furnished information on the exact extent of land in its possession post settlement with Telangana.*

**** West Bengal FDC was originally leased out 44,000 ha of forestland for carrying out all the roles of the Forest Department in the territorial Division of Kalimpong. The Corporation had written to the Forest Directorate in 2011 seeking reduction in the extent of the leased land. As no communication could be established with WBFDC despite several attempts, the extent of forest land in possession of the FDC is not clear.*

No information could be got for Telangana and Jharkhand State Forest Development Corporations. Four other FDCs in the states of Meghalaya, Bihar, Arunachal Pradesh and the Union Territory of Andaman and Nicobar Islands were majorly involved in the harvest and trade of forest produce, especially timber. These are now sick units as they suffered huge losses since the green felling ban in 1985–86 and conservation-oriented forest management practices as a result of the National Forest Policy of 1988. The corporation created in Rajasthan in 1985 was subsequently closed as none of its project proposals received approval from the state governments.[2]

Most of the states have only one FDC but two states have more than one forest-related corporations, namely Karnataka (Karnataka FDC, Forest Industries Corporation, and Cashew Development Corporation) and Tamil Nadu (Tamil Nadu Forest Plantation Corporation, Arasu Rubber Corporation, Tea Plantation Corporation). In addition, there are two Federations, one in Madhya Pradesh and the other in Chhattisgarh for harvesting and marketing NTFPs.[3]

A brief description of various state FDCs is given in **Annexure I.**

3. Role of FDCs in improving forest productivity

FDCs were established with the primary objective of raising forest productivity. NCA envisaged that the production forestry programme '*should concentrate on clear felling of inaccessible hardwood forests, followed by that of good quality mixed forests and planting with suitable fast growing species yielding higher return per unit area*'. The produce from the plantations was supposed to meet the raw material demands of wood-based industries.[1] FDCs have largely followed these NCA guidelines.

3.1 Productivity of FDC plantations

A total of 11 FDCs have been leased out approximately 1.28 million ha of forestlands for raising plantations. By 2015, these FDCs had brought nearly 1 million ha of leased forestlands under plantations

A total of 11 FDCs have been leased out approximately 1.28 million ha for raising plantations. Of these, eight FDCs carried out conversion of natural forests into commercial plantations of timber and pulpwood. The remaining three FDCs (Tripura, West Bengal and Odisha) were utilizing their forestlands mainly for cash crops. By 2015, the 11 state FDCs had brought nearly 1 million ha of leased forestlands under plantations.

The state-wise area brought under plantations is given in *Table 2: Area under plantations raised by FDCs up to 2015.* As *Table 2* shows, extensive plantations of mainly two species, teak and eucalyptus, have been raised by FDCs. Teak plantations have been raised largely in Madhya Pradesh, Maharashtra and Chhattisgarh and are now spread over an area of approximately 4.68 lakh ha. Andhra Pradesh, Karnataka and Kerala are the leading states in raising pulpwood plantations of eucalyptus. Nearly 2.33 lakh ha of forests have been brought under eucalyptus. Planting species of cash crops such as rubber, coffee, cardamom and tea over an area of 54,000 ha was also undertaken by

Table 2: Area under plantations raised by FDCs up to 2015

State	Teak	Eucalyptus/ acacia	Bamboo	Cash crops (rubber, coffee etc.)	Others (misc. species)	Total area (in ha)
Andhra Pradesh*	0	57,041.17	10,559.4	4,012	8,950.86	80,563.43
Chhattisgarh	1,10,740.61	1,250.15	6,748.75	0	427.82	1,19,167.3
Gujarat	0	3,595.15	44	0	351	3,990.15
Karnataka	1,090	39,383.6	875.6	4,143	409.2	45,901.4
Kerala	1,257.46	4,622.64	834.57	1,948.19	312.26	8,975.12
Madhya Pradesh*	2,09,342	0	23,183	0	3,189	2,35,714
Maharashtra	1,46,416	0	1,48,703			2,95,119
Odisha*	0	0	0	35,842	17,547	53,389
Tamil Nadu	0	1,27,710	0		28,775	1,56,485
Tripura	0		0	8,132.82	0	8,132.82
West Bengal*	0	200	0	0	1,172	1,372
TOTAL	4,68,846.1	2,33,802.71**	3,06,160.46			10,08,809

** Source: State FDC websites*

*** In the case of eucalyptus plantations, FDCs frequently tend to double count if they are replanting the same area after final harvest. Therefore, the actual area under eucalyptus may be a little less than that provided by FDCs*

several FDCs. In addition, the Maharashtra FDC carried out plantations under Wasteland Development Programme over 2.35 lakh ha.

The FDCs responsible for clear felling natural forests to raise plantations adopted a slew of measures to increase the productivity of their plantations, including ploughing plantation site, mechanical weeding in plantations, application of insecticides and pesticides, raising seedlings through genetically improved stocks. Special emphasis was placed on raising good nursery stock to obtain optimum number of plantation seedlings.[2]

A review report of the performance of FDCs in India by a High Level Study Team (HLST) was published in 1990 by the Union Ministry of Environment and Forests. The HLST reported in 1990 that '*FDCs have not achieved the desired improvement of productivity of forest lands*' assigned to them. The yield from FDC plantations was low, the growth poor and survival rates not satisfactory. The FDC plantations were reported to be 55–60 per cent successful.[3]

As a result of the efforts of FDCs towards improving the health of their plantations, higher survival rates were reported by officials of most FDCs raising commercial plantations. Madhya Pradesh Rajya Van Vikas Nigam (MPRVVN) reported an 80 per cent survival rate for its teak plantations, while FDCs in Karnataka and Andhra Pradesh reported a 90 per cent survival rate for their eucalyptus plantations. In order to calculate the productivity of FDC plantations, CSE requested FDCs raising pulpwood plantations to provide the per hectare yield from their plantations. FDCs raising teak plantations were requested to provide information on the projected volume of wood from one hectare of their plantations at the end of the rotation age of the tree crops.

FDCs have reported high survival rates of their plantations ranging from 80 to 90 per cent. However, without any benchmark for desired levels of forest productivity, it is difficult to state if FDCs have achieved an improvement in the productivity of their plantations

3.1.1. Teak plantations

MPRVVN was the only FDC to provide information on productivity of teak plantations. The Nigam (Corporation) has estimated that 110.22 cum of timber would be harvested per hectare of its teak plantations at the time of final felling at 60 years. An additional 68.27 cum of timber would be produced from the same land as a result of the crop thinning exercises before the final felling. Therefore, the per hectare production of MPRVVN's teak plantations works out to be approximately 3 cum/ha/year. This compares well with the productivity of teak plantations in Kerala of 3.01 cum/ha/year in similar conditions (2000 trees per hectare planted at spacing of 2m x 2m and site quality III/IV) calculated by the Kerala Forest Research Institute in a 1998 study.[4]

It is difficult to state whether the projected productivity figures of MPRVVN's teak plantations are an improvement as no benchmark has been set for desired levels of productivity. Moreover, these are projected figures, and the actual figures are likely to be lower at the time of final harvest. When compared to other productive systems for teak plantations, MPRVVN's performance is not quite as impressive, detailed as follows.

The highest productivity in teak plantations in the conditions mentioned above was noted at the age of 20 years at 3.92 cum/ha/year (i.e. mean annual increment or MAI) by the KFRI study, suggesting that the final felling should be carried out at 20 years to maximize yield. In fact, short-rotation teak plantations harvested below the age of 30 years have reported reasonably good productivity and there has been a trend among planters towards short-rotation high-yield teak plantations on private lands in which capital is not locked up for long periods.[5] A study on short-rotation teak plantations showed that the

Table 3: Economic productivity of long-rotation teak versus short-rotation teak

Description	Long-rotation teak (MPRVVN projections)	Short-rotation teak (NABARD projections)
Year of final felling	60	30
Number of trees planted per ha	2,500	2,500
Spacing of plantation	2m x 2m	2m x 2m
Expected number of trees surviving	2,000	2,000
Volume per ha at the time of final felling	110.22 cum	105 cum
Revenue per ha (includes thinning)	42,13,122	24,45,000
Revenue per ha per year	70,218.71	81,500
Profit per ha	33,70,498	23,96,100
Profit per ha per year	56,175	79,870

FDCs have limited their timber plantations to be of long rotation without exploring the possibility of short-rotation cycles or using productive timber species other than teak

biomass production ranged from 168.8 cum per hectare for 20-year-old teak plantations in Tripura and 192 cum per hectare from 38-year-old plantations in Uttar Pradesh, thereby producing 8.4 cum/ha/year and 5 cum/ha/year in Tripura and Uttar Pradesh respectively.[6] Another KFRI study suggests that the MAI for shorter rotations of 20–30 years is almost double at 10–20 cum/ha/year compared to traditional 60-year rotations.[7] Therefore, short-rotation teak plantations are far more productive than long-rotation ones.

Short-rotation teak is also more profitable than long-rotation teak. MPRVVN has projected a turnover of Rs 70,218 per hectare per year from its teak plantations, which includes revenue from thinning. A NABARD study has projected that teak plantations harvested at the age of 30 years would fetch nearly Rs 81,500 per hectare per year when planted in conditions similar to MPRVVN.[8] Given that the productivity and revenue from short-rotation teak plantations are higher than from long-rotation ones, a compelling case builds for exploring short-rotation teak plantations.

FDCs argue that long-rotation teak produces better-quality wood than short-rotation teak. However, this argument evokes mixed opinions. Manufacturers of wood products say that teak wood produced in both the systems have similar qualities and fetch similar prices in the market. The KFRI study states that teak wood has the potential of attaining mechanical maturity (optimum strength properties) by the age of 21 years. The differences between the two kinds of wood are not so large as to affect many end-users' requirements. On the other hand, short-rotation teak has higher sapwood and lower heartwood content as compared to long-rotation teak plantations. Sapwood is the living, outermost portion of a woody stem or branch, while heartwood is the dead, inner wood, which often comprises the majority of a stem's cross-section. The problems anticipated as a result of the low heartwood content are reductions in natural resistance, lower recovery of sawn wood and veneer, and smaller log diameter. As a solution to these problems, the KFRI study suggests that plantation managers could aim at producing larger-diameter logs with greater yield of heartwood per tree by accelerating tree growth of short-rotation plantations with judicious fertilizer application/genetic inputs.[9] However, it may be studied further if the use of fertilizers as prescribed is ecologically sound. FDCs should work out the costs and benefits of both kinds of plantations to achieve higher production without compromising ecology.

Box 1: Short-rotation plantations for timber: Looking beyond teak

Madhya Pradesh Rajya Van Vikas Nigam Ltd (MPRVVN) and Chhattisgarh Rajya Van Vikas Nigam Ltd (CGRVVN) are experimenting with high-input teak plantations over an area of 4,894 ha and 500 ha respectively since the late 1990s with the objective of maximizing production in minimum time and enhancing productivity per hectare. The rotation age of such plantations has been fixed at 50 years, which is a reduction from the traditional system where the final felling happened at 60 years. The yield from the high-input plantations is expected to be higher than rain-fed plantations for the following reasons:

High-input teak plantation	Rain-fed teak plantation
Additional basal dose of inputs and fertilizers of Rs 6.50 per plant.	Basal dose of Rs 0.72 per plant
Thinning operation takes place every three years starting from the eighth year of plantation. Fifteen rounds of thinning happen before final felling, which happens in the fiftieth year.	Thinning operation takes place every five years starting from the eleventh year of plantation. Eleven rounds of thinning happen before final felling, which happens in the sixtieth year.
Since more thinning operations are carried out, the output is more.	Since thinning operations are fewer, output is less.

Source: MPRVVN, 2016

It is worth noting that the efforts of FDCs to achieve higher production in minimum time have been directed towards teak alone when several multipurpose high-value timber species that can achieve the same objective exist. For instance, gamhar (*Gmelina arborea*) has displayed better growth performance than teak. As per a 1990 study, the MAI of gamhar at 20 years was 10.48 cum/ha/year as compared to 7.9 cum/ha/year for teak of the same age.[1]

Another such species, red sanders (*Pterocarpus santalinus*), with high timber value and medicinal properties, is an endangered tree species. A study by Herbal Folklore Research Centre estimates that 500 trees of red sanders can be planted in one hectare. The production has been estimated at 500 kg of heartwood per tree after 25 years where every kg fetches approximately Rs 75.[2] This works out to Rs 7.5 lakh per hectare per year.

There is also kadam (*Anthocephalus chinensis*), an indigenous fast-growing tree species that produces one of the best raw materials for the plywood industry. NABARD estimates that a yield of 0.4 cum of peelable timber can be easily obtained from a kadam tree under rotation of 10 years. At a spacing of 5m x 5m, 400 trees can be planted in one hectare, resulting in productivity of 16 cum/ha/year.[3]

Similarly, other valuable timber species like Indian padauk (*Pterocarpus marsupium*), rosewood (*Dalbergia latifolia*), shisham (*Dalbergia sisoo*) and mahogany (*Swietenia mahogany*) can also be taken up as plantations by FDCs. In fact, rosewood, shisham and red sanders are also leguminous trees that would enhance soil fertility, unlike eucalyptus and teak.

3.1.2 Pulpwood plantations

The productivity of pulpwood plantations for FDCs raising eucalyptus and acacia is provided in *Table 4: Productivity of pulpwood plantations of FDCs.*

As Table 4 shows, the productivity of pulpwood plantations of FDCs ranges from 4.76 cum/ha/year to 22.95 cum/ha/year. Obviously, the introduction of clonal varieties of these species has improved the productivity of FDC's pulpwood plantations (see *Box 2: Productivity of pulpwood plantations using exotic species*). However, these FDCs have not set any benchmark for desired productivity, which makes it difficult to analyse if these corporations have met their productivity targets.

In terms of production per hectare by FDCs raising eucalyptus plantations, Andhra Pradesh FDC has achieved the highest figure of 11.69 cum/ha/year. However, when compared to productivity figures for plantations of the same

species on private lands of farmers, i.e. farm forestry, FDCs lag behind significantly. ITC-promoted clonal eucalyptus plantations on farmers' land in Bhadrachalam, Andhra Pradesh, exhibited productivity ranging from 20 MT/ha/year to 58 MT/ha/year[10] which converts to 32 cum/ha/year to 96 cum/ha/year. This is much higher than the productivity figures of FDC plantations.

Table 4: Productivity of pulpwood plantations of FDCs

State	Major pulpwood species	Total area harvested from 2010 to 2015 (ha)	Volume of wood produced in 2010–15*** (cum)	Average yield per ha (cum/ha)	Rotation age	Productivity (cum/ha/yr)
Andhra Pradesh*	Clones of *Eucalyptus camaldulensis* and *Eucalyptus tereticornis*	17,773.98	14,54,569	81.84	7 years	11.69
Gujarat*	Clonal eucalyptus—ITC 413, JKSC 2, JKSC 8	631	25,247.6	40.01	5 years	8.00
Karnataka	Clones of *Eucalyptus camaldulensis* and *Eucalyptus tereticornis*	14,026.87	4,67,237	33.31	7 years	4.76
	Acacia	2,415.79	3,88,177	160.68	7 years	22.95
Kerala	*Acacia auriculformis*	297.36	22,294.06	74.98	8 years	9.37
	Acacia mangium	478.37	72,686	151.95	8 years	18.99
Tamil Nadu**	Clones of *Eucalyptus camaldulensis* and *Eucalyptus tereticornis*	42,810.5	16,44,757.6	38.42	6 years	6.40

** For these states, the volume harvested reflects production from clonal eucalyptus only*

*** For Tamil Nadu, the volume harvested reflects production from both clonal and seed-origin plantations, as separate figures could not be obtained.*

**** Production has been calculated for 2010–15. For Kerala and Andhra Pradesh, production has been calculated for 2010–14.*

The annual production of wood from FDC lands averaged 0.77 cum/ha during 2010–15. Though FDCs show higher productivity than natural forests, they cannot be compared to natural forests which provide a range of ecosystem services other than providing timber or pulpwood alone

3.2 Productivity of FDC lands

Considering that FDC lands also comprise plantations other than timber and pulpwood species, the productivity of its plantations would be different from that of the entire FDC lands. FDCs, however, were leased out nearly 1.28 million ha of forestlands for putting these lands to productive use. It is, therefore, important to take a wider look at the productivity of wood from these large chunks of forestland. For the purpose of calculating productivity of FDC lands, only FDCs raising commercial plantations have been considered in the following analysis.

In this CSE sudy, state governments were requested to provide the information related to the wood production of respective FDCs. The data and information received on wood production from FDC lands in the last five years, i.e. 2010–11 to 2014–15, was analysed by CSE. Overall, the annual wood production per hectare from the forestland in possession of these eight FDCs which are raising various plantations averaged to 0.77 cum/ha/year only. *Table 5: Wood production from FDC lands raising commercial plantations* provides details on per hectare production from FDC lands.

In terms of improving production from forests in the country, FDCs raising commercial plantations can be said to be performing better than natural forests, where the latter produces approximately 0.04 cum of wood per ha per year.[11] However, FDCs are supposed to be productive land-use systems that cannot and must not be compared to natural forests in India, which are meant to

Box 2: Productivity of pulpwood plantations using exotic species

All the state FDCs raising eucalyptus plantations are successfully cultivating clonal varieties of the species such as *Eucalyptus camaldulensis* and *Eucalyptus tereticornis* to achieve higher production per hectare. Tamil Nadu Forest Plantation Corporation Ltd (TAFCORN) has brought 3,500 ha of area under clonal eucalyptus plantations every year. TAFCORN procures superior tested clones of eucalyptus from Andhra Pradesh and is also experimenting with planting a South African clone (of *Eucalyptus grandis*), which is known to be very tolerant to extreme heat. According to TAFCORN, the yield of pulpwood from clonal eucalyptus ranges from 40 MT/ha in areas with poor rainfall to 100 MT/ha in heavy rainfall areas for every rotation cycle.[1]

In addition to planting clonal varieties of eucalyptus, Andhra Pradesh Forest Development Corporation Limited (APFDCL) has introduced Sand Bed Nursery technique for the development of clonal propagules. This technique avoids transportation of propagules over long distances and increases survival rates of plantations. The Corporation has also embarked upon conversion of seed origin plantations to clonal plantations for improved productivity. From 2009 to 2014, APFDCL converted 11,613 ha of the total 27,350 ha under seed origin plantations into clonal plantations.[2] The yield from seed origin plantations varied from 10 to 25 MTs per hectare. The average survival percentage of these clonal plantations is about 90 per cent by the end of the sixth year and the yield per hectare is 70–80 MTs in high rainfall areas and 40–50 MTs in low rainfall areas for every rotation cycle.[3]

Eucalyptus plantation was taken up extensively by Kerala FDC as well soon after its constitution. However, repeated cultivation of the same species in successive rotations caused invasion of several fungal pathogens and other rot diseases and the yield per hectare drastically reduced. The cultivation of eucalpytus started to become unprofitable. In order to substitute the production of pulpwood, Kerala FDC started raising plantations of *Acacia auriculformis* and *Acacia mangium* on commercial basis since 1998. The Working Plan of Kerala FDC mentions that these species of acacia have good timber value in addition to being a pulpwood species. Being a leguminous plant, it has the natural capability of nitrogen fixation and thereby enriches any impoverished or unfertile land. The yield from acacia proved to be better than eucalyptus.[4] From 2010–11 to 2013–14, the productivity of eucalyptus plantations of Kerala FDC ranged from 23.63 MT/ha to 61 MT/ha, while that of acacia fluctuated between 56 MT/ha to 100 MT/ha.

provide a range of ecosystem services and conservation functions rather than performing productive roles only. On the other hand, when compared to other productive land uses like farm forestry or wood production from trees outside forests (ToFs), the performance of FDCs is not particularly impressive. Let's see how.

Table 5: Wood production from FDC lands raising commercial plantations (2011–15)

State*	Average annual wood production from FDC lands (in cum)	Area under FDC possession (in ha)	Productivity from FDC lands (cum/ha/year)
Andhra Pradesh**	2,34,942	83,700	2.81
Chhattisgarh	40,707	1,97,322	0.21
Gujarat	8,400	5,714	1.47
Karnataka	1,52,228	41,633	3.66
Kerala	42,336	10,500	4.03
Madhya Pradesh	90,000	4,25,000	0.21
Maharashtra	32,600	3,63,000	0.09
Tamil Nadu	3,28,951	75,000	4.39
TOTAL	**9,21,764**	**12,01,869**	**0.77**

** West Bengal, Odisha and Tripura have not been included in the above table as they are mainly raising cash crop plantations. Information on pulpwood production from West Bengal FDC, which started in 2011, was not furnished.*

*** Figures for Andhra Pradesh FDC are until 2013–14 before the bifurcation of the state.*

In India, the annual availability of wood from ToFs has been estimated to be 44.34 million cum.[12] Though exact figures on area under ToFs are not available, the 2013 State of Forest Report by the Forest Survey of India estimates that approximately 11.15 million ha of area is under agroforestry in India.[13] Assuming that an additional 30 per cent over and above the area under agroforestry constitutes the total cover under ToFs, the per hectare production from ToFs works out to be 3.06 cum per year. The difference between the average per hectare production from FDC lands and ToFs reveals that ToFs are far more productive than FDCs raising commercial plantations. Given the fact that FDCs have also become multiple land use systems like ToFs, the difference is quite stark. Also when compared to the global average of wood removal at the rate of 0.85 cum/ha/year from mixed and natural forests as calculated from FAO's Global Forest Resource Assessment report 2010,[14] the figure of 0.77 cum/ha/year from FDC lands compares poorly.

3.3 Wood production by FDCs

The 2011 edition of the State of Forest Report estimates that annual wood production from forests is 3.175 million cum. The Forest Sector Report of 2010 by Indian Council of Forestry Research and Education (ICFRE) stated that nearly 60 per cent of the total wood from the forests comes from FDCs. If these estimates were to be believed and compared, the annual production of wood from FDCs is approximately 1.9 million cum as per government sources by this alternative way of calculation. This includes wood harvested by FDCs from their plantations as well as from forests earmarked by state forest departments. The figures on wood production include timber and pulpwood and exclude fuel wood.

The total wood production from FDCs during 2010–15 averages about 1.97 million cum per year, of which more than 50 per cent comes from FDCs that have been contracted the tasks of harvesting and marketing timber from forestlands

On the other hand, based on data collected from state FDCs by CSE, the total wood production from FDCs during 2010–15 averages about 1.97 million cum per year. This excludes Telangana and Jharkhand FDCs. Therefore, the two figures are quite close to each other.

Of the total production from FDCs, 0.92 million cum comes from the eight FDCs raising commercial plantations on leased forestlands. However, pulpwood dominates with a share of 0.76 million cum of total wood production from natural forests as well as plantations on FDC lands. FDCs in Tamil Nadu, Andhra Pradesh and Karnataka are the largest producers of pulpwood from their leased lands, followed by Kerala and Gujarat. The share of pulpwood and other wood in the total wood production from FDCs raising plantations is presented in *Figure 1: Pulpwood in the total production from FDC lands.*

The average volume of wood (pulpwood and timber) produced or harvested by state FDCs during 2010–15 is provided in *Table 6: Wood production from state FDCs*.

More than 50 per cent of the total wood produced from or harvested by FDCs comes from FDCs that have been contracted the task of harvesting and marketing timber from earmarked forestlands. Among them, Uttar Pradesh ranks on top with regard to wood production, followed by Uttarakhand, West Bengal and Himachal Pradesh.

Figure 3: Wood supply from forests and ToFs in India captures the contributions of the major sources of domestic wood supply in the country, giving a larger picture on wood production in India.

Figure 1: Pulpwood in the total production from FDC lands

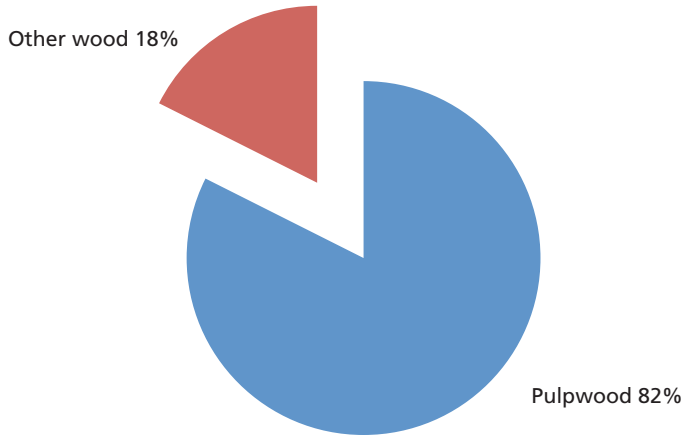


Table 6: Wood production from state FDCs

State	Average volume of wood produced/ harvested (in cum per year)
Andhra Pradesh*	2,34,942
Chhattisgarh	40,707
Gujarat	8,400
Haryana	53,360
Himachal Pradesh	1,53,000
Jammu and Kashmir	50,000
Karnataka	1,52,228
Kerala**	42,336
Madhya Pradesh	90,000
Maharashtra	32,600
Odisha***	38,000
Punjab****	52,650
Tamil Nadu	3,28,951
Tripura	2,300
Uttar Pradesh	3,20,000
Uttarakhand	2,17,380
West Bengal*****	1,53,000
TOTAL	**19,69,854**

** The average for Andhra Pradesh has been calculated for five years from 2009–10 to 2013–14*

*** The average for Kerala FDC has been calculated for four years from 2010–11 to 2013–14*

**** Odisha FDC average has been calculated for three years from 2012–13 to 2014–15*

***** Punjab FDC average has been calculated for three years from 2010–11 to 2012–13*

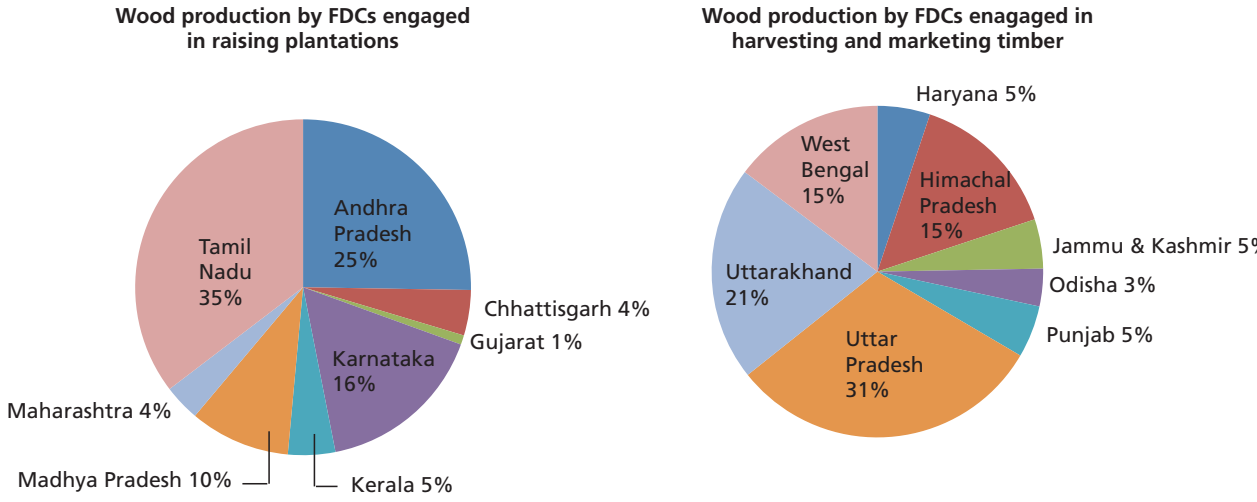
****** West Bengal FDC did not furnish information. The average has been calculated from 2005–06 to 2009–10 based on the ICFRE report 'Forestry Statistics India 2011'*

As *Figure 3* shows, the total estimated production of wood from forests, including FDCs, has been estimated at 3.175 m cum annually while the total availability of wood from ToFs has been estimated to be 44.34 m cum. With the above analysis, it is clear that in terms of the contribution of FDCs and forests to the total domestic wood supply in the country, forests, including FDCs, contribute only 6.4 per cent, with FDCs producing less than 5 per cent

of the total wood supply. India's demand for industrial wood has been growing steadily, reflected evidently in the increase in imports of industrial roundwood, which grew from 2.55 million cum in 2001 to 6.23 million cum in 2014, as per a CSE analysis. Having said that, there is ample scope for India to meet its demand for wood domestically. If the productivity of FDC lands could be enhanced to even half of that provided by farm forestry lands, wood production from the 1.28 million ha of forestlands with FDCs would increase multifold.

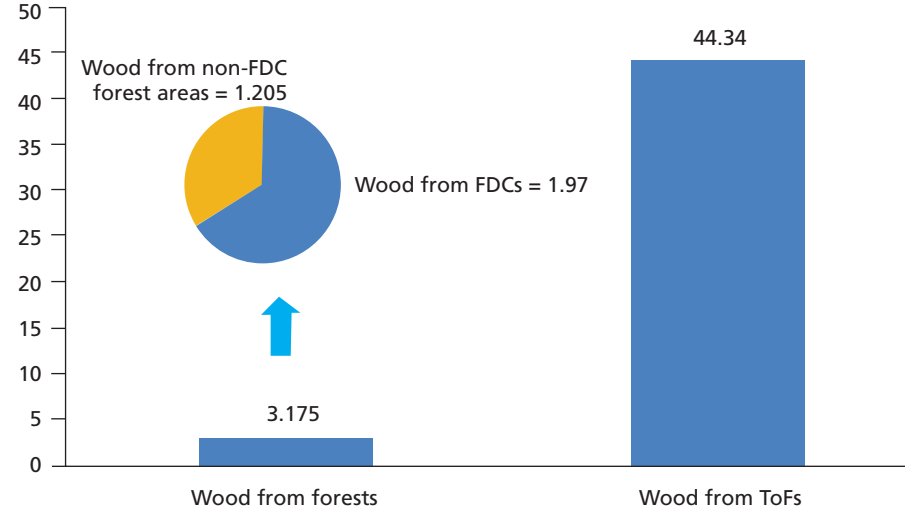
Also, the expansion of plantations under farm forestry and agroforestry in India provides enough reason to believe that the shortfall of industrial wood supply can be easily met if these land use practices are adequately supported and promoted. Farm forestry and agroforestry have increased wood production

Figure 2: Share of state FDCs in wood production from forests



** Tripura FDC has been excluded from the above charts as its contribution in the form of rubberwood timber is minimal*

Figure 3: Wood supply from forests and ToFs in India (in million cum per year)



in the forest deficit states of Haryana, Punjab and Uttar Pradesh to 2.2 million cum, 3.5 million cum and 4.2 million cum per year respectively as per estimates of the Central Empowered Committee set up the Supreme Court.[15] Currently, agroforestry is being practised over only 8 per cent of India's area under agriculture, but its potential is far greater. There is also 35 million ha of farmer-owned uncultivated wastelands, with enough potential to produce wood for industry.[16] If the potential of these lands for tree crops is utilized to their optimum, India will not only meet its industrial wood demands domestically, but also become a wood-surplus nation. Farm forestry/agroforestry also enhances farmers' incomes while augmenting the supply of wood for industries significantly. Further, farm forestry plantations do not come at the cost of our existing natural forests.

Alternatives for popular timber species have also emerged in recent years. Tripura Forest Development and Plantation Corporation Limited (TFDPC) has experimented with rubberwood as an alternative timber species in the last few years. It has undertaken processing of rubberwood from its own plantations into timber through its timber treatment plant. However, the scale of operation is fairly low. The treatment plant had received rubberwood logs totalling 10,590 cum from 1999–2000 to 2014–15. These logs are converted into planks, which are further used for making furniture. The rubberwood processing operations of TFDPC have however not been very successful due to lack of technical manpower to support them with the operations.[17]

Forests contribute only 6.4 per cent to the total wood supply in the country, of which the share of FDCs is less than 5 per cent. Interestingly, plantations by farmers have been the major suppliers of wood in India and their potential of expansion is huge. The per hectare annual turnover from FDC lands is less than Rs 5,000

3.4 Economic productivity of FDC lands

CSE calculated the economic productivity of FDC lands raising commercial plantations in terms of per hectare turnover and profits.

As seen from *Table 7: Economic productivity of FDCs raising plantations*, the per hectare annual turnover and profit from the eight FDCs involved in raising plantations is merely Rs 4534.6 and Rs 2159.14 respectively. When compared to the economic productivity of other land uses in the country, which fare far better than FDCs, questions about the efficient utilization of 1.28 million ha of forestlands with FDCs in the economic sense arise. *Figure 5: Economic productivity of different land uses in India* shows per hectare turnover and profit from different selected land uses in the country.

Table 7: Economic productivity of FDCs raising plantations

State	Area under possession (ha)	Annual turnover (Rs)	Annual profits (Rs)	Per hectare turnover (Rs)	Per hectare profit (Rs)
Andhra Pradesh	83,700	100 crore	60 crore	11,947.4	7,168.46
Chhattisgarh	1,97,322	50 crore	15 crore	2,533.9	760.17
Gujarat	5,714	38 crore	3 crore	66,503.33	5,250.26
Karnataka	41,633	52 crore	15 crore	12,490.1	3,602.9
Kerala	10,500	20 crore	1.5 crore	19,047.6	1,428.57
Madhya Pradesh	4,25,000	85 crore	50 crore	2,000	1,176.47
Maharashtra	3,63,000	120 crore	60 crore	3,305.8	1,652.89
Tamil Nadu	75,000	80 crore	55 crore	10,666.7	7,333.33
Total/average	**12,01,869**	**545 crore**	**259.5 crore**	**4,534.60**	**2,159.14**

Box 3: Wood production from farm forestry and social forestry: A case of UPFC

The average timber production from Uttarakhand is nearly 2.2 lakh cum per year while that from Uttar Pradesh is 3.3 lakh cum per year. One of the reasons for the difference could be that the Uttar Pradesh Forest Corporation (UPFC) sources more than 50 per cent of its total wood from social forestry and farm forestry. The separation of Uttarakhand from Uttar Pradesh in 2001 meant a huge reduction in the share of forests to wood production in Uttar Pradesh with total wood production dipping from 4,60,000 cum in 2000–01 to 2,10,000 in 2001–02. The state more than made up for the loss by harvesting wood from plantations raised under social and farm forestry and has been registering profits of over Rs 100 crore per year from 2007–08 to 2012–13. Eucalyptus is the largest contributor, accounting for 70 per cent of the total production from social/farm forestry.

The trend in shares of the two forestry sectors to the wood production for UPFC is presented in the graph below:

Figure 4: Wood harvested by UPFC from forests versus social/ farm forestry

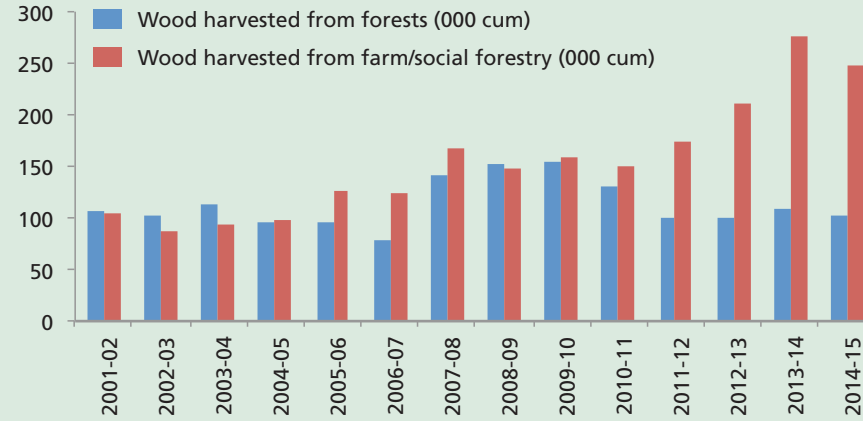


Figure 5: Economic productivity of different land uses in India

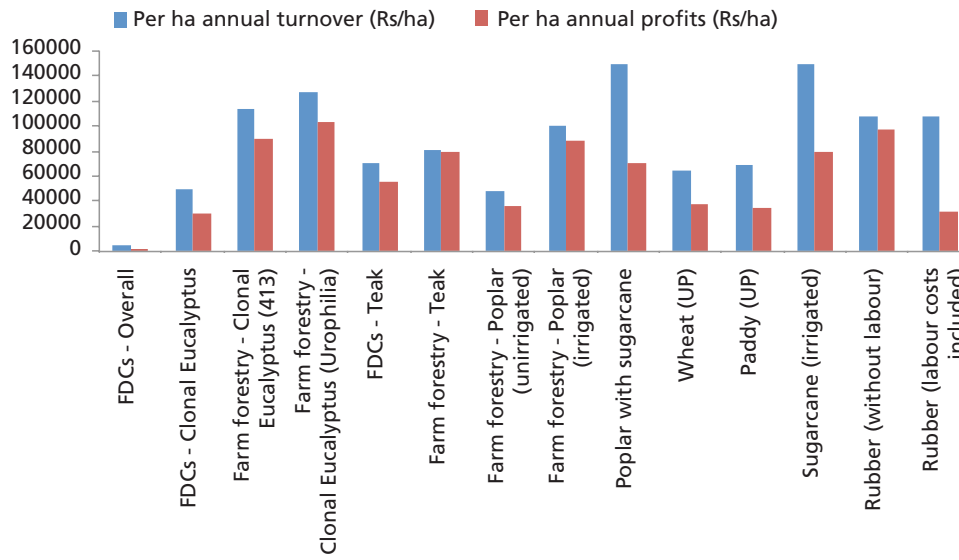


Table 8: Economic productivity of FDCs and other selected land uses

Land use	Subcategory	Per ha annual turnover (Rs/ha)	Per ha annual profit (Rs/ha)	Source
FDC	Overall	4,534.6	2,159.14	Based on information provided by FDCs
	Clonal eucalyptus	50,000	30,000	Gujarat FDC
	Teak	70,218.71	56,174.9	MPRVVN
Farm forestry	Clonal eucalyptus (413) at rotation period of three years	1,14,000	90,250	Based on discussion with experts
	Clonal eucalyptus (*Urophylla*) at rotation period of three yrs	1,26,666.7	1,02,916.7	Based on discussion with experts
	Teak	81,500	79,870	NABARD
	Poplar in unirrigated sandy conditions at seven-year rotation	47,655	35,899	Based on discussion with farmers
	Poplar in irrigated conditions at seven-year rotation	1,00,158	88,402	Based on discussion with farmers
Agroforestry	Poplar with sugar cane at rotation period of three years	1,50,000	70,833	Based on discussion with farmers
Agriculture	Wheat	64,425	3,620	N.P. Chaudhary and G. Chaudhary, 'Poplar culture on farmland: Farmer's experience from Uttar Pradesh', 2012[18]
	Paddy	68,750	35,027.5	N.P. Chaudhary and G. Chaudhary, 'Poplar culture on farmland: Farmer's experience from Uttar Pradesh', 2012
Cash crops	Sugar cane	1,50,000	78,750	Tamil Nadu Agricultural University[19]
	Rubber (labour costs excluded)	1,08,000	97,000	Based on discussion with experts
	Rubber (labour costs included)	1,08,000	32,000	Based on discussion with experts

As can be seen *from Figure 5: Economic productivity of different land uses in India* and *Table 8: Economic productivity of FDCs and other selected land uses*, all other land uses provide better returns than FDCs. Farm forestry and agroforestry, which serve the same key objective as FDCs of supplying wood to wood-based industries, provide much higher returns per hectare when compared to FDCs. This is despite the crash in prices of some popular farm forestry/agroforestry species such as poplar in the recent years. While cash crops like sugar cane and rubber have been providing remunerative returns to farmers, traditional agricultural crops of paddy and wheat also fare far better than the FDCs in pure economic terms. Therefore, it is quite clear from this analysis that FDCs need a much better strategy to increase productivity and maximize economic returns from the large chunks of forestlands available with them.

FDCs have not adopted and implemented best practices effectively to improve productivity of their plantations, leading to poor performances

3.5 Why are FDC plantations not productive?

As evident from the analyses above, FDCs lag behind farmers when it comes to the productivity of their lands. One obvious reason for the high productivity from farm forestry is that farmers have better managed lands than forestlands under FDCs and often irrigate them, which have a direct bearing on productivity. Farmers adopt a package of practices to enhance the productivity of their lands, which FDCs do not, possibly because of a lack of commitment. For instance, farmers plough their lands at least twice a year, which allows fresh nutrients to come to the surface as well as removes weeds, and apply fertilizers and manure to enhance production. When plantations are raised for productive purposes, management of existing rootstock is also essential to ensure that floral competition does not affect the growth of plantations. Again, it is a practice adopted by farmers but not by FDCs.

FDCs do invest a little in site preparation before undertaking plantations or replanting in areas where harvesting has been carried out. Steps taken include soil- and water-conservation measures, weed removal and ploughing. However, after the first and, sometimes, the second year, not enough is done to further enhance the productivity, leading to suboptimal production from long-rotation tree crops. There is some emphasis on ensuring the survival rate of plants, but there has been little emphasis on adopting catalytic measures to make plantations more productive. Further, in the absence of a benchmark for productivity, FDCs have been content with the introduction of clonal varieties of eucalyptus which has, undoubtedly, improved wood productivity in some cases in comparison to original native forests, but has failed if compared to farm forestry.

Experiments were undertaken to improve the productivity of eucalyptus plantations by a few FDCs such as Andhra Pradesh. For instance, trenches were dug to conserve water. However, as the water dried out in the trenches and mud filled them up later, efforts to clear them of the mud was not necessarily taken up. Paucity of funds has been reported as a reason. Therefore, FDCs have not adopted and implemented best practices effectively to improve productivity of their plantations, leading to poor performances.

4. FDCs and forest ecology

4.1 Environmental costs of monoculture plantations

The environmental impact of raising industrial plantations and monocultures on forestlands has been least documented, especially in India. It is a well-established scientific fact that plantations are not adequate substitutes for forests. Several research studies have proven that monoculture plantations cause changes in the native forest ecosystems through replacement of natural habitats, changes in water regime in the catchment, soil erosion, loss of biodiversity, chemical contamination etc. Where deforestation or clear felling of natural forests is involved to raise plantations, there are additional and sudden ecological damages in the form of loss of habitats for native species, disturbance in nutrient cycling, carbon emissions etc.

From an ecosystem services perspective, environmental losses as a result of deforestation in forests with density of 0.4 have been calculated by MoEF&CC itself to be Rs 50.696 lakh over a period of 50 years,[1] which translates into nearly Rs 1 lakh per ha per year. Environmental losses include soil erosion, effect on hydrological cycle, wildlife habitat losses, microclimate changes, biodiversity losses, most of which would have certainly happened as a result of FDCs' activities of conversion of natural forests into monoculture plantations. According to FDC officials, most forestlands leased to the corporations have a density of 0.4 or less. However, this is not true as in some cases denser forests have been handed over to FDCs.

The annual turnover of FDCs compares poorly even to the valuation of ecosystem services realized from natural forests. Also, the monoculture plantations of FDCs cannot compensate for environmental losses from converting natural forests into plantations

In its 2014 report on revision of Net Present Value of forests, Indian Institute of Forest Management proposed Rs 9.87–26.97 lakh per hectare as the valuation of open forests with density ranging from 0.1 to 0.4 whereas the proposed values are Rs 13.41–55.55 lakh per hectare for denser forests.[2] The global valuation of ecosystem services from forests has been estimated to be US $969 per ha per year (approximately Rs 64,980 at current exchange rate of Rs 67 per USD).[3]

As seen in the economic productivity section of this report, the turnover from one hectare of FDC land is less than Rs 5,000 per year. There is a huge gap between the per hectare turnover of FDCs and the per hectare valuation of ecosystem services, as estimated by different studies. While some environmental losses from the conversion of natural forests might be compensated through plantations on the same lands, it is hard to imagine that the compensation would be anywhere close to the ecosystem service benefits that would be realized if forests were allowed to remain in their natural state.

FDCs in India have frequently raised extensive plantations of species such as teak and eucalyptus through clear felling of diverse, old-growth natural forests. The Working Plan of one of the forest divisions of Maharashtra FDC noted that the main objective was to '*convert low value uneven aged mixed forests to uniform even aged stands of teak.*'[4] The Maharashtra FDC had raised teak plantations over 1.24 lakh ha through complete removal of natural forests from 1970 to 1987.

It is the claim of FDCs of Madhya Pradesh and Chhattisgarh raising teak that their plantations are as good as mixed forests as they have been raised through creation of gaps in natural forests. Teak also gets miscellaneous associates naturally after 25–30 years.[5] But species such as eucalyptus and acacia are

grown as pure crops without any species association allowed by FDCs. Such monoculture plantations are vulnerable to invasion of weeds like lantana and are more prone to pests and diseases. For instance, gall infestation has affected a certain variety of clonal eucalyptus on a large scale in Andhra Pradesh. Extensive clear felling and harvesting industrial crops over two to three rotations also result in depletion of soil quality and low humus content.[6]

Following the ban on clear felling in the 1980s and the promulgation of the National Forest Policy of 1988, some checks and balances have been introduced for felling operations of FDCs. In its guidelines dated 2 August 2001, MoEF&CC laid down the following conditions for felling:

i) All young to middle-aged fruit-bearing trees up to 20 trees per ha will be retained in native forests.
ii) Young to middle-aged semal, khair, rosewood trees as well as other superior miscellaneous species up to 20 trees per hectare uniformly spread over the area will be retained.
iii) No felling shall be done on either nala streams or riverbank up to 20 m distance from stream.
iv) The section size at a place shall not exceed 20 ha.
v) 20 m-wide strips of natural forest should be retained on all sides of section.

FDCs' monoculture plantations are prone to disease and cause environmental losses. Some checks and balances for FDCs' felling activities have been introduced since the 1980s. Only a few FDCs have taken up rehabilitation of wastelands and degraded forests

The letter of approval of the Working Plan for one of the divisions of the Maharashtra FDC from December 2015 also included restrictions on felling in wildlife corridors, resting places of wild animals, the vicinity of waterbodies, and eco-sensitive zones, i.e. areas within a 10-km radius of Protected Areas. However, the compliance, monitoring and effectiveness of such guidelines remain to be seen or studied.

APFDCL officials claim that eucalyptus plantations are raised only on degraded forestlands and that local tree species above the height of 5 m are not removed while raising plantations. FDCs that manage forestlands under plantations are now responsible for their overall management of their lands which includes conservation of forests, wildlife protection, fire management, rehabilitation of degraded forests, etc.

4.2 Rehabilitation of degraded forests and wastelands

The FDCs, which have been leased-out forestlands for plantations, are also responsible for the rehabilitation of degraded forests. Tripura Forest Development and Plantation Corporation (TFDPC) was created with the objective of restoring degraded forests through rubber plantations. Maharashtra FDC has nearly 20,000 ha of degraded forests under it for rehabilitation, where soil and water conservation measures are adopted, together with afforestation of mixed species, including bamboo. Maharashtra FDC has also carried out extensive afforestation of wastelands as part of the Wasteland Development Programme during 1988–91 and raised plantations over 2.35 lakh ha of wastelands, mostly outside FDC forestlands, where the FDC was involved as line agency with the Forest Department.[7] Madhya Pradesh FDC has undertaken rehabilitation of degraded bamboo forests over 13,000 ha. Odisha FDC has been struggling with obtaining approval for its Working Plans from the regional office of the MoEF&CC for harvesting plantations that the corporation had raised in the early 2000s. There has been opposition from the Odisha state forest department to let the FDC have control of management of forestlands. Under such circumstances, Odisha FDC has started acquiring revenue wastelands on lease from the Revenue Department and is raising plantations on them.

Box 4: Have FDCs improved the quality of forests?

'Site quality' of forests on which the plantations are raised directly affects the production of wood from these plantations. Site quality is a measure of soil depth and availability of water and nutrients in the soil. Forests are also classified on the basis of this determinant giving rise to five categories—I, II, III, IV and V, where I is the most productive and V the least. Forests which fall into the last two categories are generally considered to be degraded.

FDCs have been leased out forestlands which fall into the classification of site quality III, IV and V, where site III and IV have been further subclassified into IIIA and IIIB, and IVA and IVB. Plantations have been raised on all these sites. Teak plantations raised on extremely degraded forests, i.e. site quality V, proved to be unproductive and had to be abandoned. Maharashtra FDC had to hand back nearly 75,000 ha of forestland from 2006 to 2011 primarily because of the low productivity of these lands. Madhya Pradesh Rajya Van Vikas Nigam (MPRVVN) has decided to not undertake any more plantations on such forestlands. Some other state FDCs including Karnataka and Andhra Pradesh have also returned unproductive forestlands to the state forest departments.

The variation in the height of teak plantations raised on the different sites is provided in the table below:

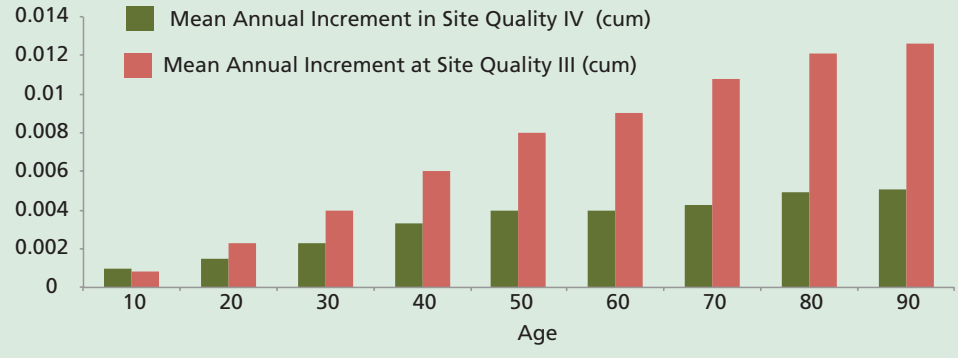
Site quality	Plantation height
IIIA	20–25 metres
IIIB	15–20 metres
IVA	12–15 metres
IVB	09–12 metres
V	06–09 metres

Source: MPRVVN, 2016

FDCs, especially those raising teak plantations, prefer forests with site quality III over IV for their plantations to achieve higher production. When measured in terms of Mean Annual Increment (MAI), tree growth in plantations on site III is almost double compared to those on site IV. MAI refers to average growth in volume per year a tree or stand of trees has shown up to a specific age.

Figure 6: Difference in MAI for teak plantations raised on site quality III versus IV shows the difference for teak plantations from one division of Maharashtra FDC:

Figure 6: Difference in MAI for teak plantations raised on site quality III versus IV



Source: Working Plan 2015–16 to 2024–25, Brahmapuri Forest Division, Maharashtra FDC

However, site quality III often has diverse and old-growth forests with mixed native-plant species, the biodiversity and ecological value of which is huge. When felling is carried out in these forests for raising plantations, all trees are removed, reserving the 40 trees/ha criterion. Such mixed forests are not unproductive actually and their conversion into monoculture plantations only enhances timber production and revenue from these forests without improving their quality. In fact, the soil quality and biodiversity are negatively impacted. In this context, how plantations can be raised on such sites without adversely impacting the local ecology needs to be explored.

Box 5: Models of leasing degraded forests for industrial plantations

In October 2014, Madhya Pradesh Rajya Van Vikas Nigam (MPRVVN) had organized a workshop to discuss 'leasing of degraded forest land for industrial plantations'. The workshop was attended by forest officers, officials from paper industries and members of various federations of commerce and industry as a follow up to the guidelines for reforestation of degraded forest land with pulpwood species through collaborative involvement of state owned Forest Development Corporations (FDCs) and participating paper mills. The guidelines were issued by Department of Industrial Policy and Promotion, Ministry of Commerce and Industries, Government of India vide their letter dated 11/02/2014.

Three models of using degraded forests for raising commercial plantations by FDCs were discussed in the workshop:

1. Leasing out 2000-3000 ha of degraded forest lands, having site quality IIIA, IIIB, IVA, IVB, through tender for a period of 40 years to the highest bidder to industries, bringing direct private investment. Under this model, 30 per cent of land had to be provided by the companies for Nistar rights of the local community. Communities cannot interfere in the remaining 70 per cent of land.
2. Bipartite agreement between FDC and paper companies—degraded forestlands in possession of FDCs like MPRVVN and FDCM were proving to be financial liabilities. Paper companies invest in FDCs to double the area that is treated annually by FDCs. The highest bidder would become entitled to the supply of raw material.
3. Tripartite participation of FDCs, farmers and paper mills proposed by the Executive Director of MPRVVN—two agreements required—first between farmers and FDCs and the other between FDCs and paper companies. Farmers would be encouraged to raise plantations on private land which is not suitable for agriculture. FDCs would fund the planting and felling costs of farmers at 5 per cent simple rate of interest and also provide farmers with technical assistance. Paper companies would enter into buy-back arrangements with FDCs. Net profit would be shared between the FDC and farmer in the ratio of 25:75. Effectively FDCs would act as middlemen for farmers under this arrangement.

It was concluded that FDCs would receive considerable improvement in their financial status due to increased business opportunities from the second and third models. Also, it was expected that paper companies would benefit from adequate supply of raw material at 'reasonable' price because of such arrangements.

Source: Proceedings of Stakeholders Consultation Workshop—'Leasing of degraded forest land for Industrial Plantations', 7 October 2014, Madhya Pradesh Rajya Van Vikas Nigam Ltd

FDCs look upon degraded forests and wastelands as financial liabilities and have often limited their intervention to 'greening' them instead of improving their overall productivity

However, it is not clear whether the afforestation efforts of FDCs have actually rehabilitated or improved the productivity of the degraded forestlands and wastelands. As per Maharashtra FDC officials, rehabilitation of degraded forests is effectively the same as '*greening*' them. In a scenario where the objective is not to raise productivity but to simply '*green*' degraded lands through afforestation or other soil- and water-conservation initiatives, it is unlikely that changes in productivity are monitored on such lands by FDCs.

FDCs also argue that degraded forests are a financial liability for corporations because of the huge costs of rehabilitating them. As forest degradation is one of the biggest issues plaguing the forestry sector, the question arises whether funds exist and can be channelized to improve their productivity. This argument of FDCs can be refuted on the ground that huge funds are available now under the Compensatory Afforestation Fund (to be established after enactment of Compensatory Afforestation Fund Act 2016) for raising productivity of degraded forests or wastelands. Maharashtra FDC had been allocated Rs 1.29 crore under the Compensatory Afforestation Management and Planning Authority (CAMPA) in 2013–14, where Rs 52 lakh was budgeted for wildlife management, primarily through creation and deepening of waterholes. Rs 40 lakh was earmarked for establishing seed nurseries and another Rs 26 lakh for infrastructure, surveys and staff training.[8] The point here is that funds are available under Compensatory Afforestation Funds and if restoring degraded areas is a priority for FDCs, such funds could very well be used for the purpose. Funds will also be released to states as per the recommendation of the 14th Finance Commission. If FDCs are able to demonstrate a good model of restoring degraded forests, it is very possible that raising finances for afforestation would not be a problem.

5. FDCs and communities

In addition to improving the productivity of India's forests, NCA expected FDCs to '*create much more employment for skilled and unskilled hands' and 'give substantial support to the economy of the backward areas and the tribal population which depends on growth of forestry activities*'. The National Forest Policy of 1988 states that a primary task of all agencies responsible for forest management, including FDCs, should be to associate the tribal people closely in the protection, regeneration and development of forests as well as to provide gainful employment to people living in and around the forest. The objective of providing unskilled employment was more or less fulfilled as FDCs work in interior and inaccessible forest areas where forest-dwelling communities often form a natural labour force of these corporations. The HLST report in 1990 noted that '*assured wages and relief from exploitation by contractors were two important outcomes of FDC working*'. Thus, generation of employment in forest areas was a perceived positive outcome from the working of FDCs.

However, in most cases, the engagement of FDCs with communities has stopped at providing employment to a few people alone. While some FDCs have attempted to benefit forest-dependent communities through their rehabilitation programmes or benefit-sharing mechanisms, large-scale initiatives to support the forest-based economies of these communities or involving communities in the protection and regeneration of forests have been lacking. As the HLST report noted, '*conscientious efforts exclusively for weaker, landless rural populations or tribals are not found. If the forest development had happened in its true sense, it would have certainly helped the weaker sections as well as tribals*'.

Other than providing unskilled employment to local communities, FDCs have not introduced large-scale initiatives to support forest-based economies of communities or involve communities in the protection and regeneration of forests

Our interaction with communities around FDC project areas revealed a sense of displeasure among communities with the FDCs' functioning model. Communities articulated the need to be consulted before FDCs start their activities, especially when FDCs were converting forests into plantations of high-value timber species, which have little use for the communities or communities perceive as ecologically damaging. The lack of dialogue has often resulted in conflicts between the communities and FDCs. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, also called the Forest Rights Act (FRA), was enacted in 2006. The Act empowers forest-dwelling communities to protect and manage their traditional forest resources and has been used by communities in some states to oppose activities of FDCs in forests over which their rights have been recognized.

Some ways in which communities have been included or impacted by FDCs are provided below:

5.1 Rehabilitation of communities through cash crop plantations

FDCs in two states, Tripura and Andhra Pradesh, have raised cash crop plantations of rubber and coffee on forestlands with the aim of rehabilitating tribal communities who practised shifting cultivation. While the utilization of forests for cash crops can be debated, the FDCs in the two states claim to have established successful models to benefit communities through their plantations.

Tripura Forest Development and Plantation Corporation (TFDPC) was established with the objective of restoring degraded forests through rubber plantations and subsequently rehabilitating tribal shifting cultivators in the state. By the end

of 2013, the Corporation had successfully rehabilitated 2,606 families from the Scheduled Tribes and Scheduled Castes community by providing them one hectare each of rubber plantations.[1] Beneficiary families of such rubber plantations were responsible for maintaining the plantations handed over to them, besides holding the rights to extract and sell latex extracted from these plantations. Under this model, the ownership of land remained with TFDPC.

However, conflicts have been reported when ownership of land over which rubber plantations were raised became contentious. In addition to forestlands where rehabilitation was done, TFDPC was also in possession of lands where it raised rubber plantations for its own revenue. In 2009, the forest rights under FRA of 43 tribal families over 52.32 ha were recognized by the District Administration in TFDPC's own plantations. The right holders, thereafter, resisted collection of latex by the Corporation from the areas for which title deeds had been issued under FRA. The matter was brought to the notice of the Head Office and the Board of Directors of the Corporation. After strong follow-up of the issue by the Corporation, the District Administration cancelled the rights of these tribal families in 2011.[2] While TFDPC claims that forest rights had been wrongfully allotted to the 43 families, the provision of cancellation of rights is not allowed under FRA and is, in fact, considered a violation of the Act.

Some FDCs have introduced rehabilitation programmes and benefit-sharing mechanisms for communities. However, the impact of such programmes and the actual realization of benefits by communities need to be studied

Similar to TFDPC, Andhra Pradesh Forest Development Corporation (APFDC) started coffee plantations to wean away the Chenchu tribal community from their traditional practice of shifting cultivation. APFDC has raised coffee plantations over an area of 2,714 ha and was leased another 1,296 ha of coffee plantations from the state forest department. According to APFDC officials, these coffee plantations located in the FDC areas are not only creating 6 lakh man-days of employment for local tribals every year, but also protecting forests from 'encroachment'.[3] In 2016, tribals were being paid wages at the rate of Rs 180 per day.

Unlike the TFDPC model of rehabilitating communities, APFDC has only employed tribals as daily-wage labourers, without handing over any coffee plantations to them. The fate of the traditional shifting-cultivation lands of the Chenchus is also not clear.

5.2 Benefit sharing with communities

Mostly, communities living adjoining FDC areas are entitled for *nistar* privileges under which there are provisions to supply forest produce free of cost or at subsidized price to communities for domestic use. FDCs in most cases retain monopoly over the sale of surplus produce, with no obligation to share the benefits with the communities, which is a major source of revenue for these corporations. Only in cases where FDCs operate in areas assigned to Joint Forest Management Committees (JFMCs) are they required to have a benefit-sharing mechanism in place.

For instance, West Bengal FDC pays 25 per cent of the net revenue to its JFMC (known as Forest Protection Committees in the state) from the sale of wood and non-timber forest produce (NTFPs) from forests after deducting the operational costs of logging. In Uttarakhand, whenever trees earmarked for harvest fall inside forestlands allotted to Van Panchayats, the state FDC pays the royalty for these trees to the panchayats. Some FDCs, as mentioned below, have recorded huge payments to communities in the name of benefit sharing, but it remains to be studied if the benefits have actually reached the targeted communities:

- The Gujarat FDC is required to share 100 per cent of net profits from the sale of NTFPs of Scheduled Areas with panchayats. The sharing of benefits with panchayats in Gujarat was a result of legislative changes rather than an inherent objective of the Corporation to benefit tribal communities. By virtue of the amendments in the Gujarat Panchayat Act 1993, the ownership of NTFPs that was with the state government was transferred to panchayats in forest areas within Scheduled Areas with effect from December 1997. In 2002, the Corporation reached an agreement with gram panchayats to entrust the activity of the collection of NTFPs to the Corporation from Scheduled Areas on a 'no-profit, no-loss' basis. From 2008 to 2015, the Corporation was liable to pay nearly Rs 34 crore to the district panchayats as a result of the agreement. However, as per the Gujarat FDC officials, the amount has not been transferred into the accounts of panchayats so far since approval from the state government is pending.

- The Madhya Pradesh Rajya Van Vikas Nigam (MPRVVN) has paid Rs 34.35 crore as dividend to JFMCs from 2006 to 2014 and is perhaps the only state that has a separate resolution for FDC and JFMCs. In a government order dated 6 November 2015, the Madhya Pradesh government laid down provisions for MPRVVN on sharing benefits with JFM committees for the forest produce from the plantations on JFM lands. The order stated that plantations by MPRVVN on JFM lands would comprise short-rotation crops like bamboo and medium- and long-rotation crops like teak and gamhar (*Gmelia arborea*). Forty per cent of the produce from short-rotation crops and 20 per cent from long-rotation crops would be shared with JFM committees. Twenty per cent of the net revenue realized from the harvest of produce before undertaking plantation would be shared with the JFM committees.

It is quite likely that communities would be eligible for a significant chunk of FDC forestlands under FRA. However, FDCs have not worked out the areas on their lands over which forest rights have been or could be recognized

5.3 Forest rights and FDCs

The FRA recognizes the rights of forest-dwelling communities on forestlands. A study by the Rights and Resources Initiative estimates that at least 40 million ha of forestlands are eligible for recognition under FRA.[4] This figure is close to half of the total extent of geographical area under forest cover in the country. It is quite likely that a significant chunk of the forestlands available with FDCs would be eligible for rights of the communities under FRA also. However, FDCs have not worked out the area on their lands that has been or potentially could be regularized to traditional forest-dwellers under FRA. The presence of communities on FDC lands continues to be noted as encroachment. Community Forest Resource (CFR) rights under FRA also empower communities to protect, manage and regenerate their forests. The objectives of community-based forest management often differ from those of FDC, where the former lays emphasis on maximizing forest resources such as NTFPs instead of timber. A few cases of conflicts have been recorded as a result of the above:

- In Rajnandgaon district of Chhattisgarh, tribal villages have stopped the FDC from transporting felled wood outside the forests for sale. The FDC had been carrying out its regular felling operations in forest areas which have now been recognized as Community Forest Resource (CFR) areas of the tribal villages under FRA. The villages are opposing the removal of wood from their CFRs because they view it as destructive to their forests. The FDC has not included CFRs or FRA in its Working Plan. The delay in the transportation of wood has been causing losses to the Corporation. It was learned that the Divisional Manager of Rajnandgoan had written to the district administration demanding cancellation of forest rights of one of these protesting villages in Chhattisgarh.

- In the Nandurbar forest division of Maharashtra FDC, the CFR claims of several tribal villages were declared ineligible as they fell on lands in possession of the state FDC. As the FRA recognizes the rights of forest-dwelling communities on all kinds of forestlands, the basis for rejection of CFR claims is legally wrong and has caused conflicts. In a few other villages in the same forest division, where CFRs have been recognized over FDC lands, the Corporation has made it difficult for the right-holding villages to exercise their protection and management rights over these lands. These lands are degraded with scattered plantations of teak, and the communities have prepared their own management plan which seeks to convert these degraded lands into mixed forests. The FDC, on the other hand, wants to implement its Working Plan on these lands and plant teak.[5]

FDCs have faced criticism and opposition from communities for felling natural forests that sustain local communities. Conflicts have been reported where FDCs converted forests into plantations of species that have little use for communities and were planted by FDCs without consulting them

- In the Coochbehar Forest Division of West Bengal, forest villages have been resisting the coupe felling of forests by the state FDC since the enforcement of FRA in 2008. These villages have constituted committees under Section 5 of FRA for the protection and management of their forests and strongly believe that the felling of forests has led to increase in incidences of human wildlife conflict in their region. On 6 March 2014, the Range Forest Officer (RFO) of the Moraghat Logging range of West Bengal FDC wrote a letter to the gram sabha of North Khairabari forest village seeking permission from the gram sabha to carry out Clear Coupe Felling (CFC) in the 34 ha of the area claimed by the village as CFR.[6] After carrying out a survey of the proposed felling area, the gram sabha observed that the felling would mean loss of over 1,700 trees of native species and, thereby, refused permission to the FDC, forcing the Corporation to abandon its felling plan in the forests surrounding Khairabari.

5.4 Other conflicts with communities

In addition to the conflicts arising from overlap of CFR and FDC lands, FDCs have also faced criticism and opposition from communities for converting so-called 'poor-quality' natural forests to plantations of industrially or commercially valuable species such as teak and eucalyptus. The HLST report of 1990 also noted that the forest-dwelling communities had '*not taken to FDC working whole-heartedly*'. FDCs follow their Working Plan, which has its genesis in the colonial era and continues to be operated without the need for consultation with communities. In some cases, FDCs have been dragged to court by the communities.

Some cases of conflicts are listed as follows:

- In the Gadchirolli and Chandrapur districts of Maharashtra, one forest division of Maharashtra FDC had been transferred approximately 10,000 ha of reserved forests in 2014 by the state forest department (see *Box 6: Lack of an impact assessment system for monoculture plantations on forestlands*). The FDC's felling operations in the natural forests have created much uproar among the communities in the Gadchirolli district, who have strongly condemned the conversion of natural forests into teak plantations as these natural forests have provided several tangible and intangible ecosystem services to the opposing communities for generations. The local communities have refused to provide their labour for felling and plantation activities of the Maharashtra FDC as a form of protest. Most of the protesting villages are governed under the Panchayat (Extension to Scheduled Areas) Act, 1996, also called PESA, which empowers gram sabhas to manage their resources and requires their consent before commencing any activity. As

Box 6: Lack of an impact assessment system for monoculture plantations on forestlands

The Forest Development Corporation of Maharashtra (FDCM) was initially leased out 4.63 lakh ha of forestland to raise commercial plantations. During 2006–07 to 2010–11, the Corporation had to surrender approximately 70,000 ha to the state forest department because of difficulties in managing these lands on the grounds of large-scale 'encroachment', unproductive lands and non-viability of plantations. The area in possession of FDCM reduced to 3.93 lakh ha by 2011. Between 2011 and 2013, FDCM had to hand back another 62,000 ha approximately to the state forest department due to huge wildlife presence in these forests and their consequent notification into Protected Areas (Koka Wildlife Sanctuary) and buffer zones (Tadoba Tiger Reserve). FDCM requested the state forest department to compensate for this loss of forestland. In response, the state forest department transferred 38,977.93 ha of new forestland to FDCM in June 2014. As of March 2016, FDCM had 3.63 lakh ha of forest under its management.

FDCM works through 14 forest divisions in the state. Brahmapuri is one such division spread across the districts of Gadchirolli and Chandrapur. Brahmapuri received 9,880.73 ha from the fresh allotment of forestland, which has taken up the total area under its management to 30,123.74 ha. Similar to the Working Plan model of the forest departments, each forest division of FDCM prepares a Working Plan, which is approved by the regional office of the MoEF&CC. Brahmapuri's Working Plan for 2015–16 included felling 690 ha of natural forests, which involved removal of 2,10,000 trees and corresponding plantation and regeneration of 15,52,500 trees of teak. The Plan received approval from the Union Ministry in December 2015.

Soon after receiving approval, FDCM started tree felling in several compartments of the newly allotted forestland. This triggered a massive protest from communities in the Wadsa range of Gadchirolli district who are concerned that the loss of natural forests would cause them huge losses and degrade the environment as well. Gram sabhas, which come under the Panchayat (Extension to Scheduled Areas) Act, 2006 in this region, have passed resolutions against the FDCM's felling operations. Some gram sabhas had also claimed Community Forest Resource (CFR) claims under the FRA over these forests as early as 2011 but the allotment of lands to FDCM happened while the claims were still pending. One of the affected gram panchayats has filed a Public Interest Litigation against FDCM in the Nagpur bench of the High Court. The matter was transferred to the National Green Tribunal (NGT) in June 2016 for decision.

The transfer of forestland to FDCM or other FDCs is treated merely as changing hands from one forest agency to the other, exempting these Corporations from obtaining any environmental or forest clearance for replacing natural forests with monoculture plantations. The working plan approval does not require an assessment of the environmental and social impacts of conversion of complex forest ecosystems into monoculture plantations. Monoculture plantations are known to cause soil erosion, possible changes in availability of water in the catchment, chemical contamination etc. As in the case of Brahmapuri, deforestation is also involved in raising such plantations, which obviously incurs additional damages in the form of loss of biodiversity and natural habitat.

The forests proposed for clear felling by the Brahmapuri division have been deemed 'low quality' and 'low value' by FDCM. However, these forests are diverse, old growth and often dense with mixed species—such as ain (*Artocarpus hirsutus*), dhawada (*Anogeissus latifolia*), bija (*Pterocarpus marsupium*), shisham (*Dalbergia sissoo*), khair (*Acacia catechu*), mahua (*Madhuca longifolia*), tendu (*Diospyros melanoxylon*), amla (*Emblica officinalis*) and behera (*Terminalia bellirica*)—and constitute an important source of sustenance and livelihoods for the local communities. When such forests become plantations, their economic value might enhance but significant ecological costs would be involved which have been largely ignored in India.

a result of the local protests, Maharashtra FDC was able to fell only 385 ha of forests in 2015–16, short of its plan of 690 ha. The communities had filed a case in the Nagpur bench of the Bombay High Court against the FDC and in June 2016, the High Court transferred the case to the National Green Tribunal (NGT) for further decisions.

- In the Mohgaon project area of the Madhya Pradesh FDC, protests erupted in 2012–13 against the felling of trees by the FDC on forests that had been protected by the JFMCs of villages in the Anjania and Kanchangaon Ranges. The leader of the one of the eight affected JFMCs filed a petition in the High Court against the FDC, which was transferred and disposed of by the NGT. As a result of the protests and the subsequent court hearings, the FDC suffered losses of nearly Rs 22.98 lakh. In its judgment dated 8 May 2014, the NGT noted that '*the MPFDC did not consult the above committees while preparing the Working Plan and has taken up its activities in isolation causing resentment among the local communities'.* The judgment also observed that *'it is high time to make a provision that the issue of transfer of forest land to the MPFDC is discussed with JFM Committees so that their aspirations and wishes may find place in the forest management.'*[7]

6. Discussion and conclusion

The objective of FDCs was to raise productivity of forestlands, create employment, support the economy of the backward areas and tribal population, provide raw material to industry and export wood and wood products. Consequently, FDCs raised plantations, largely of eucalyptus and teak. However, the productivity of FDC plantations as well as FDC lands compares poorly with other productive tree-based land use models like farm forestry and agroforestry. The economic productivity of FDC lands is low and the environmental losses from conversion of natural forests into commercial plantations outweigh the monetary benefits realized from FDC plantations. In addition, the conflict between FDCs and the community is on the rise. It is our overall assessment that FDCs have not fulfilled their objectives so far.

Sitting on 1.28 million ha of forestlands, FDCs are a minor player in the wood market of India. Our overall assessment is that FDCs have failed to fulfil their objectives

On the environmental front, guidelines on tree felling by FDCs have been introduced, which impose restrictions and checks to reduce the impacts of felling on wildlife, forest streams and overall biodiversity. However, there is no study to establish the efficacy of these guidelines. In fact, there is no study on the ecological impacts due to conversion of large chunks of mixed forests into monoculture plantations by FDCs. Even today, the conversion of mixed forests into monoculture plantation by FDCs is seen as a forestry activity that does not require impact assessment studies.

FDCs have limited their plantations largely to teak and eucalyptus without giving serious thought to revamping the ongoing production forestry model to raise native and/or threatened species of trees (e.g. red sanders, ebony, rosewood, agarwood etc.) and scaling up native sources of pulpwood (e.g. bamboo) that can restore the ecological balance and be of use to local communities also.

FDCs in India manage nearly 1.28 million hectares of forestland, not a small number by any stretch. Given the widening gap between the demand and supply of wood and other forest products/ecosystem services, it is timely that the Central government revisits the existing FDC model with state governments and explores a more holistic and productive model for these Corporations.

7. Recommendations

When the NCA recommended the establishment of FDCs in 1970, it envisaged that these Corporations would increase wood production from forests to the extent that wood-based industries could meet a significant part of their demand from forests. However, FDCs today are a minor player in the wood market of the country. It is, therefore, important that the model of FDC is revisited and improved by the government and state forest departments.

CSE makes the following recommendations to improve the FDC model in India:

1. **Increase productivity from FDC lands:** It is clear from this study that the FDC model as it is functioning now has not been successful in raising productivity of forestlands to the desired levels. FDCs should learn from the other productive land-use management systems, such as farm forestry, which are being practised successfully in India. Also, FDCs should set a benchmark for the level of productivity that their lands have potential for and evaluate their performance against this benchmark regularly. Land being a scarce resource in the country, every hectare of FDC land should perform much better on the criterion of productivity.

   CSE proposes the following models to improve productivity on FDC lands:

   Model 1: Adopt a package of productivity-enhancing practices on FDC lands
   There is great need and huge scope for FDCs to adopt wholehearted measures to enhance the productivity of their plantations. Possible measures include regular ploughing, weeding, appropriate soil- and water-conservation steps and building water-harvesting structures in the areas under intervention. It is important that FDCs implement these measures in a sustained manner rather than abandoning them after the first or second year of planting. The budget for maintenance of plantations should reflect the aforesaid costs clearly.

   As a simplistic measure, FDCs have often resorted to plantations of exotic fast-growing species/clones like those of eucalyptus and acacia to meet the objective of improving productivity. These species are grown as monocultures, and experiments to intercrop them with other productive species such as bamboo have not really been undertaken. One of the ways to achieve high productivity can be to carry out plantations of native but highly productive species suitable for various agro-climatic zones. FDCs should also experiment with two- or three-tier cropping patterns where combinations of productive species of light-demanding and shade-tolerant species are planted together in layers to optimally utilize horizontal and vertical spaces, as often practised in agro-forestry. Alternatively, short-rotation productive trees of native species should also be explored.

   Model 2: Bipartite agreement between FDCs and local communities
   This model can be explored and experimented for improving the productivity of degraded forests. In this model, degraded forests can be leased by the state forest departments jointly to FDCs and local communities, where the clearly defined objective should be to restore degraded forests and enhance productivity of wood and NTFPs. A Memorandum of Agreement can be signed between FDCs and the communities to raise plantations of

productive, multipurpose species which are suited to the local ecology.

Considering the widespread failure of the JFM model, communities must take a major share (i.e. over 50 per cent) of the produce from such lands. Also, local communities must have a major decision-making role without the high-handedness of forest departments in forest management in such areas. FDCs can be entrusted with the additional task of raising finances through schemes such as Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) and CAMPA as well as providing technical support to the communities and monitoring their performance. Successful models like WADI model of NABARD can also be explored with their replication for wood species along with NTFPs as suitable for the particular state and site. The plantations should be raised in such a way that a range of forest products can be derived from them besides wood. For instance, fodder or medicinal plants can be grown as undergrowth crop between trees, over which communities are provided rights.

Model 3: Tripartite partnership between FDCs, farmers and private sector
In this model, farmers within a periphery of five to 10 km of FDC-project areas can be identified to partner with FDCs. FDCs in turn can have a second agreement with private companies and wood-based industries. In this model, FDCs may provide farmers with technical assistance and planting stock as well as fund planting and felling at a simple rate of interest less than 5 per cent. They can also undertake soil- and water-conservations measures, funds for which can be channelized from CAMPA, MGNREGS etc. Paper companies would enter into buyback arrangements with FDCs. Net profit may be shared between the FDC and farmer in the ratio of 25:75.

Model 4: Bipartite agreement between FDCs and the private sector
In this model, the plantations already raised by FDCs can be leased to the private sector for management. While ownership of plantations will continue to be retained by FDCs, the private sector can invest in the plantations to improve their productivity. An agreement between the FDCs and private sector can be drawn out for sharing profits from the harvest. However, care should be taken that any such FDC land, where plantations have not been undertaken, is not leased to the private sector. This model will be applicable only where the existing land use is plantations at the time of lease.

2. **Focus on making degraded forests productive:** The HLST report had recommended that the main activity of the FDC should be forest development through a sound policy of afforestation, which includes rehabilitation of degraded forests. FDCs have frequently avoided this challenge and have been using healthy forests only. Therefore, it is recommended that FDCs focus more on making degraded forests and wastelands productive. Rehabilitation of degraded forests or wastelands by FDCs should not be limited to '*greening*' these lands only. Funds available under Compensatory Afforestation Funds, 14th Finance Commission, Green India Mission etc. should be used to improve the productivity of wastelands and degraded forests.

3. **Stop transfer of mixed forests to FDCs for plantations:** As seen in the case of the Maharashtra FDC, the transfer of mixed forests to FDCs triggered protests among communities. Such transfer should not be allowed, especially when large tracts of degraded forestlands are available in the country. Converting mixed forests into plantations can be socially and ecologically damaging

and it should, therefore, be a policy across all states to not transfer healthy and mixed forests to FDCs.

4. **Carry out impact assessment for converting forests into plantations:** There have been few studies or assessments of the environmental, social and biodiversity impacts of monoculture plantations on forestlands in India. With the lack of such studies, carrying on with the activity of raising commercial plantations through conversion of natural forests is worrisome. It is recommended that leasing out forestlands to FDCs must be regarded as a non-forestry activity and a proper forest clearance procedure based on scientific impact assessment of such diversion is adopted in the future. Only after a careful cost–benefit analysis on all the aforesaid parameters, forestlands may or may not be given to FDCs for proposed plantations.

5. **Develop guidelines for FDCs raising commercial plantations**: The MoEF&CC should develop comprehensive national guidelines for the functioning of FDCs, which lays down conditions for the nature of plantations that can be undertaken, choice of species for plantations, provisions for role of the local communities in the wake of new legislations like FRA, 2006, etc. In the absence of such guidelines, accountability and conflict resolution remain unclear.

6. **Evolve mode of engagement with communities:** In the current era, where forest policies and legislations are recognizing communities as important stakeholders in forest management and decision-making, the nature of engagement of FDCs with communities will also have to be determined by the rights and entitlement of communities around project areas. Three models emerge in this context, and FDCs should have a clear policy for each of them. These include:
   i) The villages in and around FDC project areas have received or are eligible for Community Forest Resource (CFR) rights under FRA on lands which had been in possession of FDCs. In cases where the overlap of CFR and FDC lands leads to conflict, it is recommended that FDCs hand over these lands to communities to avoid conflict and subsequent revenue losses. In the non-conflict cases, FDCs and right-holding gram sabhas can work together to improve the productivity of the overlapping lands, where FDCs can provide technical support while decision making rests with the gram sabhas.

   ii) The projects of FDCs are located in forests assigned to Joint Forest Management Committees (JFMCs). In such cases, it should be mandatory for FDCs to develop their Working Plans in consultation with the JFMCs. Every state should review its resolution on JFM to insert appropriate provisions specifying the role and duties and responsibilities of its FDC vis-a-vis JFM committees in the areas handed over to the FDCs, as seen in the case of the Madhya Pradesh FDC.

   iii) In FDC lands, where neither FRA nor JFM is applicable, FDCs should associate the local communities closely in fulfilling their objectives, as required under the National Forest Policy of 1988 and set aside a fixed percentage of their lands to meet the needs and aspirations of the communities.
7. **Review working of FDCs every five years:** It is disappointing to know that no data or information is maintained at the MoEF&CC on FDCs. It is

an urgent imperative for MoEF&CC to review the working of FDCs at least every five years so that their functioning with respect to aims, objectives and challenges of forest development are discussed periodically. Moreover, a vibrant public information system should be set up on the forests of India that are under the control of FDCs.

Annexure I

Brief description of state FDCs in India

1. **Andhra Pradesh:** Established in 1975, the Andhra Pradesh Forest Development Corporation Limited (APFDCL) was initially leased out 83,700 ha of forestland to develop land for raising forest plantations, in particular eucalyptus, bamboo and cashew. The bifurcation of the state has led to a reduction in the total area under its management to nearly 60,000 ha. APFDCL harvested nearly 1.4 lakh metric tonnes (MT) of pulpwood annually from its plantations from 2009–10 to 2013–14 and sold to wood-based industries. The Corporation has not been able to harvest any pulpwood in the last two years owing to the delay in approval of its working plans post bifurcation of the state. Coffee plantations have become another major profitable activity of the Corporation.

2. **Chhattisgarh:** Chhattisgarh Rajya Van Vikas Nigam Limited was established in 2001 after bifurcation of the state from Madhya Pradesh. About 197,322 ha forestland has been leased to the Corporation, of which nearly 115,000 ha is under teak plantations. Raising of commercially important species like teak and bamboo and their harvest and trade are the major activities of the Corporation. The annual production of teak wood from the Nigam has been approximately 40,000 cum from 2010–11 to 2014–15.

3. **Gujarat:** Gujarat State Forest Development Corporation Limited (GSFDCL) was established in 1976 to undertake the collection and trade of Non-Timber Forest Products (NTFPs) for the benefit of tribal populations in the state. GSFDCL has diversified into several activities now which include (i) raising clonal orchards of eucalyptus on forestland (ii) production and sale of furniture through the Corporations' wood institution called Vanil Udyog (iii) production of ayurvedic products under the brand name of Dhanvantri. (iv) collection and trading of charcoal manufactured by local people and gram panchayats. The contribution of NTFPs to the revenue of GSFDCL has been steadily declining from 72 per cent in 1995–96 to less than 12 per cent in 2014–15, which has led the corporation to diversify its activities. In 1981, the FDC was leased out 1,19,080 ha of forestland for a period of 51 years for intensive management and development. Owing to low productivity of the leased forests, GSFDCL has handed the same back to the forest department in 2012–13. In 1986, the Government of Gujarat also handed over 5,714 ha of reserved forest of Panam Irrigated Plantation project to the Corporation on lease for 30 years, where clonal orchards of eucalyptus are being raised. The annual average production of eucalyptus wood from these plantations has been 8,400 cum from 2010–11 to 2014–15. Part of the wood is supplied to Vanil Udyog, for value addition, while the rest is sold through auction. GSFDCL also purchases wood from the state forest department for the production of school benches. The sale of school benches provides nearly 45 per cent of the total revenue of the corporation.

4. **Haryana:** Haryana Forest Development Corporation (HFDC) was established in 1989 with the main purpose of assuring reasonable prices to the farmers for their standing trees and other forest produce and to establish forest-based industries. HFDC is also harvesting trees and marketing wood from earmarked areas of forestlands and institutions like colleges, schools,

hospitals since 1995–96 and pays royalty to these agencies in lieu. The Corporation is also engaged in purchasing wood from panchayats as well as farmers who practise agroforestry and farm forestry. The average volume of wood harvested and purchased by HFDC has been 55,000 cum annually from 2010–11 to 2014–15. The share of forests and institutions to the total wood volume of the corporation is nearly 99%, highlighting that farmers and panchayats are very small contributors to the HFDC. In 15 years from 2000–01 to 2014–15, the HFDC purchased only 2,383 cum and 5,568 cum from farmers and panchayats respectively,[1] despite the fact that the Corporation has a system of Minimum Support Price (MSP) for wood produced by these groups. However, the farmers and panchayats find it more profitable to sell through contractors and open auctions. In addition, HFDC is also engaged in the manufacture of wooden crates, barbed wire, polythene bags, etc. and runs a saw mill.

5. **Himachal Pradesh:** Himachal Pradesh State Forest Development Corporation (HPSFDC) was established in 1974. Initially, the working of Rosin and Turpentine Factories at Nahan and Bilaspur were taken over and subsequently resin extraction operation was also taken over. In 1983, wood harvest and marketing, including bamboo, for the whole state became the major activity of the Corporation. Every year, the Forest Department has to identify trees, which are allocated to the Corporation for harvesting and marketing upon payment of royalty by the Corporation to the department. The corporation also carries out felling of trees that belong to scheduled species from private lands. The annual production of wood by HPSFDC has been 1.5 lakh cum on an average from 2010–11 to 2014–15. HPSFDC has diversified its activities towards ecotourism also. All wood from the state is sold through the Corporation, which amounts to nearly 60 per cent of its revenue. A report by the Comptroller-Auditor General of India noted that HPSFDC was able to transport less than 50 per cent of the wood available to its sale depots during the above period. Of nearly 4.3 lakh cum of wood that was transported to the sale depots, the Corporation managed to sell only 2.76 lakh cum as cartel formation in the state led to non-competitive rates for wood. These shortfalls are causing losses to the Corporations. HPSFDC is among the few corporations that have been running into heavy losses in the last five years. From 2010–11 to 2014–15, the Corporation had accumulated losses to the tune of Rs 52.75 crore, putting its survival at stake. Other activities of the Corporation like resin extraction and ecotourism have also incurred losses in the last 5 years.[2]

6. **Jammu and Kashmir:** The Jammu and Kashmir State Forest Corporation was established in 1978 to carry out extraction and sale of wood in the state. The main objective of the Corporation is to undertake removal and disposal of trees and exploitation of forest resources entrusted to it by the Government of Jammu and Kashmir. Following the Supreme Court ban on green felling in 1996, its current activity is confined to removal of dead and dying trees, which on an average is 50,000 cum annually. The annual turnover is about Rs 60 crore with net profit of about Rs 2 crore.[3]

7. **Karnataka:** Karnataka Forest Development Corporation Ltd (KFDC) was established in 1971 to encourage cultivation of fast growing trees species which are suitable for producing paper pulp and rayon-grade pulp. Accordingly, plantations of pulpwood species such as eucalyptus, acacia and bamboo and commercial species such as rubber have been undertaken on forestland leased out to the Corporation. KFDC has 41,663 ha of

reserved forest available for plantations, of which rubber plantations are raised and maintained over 4,443 ha. From 1972 to 2012, plantations of eucalyptus, acacia and other species have been carried out over 69,930 ha, which includes lands that have been replanted post harvest of the aforesaid species. The annual production of pulpwood is nearly 1 lakh MT, which is sold to paper mills and polyfibre industries. The sale of rubber latex and, more recently, over-mature rubber trees are the major sources of revenue for the Corporation, contributing to approximately 82 per cent of the total revenue from 2001 to 2015. Plantations of pulpwood species like eucalyptus and bamboo, on the other hand, which constituted the chief objective of the Corporation, are not the activities that sustain the Corporation.

8. **Kerala:** Kerala Forest Development Corporation was established in 1975 in Kottayam for the establishment of plantations of industrially and economically valuable plantations of fast growing species like eucalyptus to feed the wood based industries. The Corporation was transferred 10,618.9 ha of reserved forests in 1983 by the state forest department for plantation activities. The activities of the corporation include cultivation of tree crops such as eucalyptus, acacia, teak and cash crops like tea, cardamom and coffee. Kerala FDC has had to hand over some of the original leased forestlands back to the Forest Department due to unproductive and unmanageable plantations of coffee and cardamom. The corporation has nearly 8,970 ha of land under plantations of tree and cash crops as well as medicinal plants, while the rest of the land is either unproductive or used for miscellaneous activities of the Corporation such as ecotourism zone, office compounds, floriculture centre, etc. The corporation produces nearly 43,000 cum of pulpwood and timber annually.

9. **Madhya Pradesh:** Madhya Pradesh Rajya Van Vikas Nigam Limited (MGRVVN) was established in 1975 with the main objective to replace 'low value' and 'inferior forests' with high economical value species such as teak and bamboo. Commercial plantations of teak and bamboo is the main activity of the Nigam. MPRVVN has been leased out 4.26 lakh ha of forestland for intensive management. The average annual production of wood from MPRVVN forestland has been 90,000 cum from 2010–11 to 2014–15. MPRVVN has raised teak plantations over 2,09,342 ha up to 2015. Bamboo plantations have been undertaken over 23,183 ha, while miscellaneous species have been planted over 3,189 ha.[4] Rehabilitation of degraded forests in over 15,000 ha is also an important activity of the Corporation, with intensive soil and water conservation measures and plantations of species like bamboo.

10. **Maharashtra:** The Forest Development Corporation of Maharashtra Limited (FDCM) substituted the Forest Development Board in 1974 to 'capitalize on the success attained and to enlarge the programme rapidly'. The main objective of FDCM is to raise plantations of high revenue yielding species such as teak in place of 'low value' miscellaneous forests. FDCM was originally leased out 4.72 lakh ha of forestland to achieve its objectives by the state forest department. By the end of March 2016, FDCM had 3.63 lakh ha of reserved forests under its possession. FDCM had to hand over the remaining forests back to the forest department for reasons like low productivity, high incidence of illicit felling, encroachments, forest diversion for non-forestry purposes and wildlife presence. FDCM has also diversified into ecotourism and cultivation of medicinal plants. FDCM

has nearly 1.46 lakh ha under teak plantations currently, where around 1.24 lakh ha was raised from 1969 to 1987 through clear felling of natural forests. Following the ban on green felling in several states in the 1980s, FDCM has been adding only 1,200 ha of forests on an average under teak plantations annually. The average production of wood by FDCM has been 33,000 cum annually.

A report by Comptroller and Auditor General (CAG) of India on the performance of Public Sector Units in Maharashtra revealed that five of the 14 divisions of FDCM had managed to harvest less than 40 per cent of the total teak timber it had planned during 2006–11. The reasons given by FDC for shortfall in production were failure of plantation, low stock growth and illicit cutting. It is not clear what steps have been taken to address the low production problems.

Table 9 below shows the shortfall in teak timber production by the five divisions of Maharashtra FDC for 2006–11:

Table 9: Shortfall in teak timber production from five divisions of Maharashtra FDC

Year	Planned production of teak (cum)	Actual production of teak (cum)	Shortfall (cum)	Percentage shortfall
2006–07	2,563	1,271	1,292	50.4
2007–08	1,447	273	1,174	81.1
2008–09	3,695	1,644	2,051	55.5
2009–10	3,680	1,287	2,393	65.0
2010–11	3,952	1,489	2,463	62.3
TOTAL	**15,337**	**5,964**	**9,373**	**61.1**

Source: CAG Report on Maharashtra, 2011

11. **Odisha:** Odisha Forest Corporation (OFC) was established in 1962 as the first public sector forest-based harvesting, marketing and trading agency in the state. In 1990, two other state corporations, namely Similipal Forest Development Corporation and Odisha Plantation Development Corporation, were merged with OFC, thereby forming the existing Odisha Forest Development Corporation (OFDC). One of the main activities of the OFDC was harvesting wood from government forests and marketing it through its sale depots. OFDC is the sole marketing agency for trading nationalized NTFP species like tendu leaves and bamboo. The OFDC is also involved in raising cash crop plantations like cashew and rubber. OFDC harvests nearly 38,000 cum of wood annually from the forests earmarked by the Forest Department. Plantations of cashew, rubber and eucalyptus have been raised over an area of 53,389 ha.[5] The annual production of tendu leaf in Odisha is around 4.5–5 lakh quintals, all of which is marketed through OFDC. Revenue from the sale of tendu leaves, which amounts to Rs 550 crore annually, is returned to the forest department after deducting a 10 per cent commission. In 1983, OFDC harvested 3.29 lakh cum of timber, which dropped to 58,000 cum in 1993 following the National Forest Policy of 1988.[6]

12. **Punjab:** The Punjab State Forest Development Corporation was established in 1983 with the main objective of harvesting and marketing wood from

forests earmarked by the Forest Department and pay royalty in turn. Corporation also assists the farmers in production and marketing of their agroforestry produce (mainly eucalyptus and poplar). The Corporation also runs saw mills and carpentry units and promotes the use of eucalyptus and poplars, and also carries out purchase of land on behalf of the state forest department for compensatory afforestation. Punjab FDC harvested nearly 52,000 cum of wood annually from 2008–09 to 2012–13, 70 per cent of which comes from tree felling due to widening of national highways.[7]

13. **Tamil Nadu:** The Tamil Nadu Forest Plantation Corporation Limited (TAFCORN) was formed in 1974 with the objective of raising, maintaining and harvesting commercial plantations like eucalyptus, cashew and casuarina. The pulpwood raised from the plantations is sold to paper mills in Tamil Nadu as well as the neighbouring states of Karnataka and Andhra Pradesh. Nearly 75,000 ha of reserved forests have been leased out to TAFCORN by the state forest department. Eucalyptus plantations have been raised over an area of approximately 1.27 lakh ha from 1974 to 2015. TAFCORN has harvested 39.11 lakh MT of pulpwood in its 42 years of operation, averaging about 93,000 MT per year. Since 2008, the average has shot up to 1.78 lakh MT per year due to introduction of clonal eucalyptus.

14. **Tripura:** Tripura Forest Development and Plantation Corporation Limited (TFDPC) was established in 1976 with the objective of rehabilitating degraded forestlands, settling of tribal shifting cultivators and generation of employment in the rural areas. At present, activities of the Corporation are restricted to raising commercial rubber plantations; extraction and processing of rubber latex sourced from own plantations as well as outside sources; treatment and processing of rubberwood into value added products such as wood, furniture and doors. TFDPC has raised rubber plantations in a total area of 8,132.82 ha. This is in addition to 418.66 ha of rubber plantations already raised by the Forest Department and handed over to the Corporation in 1981. TFDPC has established an industrial estate, which receives wood from rubber plantations when the plantations are cut down on attaining maturity. The estate has a wood treatment plant and a rubber wood factory, which receives on an average 2,300 cum of rubberwood logs annually from TFDPC. The treatment plant manufactures structural wood while the rubberwood factory makes wooden boards.

15. **Uttar Pradesh:** Uttar Pradesh Forest Corporation was established in 1974 with the main objective of harvesting and marketing the forest produce on behalf of the state forest department. The trees and other produce (bamboo and tendu leaf) earmarked by the Forest Department are harvested and marketed by the Corporation after paying the royalty. The UP FDC also carries out harvesting and disposal of wood and fuelwood from plantations raised under social forestry and farm forestry. UPFC harvested nearly 3.2 lakh cum of wood annually from forests and social forestry from 2010–11 to 2014–15. The contribution of social and farm forestry to the total wood harvested by the Corporation has risen from 5 per cent in the early 1990s to approximately 70 per cent since 2010.

16. **Uttarakhand:** Uttarakhand Forest Corporation was established in 2001 after the separation of the state from Uttar Pradesh. The main activity of the Corporation was harvesting and marketing of wood from trees allotted by the forest department. The Corporation has diversified its activities to include mining of minor minerals from riverbeds inside reserved forests

and ecotourism. The Corporation harvests nearly 2.2 lakh cum of wood annually during 2010–15. The sale of wood constitutes the largest source of revenue for the Corporation though revenue from the sale of minor minerals such as sand and bajri has risen from 10 per cent when the Corporation started to 30 per cent during 2012–15.

17. **West Bengal:** The West Bengal Forest Development Corporation (WBFDC) came into existence in 1974. The main activity of the Corporation is harvesting and marketing wood, poles, pulpwood and fuelwood on an agency basis from all the territorial forest divisions of the state. WBFDC was initially leased nearly 44,000 ha of forests in the Kalimpong Division of North Bengal, but had written to the Forest Department seeking reduction in the extent of leased land to 100 sq. km in 2011. WBFDC has also taken up clonal plantations of eucalyptus since 2010.[8] Collection and sale of honey constitutes a major source of revenue for the Corporation.

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