

Impact of Forestry Practices on Primary Natural Forests in The Western Ghats: A Case Study From Vazhachal Forest Division, Kerala

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Abstract

In the past, the Western Ghats were known to have the most productive natural forests. Presently, forest management and developmental activities have reduced the diversity and richness of these forests. Here, the extent of each vegetation type of the Vazhachal division was analysed to understand the extent of primary dense and degraded forests as well as the forest plantations. Vegetation mapping shows that the present distribution of the dense forest type of Vazhachal forest division is only 25 % (105.53 sq. km), but according to the working plan information, Primary dense forest covers 135.40 sq. km, of the division's total area of 413.94 sq. km. The remaining are degraded forests with the felling of timber, or forest plantations and areas converted for non-forest purposes. The most disturbed vegetation was found in areas where species were actively planted. The results obtained emphasise that major forestry operations in the name of forest management have contributed significantly

Forests are the highest productive terrestrial ecosystem which accommodates 80% of the Earth's plant biomass. India has a total geographical area of about 329 million hectares with a coastline of over 7500 Km

to forest degradation, contrary to the general assumption that the dependence of local people alone is the primary cause of forest degradation. This conclusion is supported by the findings of the phytosociological comparison of saplings in planted and unplanted evergreen primary forest regions of the Vazhachal division. Where the species planted areas show degraded vegetation composition compared to the undisturbed benchmark plots. the study recommends ecorestoration of degraded forest lands in the primary forest regions shall be, based only on the bioclimate and niche and also considering the existing vegetation composition of the region. This can help in regeneration and mitigate the impact of prior forest management.

Keywords

Western Ghats, Forest Degradation, Forestry Practices, Vazhachal Forest Division, Terrestrial ecosystems

Introduction

(Arisdason & Lakshminarasimhan, 2017). The Major reason for the degradation of primary natural forests in India is the 'colonial legacy' which allowed large scale clear-felling for timber and conversion of

forests for commercial and industrial plantations in the name of 'Forest management' and allocation of forest areas for developmental projects in tune with the post-colonial 'Conservation' strategies. The Forest laws such as Indian Forest Act 1927, Wildlife Protection Act 1972, and Forest Conservation Act 1980, along with forest policies, were the primary reason for the massive degradation happened to the Natural Forests in India and the Western Ghats.

The primary reasons for the post-1980 forest clearances were the massive conversion of forests for Dams, mining, and other industries. The remaining primary forests are not exactly primary in nature.

Materials and Methods

Preparation of Vegetation map: The vegetation map was prepared using QGIS 3.10 software, toposheets, areal Images (Google), satellite imagery of NASA 2007 provided by Google Earth, and previous works done in the study area following Ramesh *et al.* (2007) and Bachan *et al.* (2014).

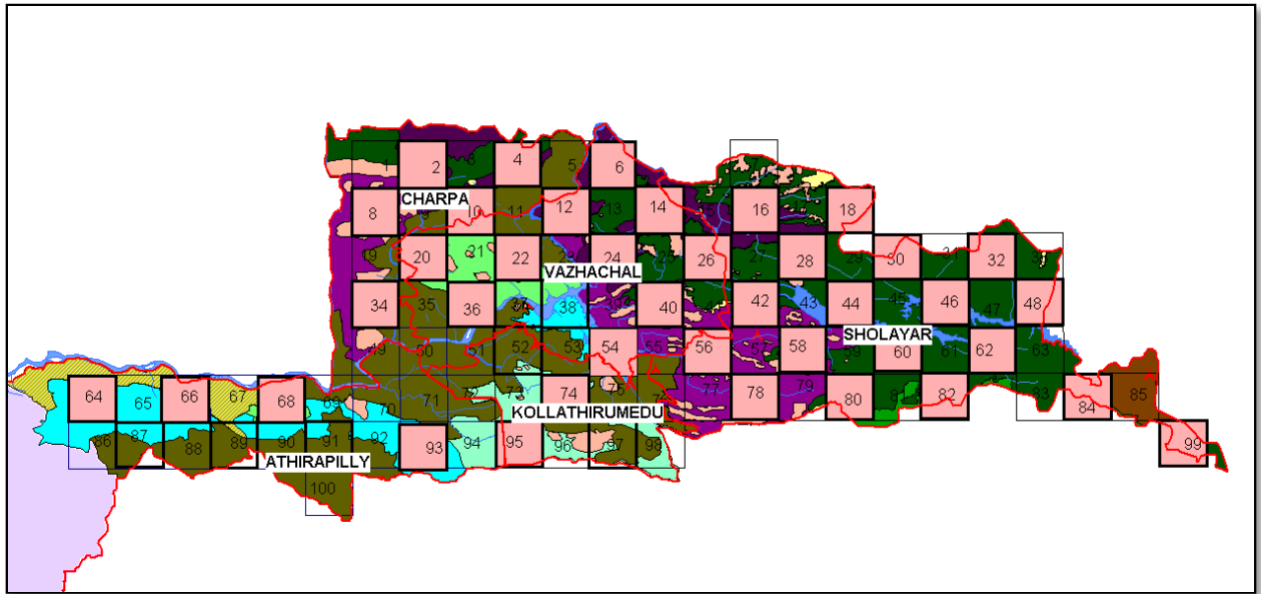
History of the impact of various forest management practices on Natural Primary

Understand the impact of planting activities within the evergreen forest areas using phytosociological parameters: Each heterogenic unit of Natural Primary Forest areas under various operations in the past were identified from the vegetation maps, working plans, and also from the perception of tribal people. These include 1. Dense Primary Evergreen Forests (Comparatively

Most of these natural forests were interrupted with timber extraction in the past, such as clear-felling, selection-felling, and selected removal of saplings. The PFM activities and tree species planting programs, following the same forestry practices of the plantations, i.e., planting of few timber species and removal of natural saplings in the planting locations, in the name of Assisted Natural Regeneration (ANR) also affected considerably the species composition and natural succession of many natural primary forests. All these are the foundations for the present study to understand the impact of Forest management in the primary natural forests taking the Vazhachal Forest Division of Central Kerala as a case study.

Forests from the Forest Working Plans and related literature: All the working plans of the Vazhachal Forest Division [Varghese, 2002 (Vazhachal division); Vishwanathan, 1954 (Chalaky division); John, 1969 (Chalaky division); Kurian, 1974 (Malayattur division)] and other related publications were checked thoroughly to elucidate Various forestry practices in Natural forests during different management periods.

Undisturbed), 2. Degraded Primary forests, 3. Areas of Primary Dense forests planted with the cane (*Calamus* spp., *Coscinium fenestratum*, etc). A comparison of the benchmark plots (1. Dense Primary Evergreen Forests) with others within disturbed areas provided input on the impact of forestry practices on seedling and sapling community composition.



Map 1: Sampling Grids of Vazhachal Forest Division

The entire area was divided into grids of 2 x 2 km. Six grids in the natural evergreen forest areas with different forestry practices including comparatively better dense evergreen forest were selected, of which i. Grid 30, a comparatively undisturbed dense medium elevation evergreen forest area took as a benchmark or control, ii. Grid 32 and 82 areas with activities of the tribal and residents, iii.

Result and Discussion

Since the rainfall of the areas is more than 3000 mm per year with short dry months the division has got suitable bioclimate for

Grids 48, 84, and 46 forest areas with planting activities of species happened within the last 20-10 years in the JFM period, i.e., planting of cane (grid 48), coffee & *Calamus* (grid 84), and other species including *Coscinium* (grid 46). Plots were set for phytosociological sampling following the methods of the National Working Plan Code (2014) and (Bachan *et al.*, 2009; Bachan, 2010; Bachan *et al.*, 2014).

evergreen and wet evergreen forest types. All other seral stages including deciduous forest, degraded forest, etc. can be considered as secondary forests. (Bachan *et al.*, 2014).

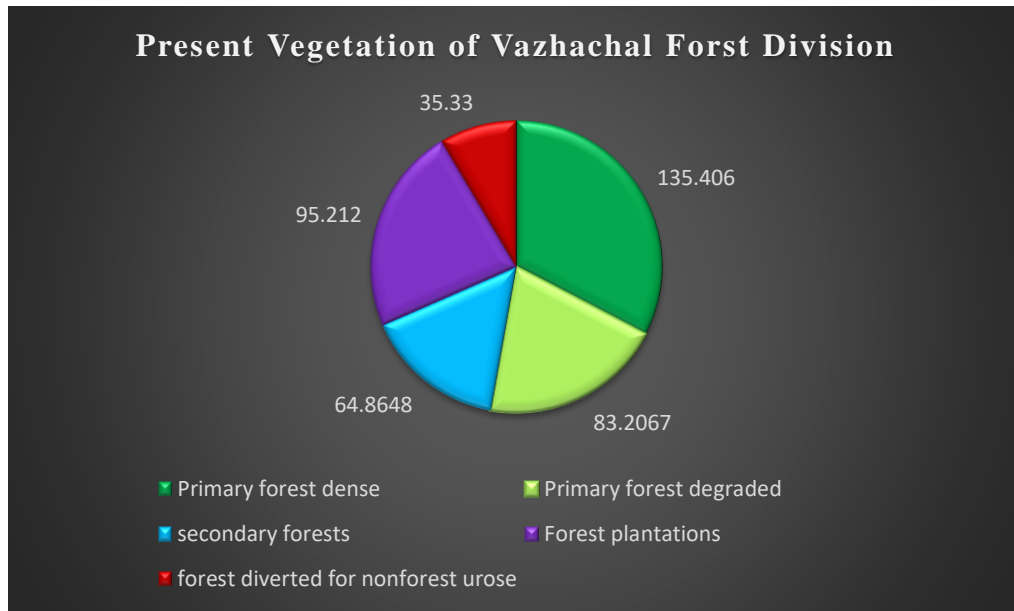
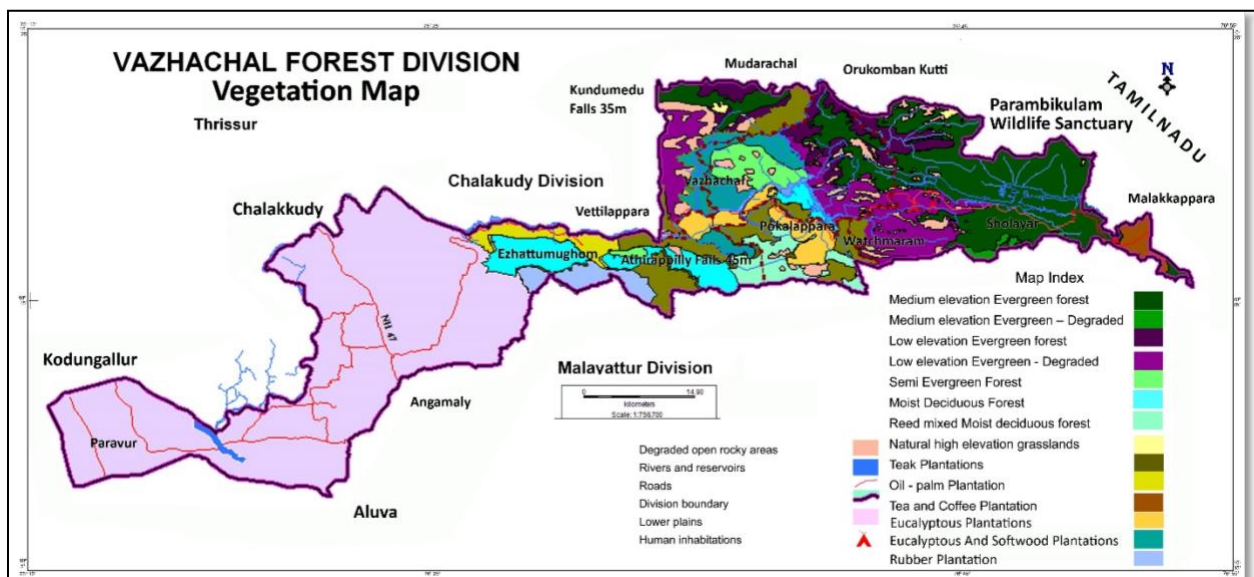


Fig. 1. Present Vegetation of the Vazhachal Forest Division from working plan data

The study showed that among the forested areas, the Primary dense forest occupies 135.40 sq. km, secondary forests occupy 64.86 sq. km, and plantations occupy 95.2 sq. km, and areas diverted for other non-forest purposes include 35.33 sq. km. The rest of the area occupies primary forests degraded 83.20 sq. km. Approximately 3/4th of the present

vegetation is dense natural forest indicating the richness of the regions. The other degraded types indicate the degradation that happened to the forest during different periods. All of these are concordat with observations of previous works (Bachan *et al.*, 2014; Ramesh *et al.*, 1997; Ramesh & Gurukkal, 2007).



Map 2: Vegetation Map of Vazhachal Forest Division

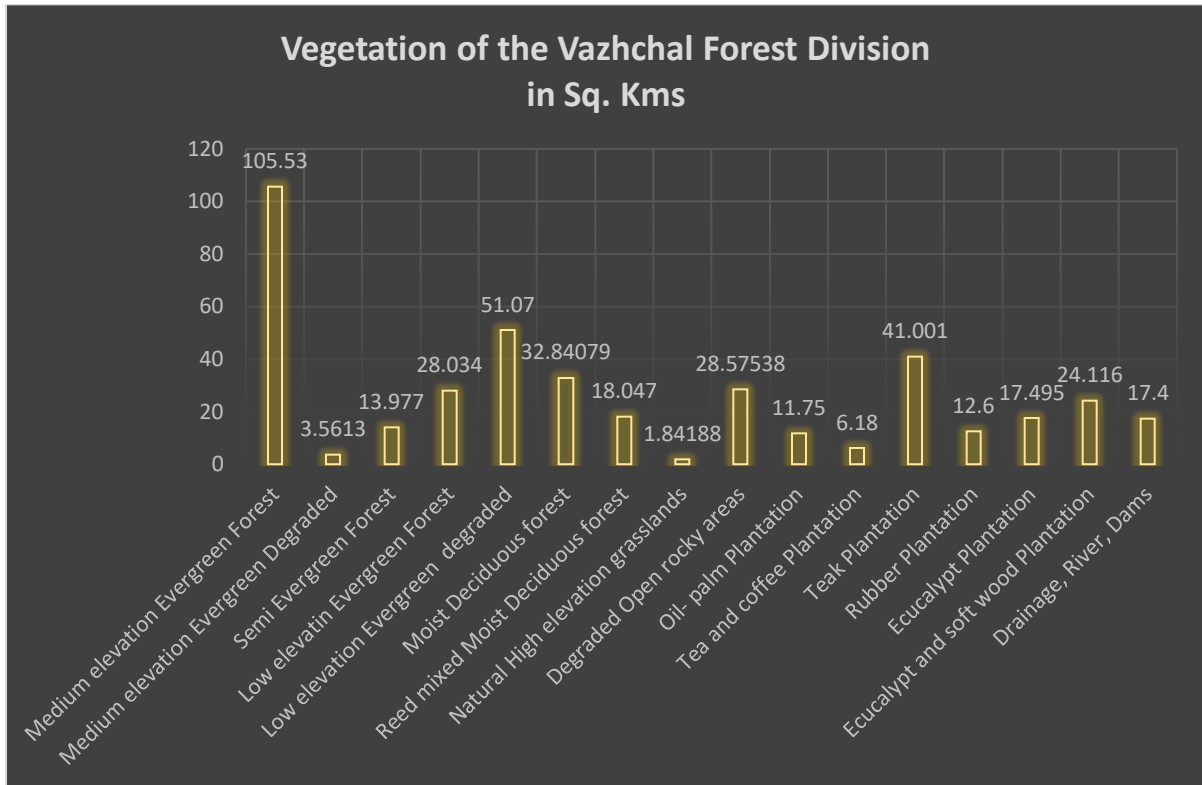


Fig. 2. The Vegetation of the Vazhachal Forest Division from Vegetation mapping.

The vegetation map of the Vazhachal forest division shows that the present distribution of dense forest type is only 25 % (105.53 sq. km) of the Division. The remaining are degraded forests with different felling of timber happened, or forest plantations and areas converted for

non-forest purposes. 28.5 sq. km (6%) of forests in the mountain tops or natural grasslands were opened up to open degraded areas and more located in forest timber and plantation activities or catchment of Reservoirs.

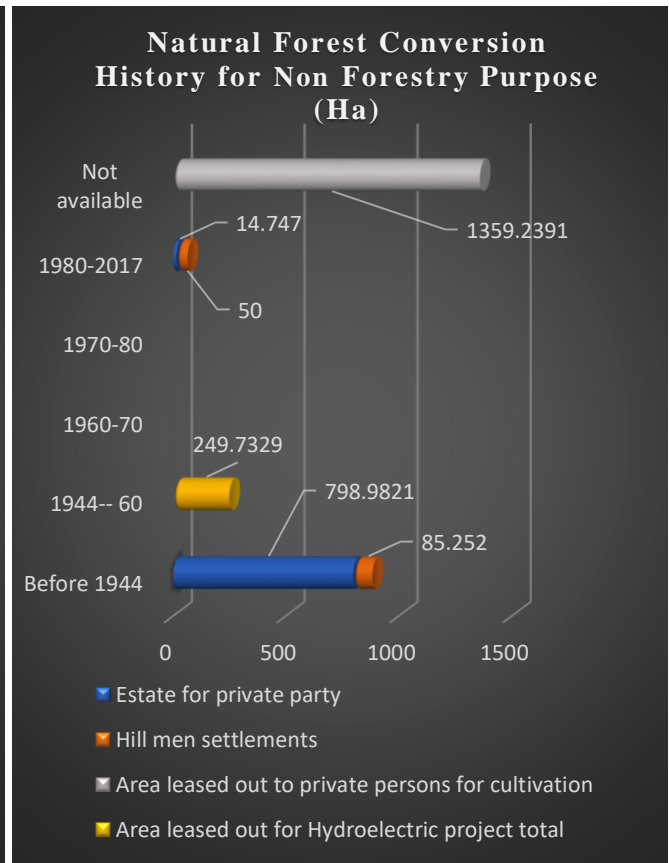
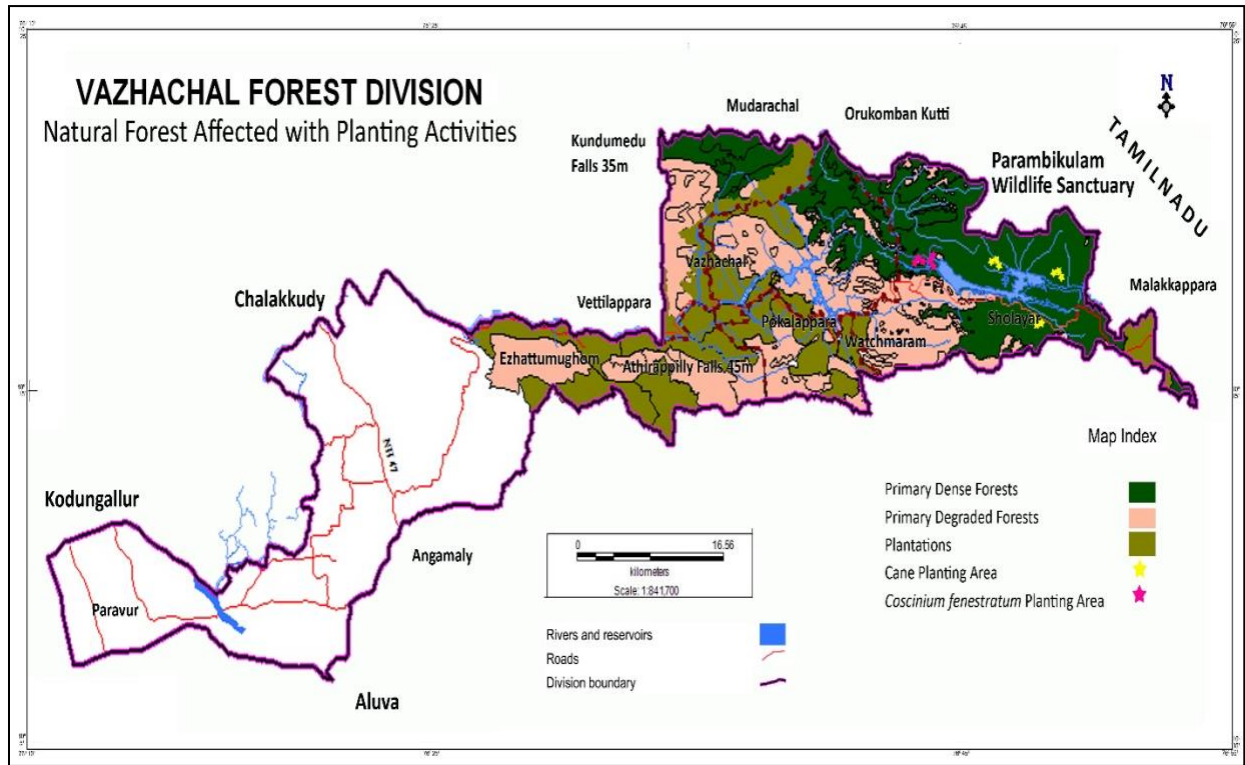


Fig. 3. Natural Forest Conversion History for Forestry Purpose History for Non-Forest purpose

Fig. 4. Natural Forest Conversion History for Non-Forest purpose

The history of forest degradation started before 1944 with conversion for plantations and felling for timber. Observations of Varghese, 2002 and Bachan *et al.*, 2014 also agrees with that. Maximum

timber extraction happened in the 1970-1980 period (35 Sq. km), is followed by 1980-2017 (11.07 sq. km) for plantation, social forestry, and silviculture purposes.



Map 3: Natural Forest affected with Planting activities

According to the analysis, the overall degradation of natural forests in the division accounts for majorly of forestry operations and hydroelectric projects. The phytosociological assessment conducted in selected locations systematically showed a severe impact of these activities in the composition of saplings. Among the six chosen sites (i. Grid 30 is a

comparatively undisturbed dense medium elevation evergreen forest, benchmark or control, ii. Grid 32 and 82 areas with activities of the tribal and residents, iii. Grids 48, 84, and 46 forest areas with planting activities of species happened within the last 20-10 years in the JFM period, i.e., planting of cane (grid 48), coffee & *Calamus* (grid 84), and other species including *Coscinium* (grid 46).

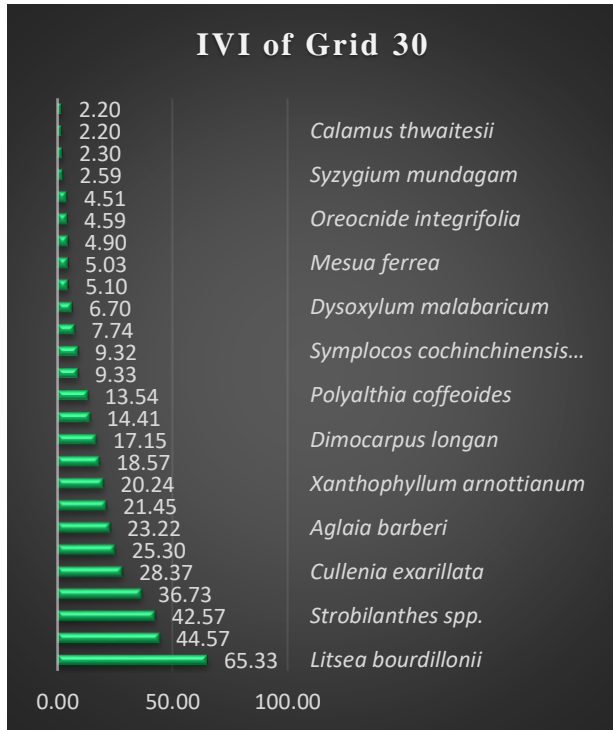


Fig. 5. Vegetation composition of Grid 30

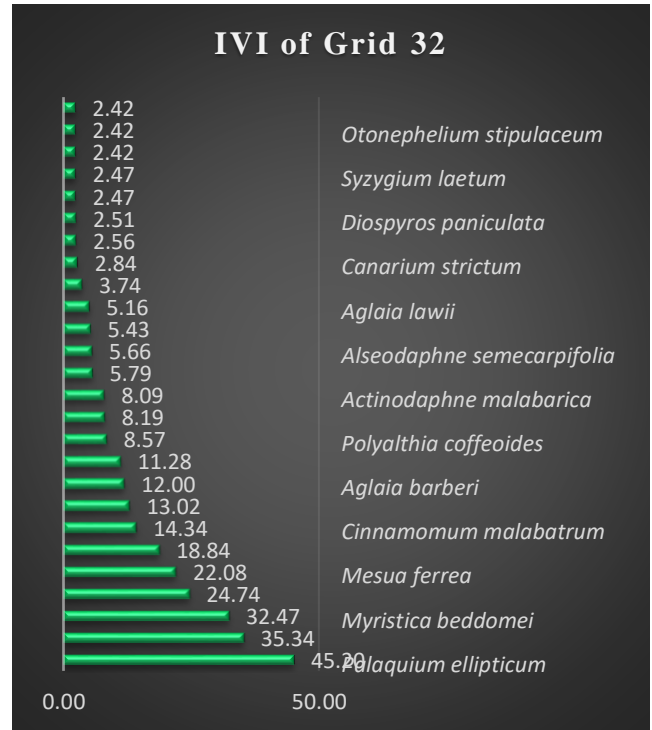


Fig. 6. Vegetation composition of Grid 32

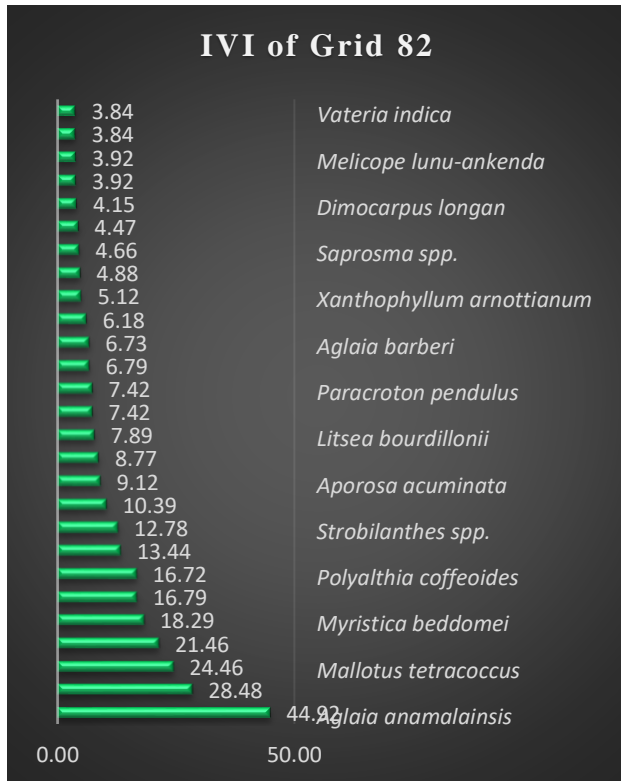


Fig. 7. Vegetation composition of Grid 82

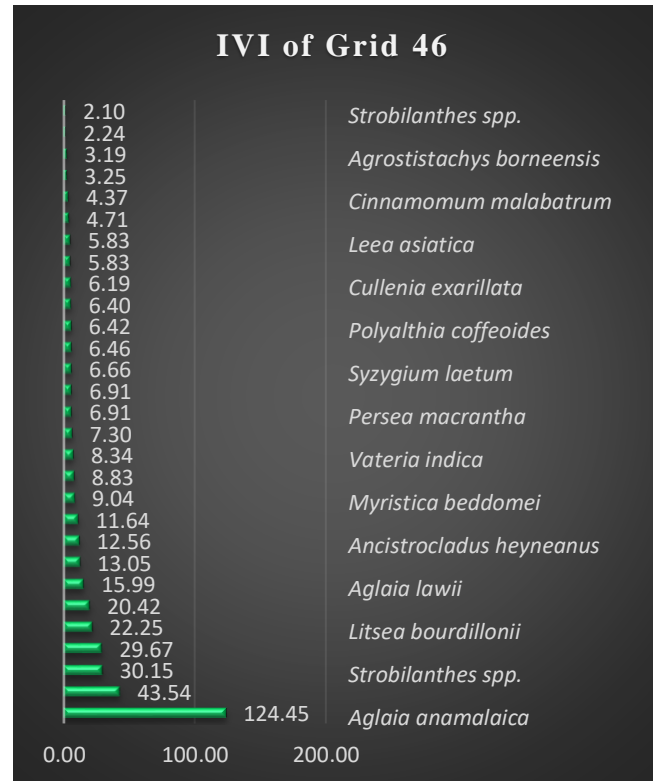


Fig. 8. Vegetation composition of Grid 46

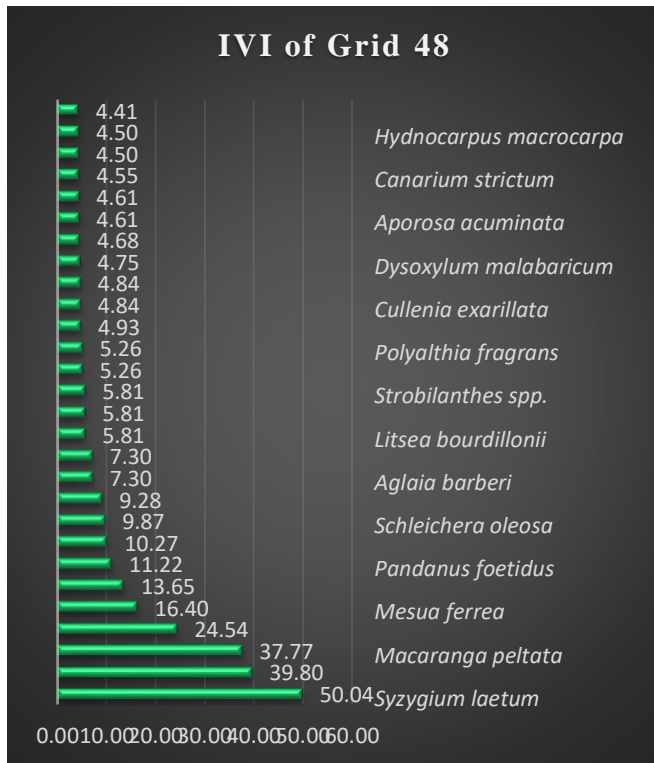


Fig. 9. Vegetation composition of Grid 48

Better composition with dominance of true evergreen species such as *Litsea bourdillonii*, *Aglaiia lawii*, *Cullenia exerillata*, *Strobilanthes* species, etc., without the absence of species of indication of degradation, was found in the Benchmark Grid (30). The most disturbed vegetation was detected in regions where the forest department planted canes, *Coscinium*, and other species throughout the past two decades as part of PFM activities, i.e., Grid 46, 84, and 48, respectively. With a dominance of species such as *Polyalthia*,

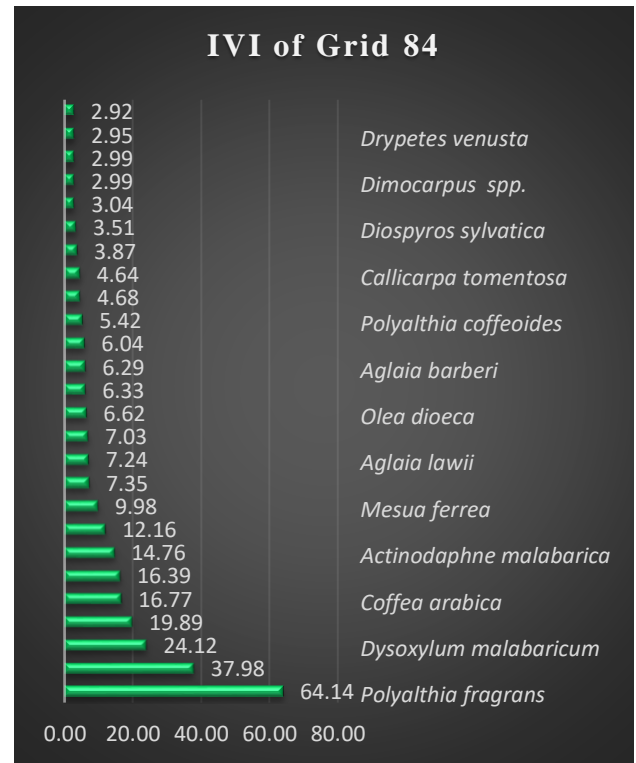


Fig. 10. Vegetation composition of Grid 84

Macranga, *Actinodaphne* with the absence of important climax species of wet evergreen which is present in the benchmark grid. Vegetation degradation in the planted areas is higher than in local or resident regions, which confirm that local people's reliance is not the primary driver of forest degradation. Large-scale forestry operations in primary natural forests have a detrimental effect, obstructing natural succession and causing degradation of native vegetation types in the area, as evidenced by these findin

Conclusion

Forest conversions continue to have a negative influence on natural forests. Improper forest management aided this degradation, and the conversion rate rose

sharply after 1944. Forest conversions in the Vazhachal forest division reached their peak in the 1970s to 1980s. This degradation was triggered by other planting operations that happened in the Primary natural forests. The

impact of these disturbances can be seen in the Vazhachal forest division's remnant dense natural forests (105.53 sq. km). The phytosociological assessment in disturbed forest areas shows a severe impact of these activities on the composition of saplings. During the past two decades, planting activities without understanding the niche specificity have caused disturbed vegetation in areas where species are actively planted. The selection of species from a seral stage which is not suitable for the present composition; following plantation protocol to plant 'Cane' with the removal of all seedlings and saplings there in a one square meter area

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centralize management system and policy are the more significant reasons for this degradation. Thus, the study reveals, with the support of phytosociological data, that massive forestry operations in the name of forest management have contributed significantly to forest degradation. Therefore, the study recommends Ecorestoration of degraded forest lands in the primary forest regions shall be, based only on the bioclimate and niche and also considering the existing vegetation composition of the region. This can help in regeneration and mitigate the impact of prior forest management.

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