

**STUDIES ON ECOSYSTEM SERVICES AT
MAHATMA GANDHI BOTANICAL GARDEN,
GKVK, BANGALORE**

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**DEPARTMENT OF FORESTRY AND ENVIRONMENTAL SCIENCE
UNIVERSITY OF AGRICULTURAL SCIENCES,
BANGALORE**

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GKVK, BANGALORE**

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BENGALURU

NOVEMBER, 2021

AFFECTIONATELY

DEDICATED TO

MY PARENTS

SRI. MANJUNATH G B

SMT. BHAGYA LAKSHMI T

AND MY SISTER

TEJASWINI M B



**DEPARTMENT OF FORESTRY AND ENVIRONMENTAL SCIENCE
UNIVERSITY OF AGRICULTURAL SCIENCES
BANGALORE**

CERTIFICATE

This is to certify that the thesis entitled “**STUDIES ON ECOSYSTEM SERVICES AT MAHATMA GANDHI BOTANICAL GARDEN, GKVK, BANGALORE**” submitted by **Mr. PRAVEEN KUMAR, M. B., ID No. PALB 9253** for the degree of **MASTER OF SCIENCE (Agriculture)** in **ENVIRONMENTAL SCIENCE** to the University of Agricultural Sciences, Bangalore, is a *bona-fide* record of research work carried out by him during the period of his study in this university, under my guidance and supervision and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

BENGALURU
November, 2021


R. KRISHNA MURTHY
(Major Advisor)

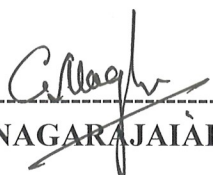
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(Praveen Kumar, M. B.)



Studies on physico-chemical properties of soil at Mahatma Gandhi Botanical Garden, GKVK, Bangalore

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Introduction

➤ Botanical Garden (BG) is a place where diversified collections of plants are maintained for educational, conservation, scientific or economic purposes.

➤ It acts as a centre for ex-situ conservation and serves as a living repository.

➤ Soil plays an important role in growth and development of trees and even soil health also depends on type of trees.

Objective

➤ To study the soil physico-chemical properties of Botanical Garden.

Material and Methods

➤ The trees in botanical garden were placed systematically based on their family into ten blocks.

➤ Composite soil samples were taken in each block at three depths (0-30 cm, 30-60 cm and 60-90 cm) using motorized auger.

➤ Soil samples were sieved using 0.2 mm mesh and taken to laboratory for analysis of physico-chemical properties.

Experiment details



➤ Mahatma Gandhi Botanical Garden has about 186 tree species, which are having girth size of ≥ 30 cm.
➤ Area: 26 ha (65 acres).
➤ Each block have an area around 2.6 ha.
➤ The soil texture was found to be sandy loam.
➤ Trees belonging to Fabaceae family was found to be dominant in the garden.

Experimental results

Table 1: Soil physico-chemical properties at different depths in ten blocks of botanical garden

Blocks	Soil depth cm	BD Mg m ⁻³	PD Mg m ⁻³	Porosity %	MWHC %	pH	EC dS m ⁻¹	OC %	N kg ha ⁻¹	P ₂ O ₅ kg ha ⁻¹	K ₂ O kg ha ⁻¹	Ca c mol (p ⁺) kg ⁻¹	Mg c mol (p ⁺) kg ⁻¹	S mg kg ⁻¹
B-1	0-30	1.11	2.07	46.38	35.08	4.92	0.06	0.87	225.79	74.59	91.39	4.4	2.9	85.54
	30-60	1.22	2.26	46.02	34.4	5.10	0.05	0.78	213.25	74.59	60.61	3.8	1.0	69.09
	60-90	1.28	2.37	45.99	33.6	5.68	0.04	0.69	200.70	72.31	59.00	3.7	1.5	50.01
B-2	0-30	1.20	2.24	46.43	36.1	5.12	0.04	1.35	225.69	80.85	79.03	4.3	1.7	123.05
	30-60	1.24	2.32	46.55	35.16	5.19	0.04	1.20	213.25	80.28	75.26	4.1	1.6	46.06
	60-90	1.34	2.82	44.63	33.48	5.47	0.03	1.02	200.70	76.30	63.30	4.0	1.3	39.48
B-3	0-30	1.22	2.32	47.41	36.72	5.77	0.04	1.26	224.79	88.25	87.23	3.4	1.8	76.33
	30-60	1.24	2.36	47.46	36.8	5.92	0.03	1.17	213.25	80.28	66.93	3.5	1.8	73.70
	60-90	1.28	2.37	45.99	34.24	5.99	0.03	0.93	213.25	74.02	48.38	2.6	1.3	70.41
B-4	0-30	1.19	2.26	47.35	36.45	5.30	0.08	0.87	225.79	76.87	105.10	4.8	2.3	103.31
	30-60	1.21	2.28	46.93	35.38	5.36	0.05	0.75	213.25	74.59	103.76	3.5	2.3	78.96
	60-90	1.26	2.34	46.15	34.94	5.45	0.04	0.60	200.70	74.59	89.91	3.6	1.6	69.75
B-5	0-30	1.21	2.28	46.93	35.54	5.63	0.05	1.20	238.34	92.24	188.70	2.9	1.7	101.99
	30-60	1.25	2.32	46.12	34.98	5.66	0.04	0.78	225.79	74.59	100.26	3.2	1.5	62.51
	60-90	1.31	2.41	45.64	34.4	5.83	0.03	0.63	188.16	74.02	83.33	3.3	1.0	48.69
B-6	0-30	1.23	2.34	47.44	35.78	4.46	0.03	1.08	225.79	78.01	101.07	2.6	1.5	84.22
	30-60	1.26	2.38	47.06	35.42	4.66	0.02	0.93	213.25	74.73	84.94	2.8	1.4	73.04
	60-90	1.28	2.36	45.76	34.92	5.10	0.02	0.75	100.35	74.59	71.50	3.5	1.0	63.17
B-7	0-30	1.20	2.29	47.60	36.34	4.86	0.03	1.14	213.25	79.14	81.72	3.9	1.4	83.57
	30-60	1.24	2.31	46.32	34.36	5.73	0.02	1.05	200.70	77.44	63.84	3.4	1.3	58.56
	60-90	1.29	2.40	46.25	33.94	5.94	0.02	0.93	200.70	72.88	56.72	3.8	1.3	53.30
B-8	0-30	1.29	2.21	41.63	30.6	5.29	0.10	1.05	213.25	76.87	111.96	4.6	2.2	66.46
	30-60	1.31	2.24	41.52	30.08	5.36	0.03	0.99	213.25	75.16	86.02	4.3	1.8	65.80
	60-90	1.35	2.28	40.79	29.9	6.03	0.03	0.84	200.70	74.02	78.36	4.3	1.7	59.88
B-9	0-30	1.16	2.20	47.27	36.46	4.60	0.03	0.96	213.25	79.71	100.93	3.9	1.3	101.33
	30-60	1.25	2.32	46.12	35.15	4.78	0.03	0.87	200.70	79.14	71.37	3.1	0.9	84.88
	60-90	1.31	2.44	46.31	34.88	4.87	0.02	0.75	200.70	71.17	63.84	2.7	0.6	61.19
B-10	0-30	1.19	2.24	46.88	34.96	4.55	0.03	1.17	225.79	82.56	84.13	3.3	1.0	87.51
	30-60	1.23	2.28	46.05	33.64	4.94	0.03	1.08	213.25	74.59	80.91	3.0	2.1	75.67
	60-90	1.27	2.32	45.26	32.82	5.89	0.02	0.93	200.70	73.45	64.51	3.0	1.1	33.56

CD at 5%														
Blocks	0.05	NS	0.76	0.95	0.52	0.02	0.13	NS	NS	29.85	0.76	NS	NS	NS
Depth	0.02	NS	0.42	0.52	0.29	0.01	0.07	21.74	3.70	16.35	NS	NS	0.41	17.34

BD- Bulk density PD- Particle density MWHC- Maximum water holding capacity EC- Electrical conductivity
OC- Organic carbon CD- Critical difference NS- Non significant

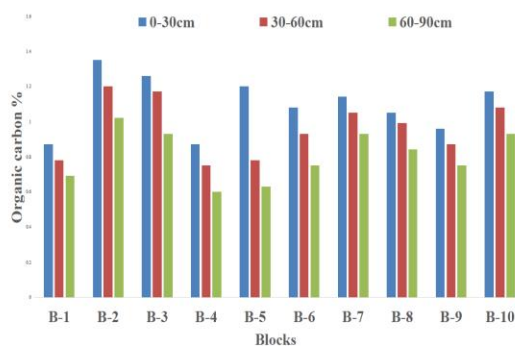


Fig. 1: Depthwise distribution of soil organic carbon

Results and Discussion

➤ Soil bulk density and particle density increased with increasing soil depth, but there was decrease in maximum water holding capacity and porosity.

➤ Soil pH was found to vary significantly between the blocks as well as between the soil depths, which might be due to variation in organic matter (Rukshana *et al.*, 2014).

➤ Soil Electrical conductivity and organic carbon content decreased with increasing soil depth, which was due to decreasing organic matter from surface soil to deeper layers (Ghimire, 2010).

➤ Soil primary and secondary nutrients were found to decrease with increasing soil depth, which was due to decreasing organic matter content across the soil profile.

➤ The soil iron and manganese content decreased with increasing soil depth but no significant difference was observed between the blocks, where as in case of soil zinc and copper content there was significant variation with respect to blocks as well as depths, which might be due to differential uptake of micronutrients and variation in organic matter (Jiang *et al.*, 2009).

Summary

➤ Soil physical and chemical properties were found to be improved by the influence of trees by addition of organic matter in the form of litterfall.

➤ Surface soils were found to be more fertile and rich in organic matter due to litter addition by trees in the garden.

➤ Since botanical garden is mixed plantation it is difficult to identify the influence of a particular tree species on soil physico-chemical properties.

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I INTRODUCTION

Floral diversity is major part of total biodiversity on Earth. Humans and other living organisms on Earth have been supported by plant diversity. Till now there are approximately 1.75 million known species (Heywood and Watson, 1995; Groombridge *et al.*, 2002), and 5–30 million or more likely to exist in the entire world (Duraiappah *et al.*, 2005). Today, our Earth is facing a continuous loss of biological diversity due to human activities. Many of the plant species are at risk of extinction from their natural haunts as tropical species are currently disappearing at an overall rate of 0.8 – 2.0% per year (May and Stumpf, 2000). The direct driver of the loss of a significant chunk of plant genetic resources is man's direct or indirect activity. Overexploitation of plant, resources have threatened the existence of valuable species in nature thereby warranting conservation measures, with *in-situ* and *ex-situ* strategies.

In India, habitat destruction, overexploitation, pollution, and species (exotics) introduction were identified as major causes for loss of biodiversity (UNEP, 2001). Biodiversity loss is of concerning issue, there is accumulating evidence that loss of biodiversity will also have many impacts on ecosystem functions and services, and hence for well-being of humans (Diaz *et al.*, 2006). Botanic Garden (BG) is a place where diversified collections of plants are maintained for educational, conservation, scientific or economic purposes (Hawksworth, 1995). It acts as a Centre for *ex-situ* conservation and serves as a living repository. Botanic garden acts as a place of aesthetic beauty and also offers ample opportunities to study various aspects of plant biology and also helps in generating public awareness, imparting environmental education, and developing a global strategy for conservation of plant species.

The big priority of the Botanical Garden is to keep living and dried specimens for better knowledge of plant species; to cultivate ecologically, economically, medicinally, and horticulturally significant plant species; and to act as a living repository for native, naturalized, and alien plant species to collect, propagate, conduct research and to aid in *ex-situ* conservation; to act as a center for rescue, recovery and rehabilitation of valuable plant species to generate public awareness, impart environmental education and finally to develop an effective strategy for conservation of plant species. With the significant increase

of conservation efforts, BGs are increasingly active in the *in-situ* and *ex-situ* management and conservation of plant resources, sometimes in collaboration with other organizations (Hawksworth, 1995; Heywood and Watson, 1995). The role of BGs in *ex-situ* conservation of plant species gained significant momentum after the “Earth Summit” or Convention on Biological Diversity, shortly CBD” that held at Rio de Janeiro, Brazil, South America from 3 to 14 June 1992. Botanic gardens linked with herbaria and gene banks generally maintain substantial data, the availability of such data is important in conserving plant genetic resources and instrumental in developing Global Strategy for Plant Conservation (GSPC), which was adopted by the Convention on Biological Diversity (CBD).

Botanical gardens are a rich source of biodiversity since many diversified species are conserved thereby providing the least disturbed and favorable environmental conditions. As biodiversity increases it also influences soil physical, chemical, and biological properties. Trees can enhance soil nutrient status by minimizing non-productive nutrient losses from erosion and leaching, as well as enriching nutrients in soil through nitrogen fixation, and by providing biomass and a suitable microclimate for biological processes (Schroth and Sinclair, 2003).

About 20-25 per cent of a tree's entire live biomass is contributed by its roots and it is continuously adding organic matter to the soil through dead and decaying roots. Along with nutrient enrichment trees provide both short and long- term benefits to the local people and they involve in carbon storage for environmental stability. Deforestation and forest degradation in the tropics generated about 1.4 ± 0.5 billion tons of carbon yearly basis. (Houghton *et al.*, 2012). REDD (Reducing Emissions from Deforestation and Forest Degradation) activities need to be carried out in arid and semiarid tropical regions to enhance carbon sequestration. It can provide economic benefits to the local people to reduce poverty.

Carbon dioxide and other greenhouse gases have significantly grown in the atmosphere's natural equilibrium. This is because to the prolonged use of fossil fuels and the conversion of forest area to agricultural land. The most affordable alternative to mitigate climate change is through carbon sequestration by improving vegetation or by planting trees are the major sinks of carbon.

The quantity of carbon storage mainly depends on the tree species. Information about carbon accumulation of tree species is limited in both tropical and temperate regions. Exploring the carbon storage capacity of tree species is needed to regulate climate change. On the other hand, the tree growth and the carbon storage potential are strongly correlated. Species-specific carbon sequestration potential studies provided totally different estimates. It depends on various factors like location, weather conditions and management practice, etc.

The reliable quantification of carbon sequestration by vegetation will help the policy makers, researchers, and entrepreneurs to sell Certified Emission Reduction to developed countries (Ahammad *et al.*, 2014; and Ahmed and Glaser, 2016) in global carbon markets under REDD + and CDM as they need to offset their higher per capita carbon emission.

Estimation of above ground biomass (AGB) is an essential aspect for the estimation of carbon stocks and effects of deforestation and carbon sequestration on global carbon balance (Ketterings *et al.*, 2001). It's also a good way to quantify the structural and functional characteristics of forest ecosystems across a wide range of environmental conditions (Brown, 2001). Carbon stock estimation includes quantification of soil organic carbon, carbon in living trees, understory vegetation, woody debris, and litters of forest floor in form of aboveground carbon and belowground carbon (Gibbs *et al.*, 2007; and Patra *et al.*, 2013).

Soil has over three times the amount of organic carbon as plants and twice the amount of carbon as the atmosphere (Dinakaran *et al.*, 2008 and Kumar *et al.*, 2006). Terrestrial vegetation and soil currently absorb 40% of global CO₂ emission from human activities (Sheikh and Kumar, 2010). The soil in the urban park can also play in climate change mitigation. All around the world, the forests and biodiversity of species and number of trees are being degraded. The aspect of urban green space can play an important role in conserving tree diversity. Diversity of tree species also increases the efficiency of trees to play their roles in urban environment (Zare *et al.*, 2009). Using basal biomass, studies have made important contributions to calculating ecosystem-level aboveground carbon stocks (Rahman *et al.*, 2014). Despite these advantages, there is nevertheless a paucity of

quantitative data and information on urban parks' ecosystem carbon stock and tree species diversity, — especially in Bengaluru. So, this study focused on the following objectives;

1. To study the Carbon stock and nutrient turnover of different tree composition.
2. To study the soil physico-chemical properties of Botanical Garden.

II REVIEW OF LITERATURE

The literature on the tree diversity, carbon sequestration of trees and soil physico-chemical and biological properties were studied by the number of investigators under different land use systems. Efforts were made in this chapter to include a review of studies related to present investigation “Studies on Ecosystem services at Mahatma Gandhi Botanical Garden, GKVK, Bangalore” under the following subheads:

2.1 Tree species richness, diversity and density

2.2 Tree species diversity in garden

2.3 Biomass estimation

2.4 Biomass carbon stock determination

2.5 Carbon sequestration in ecosystem

2.6 Urban Park in carbon sequestration

2.7 Nutrient Cycling and turnover

2.8 Soil physical properties

2.9 Soil chemical properties

2.10 Soil biological properties

2.11 Soil organic carbon

2.1 Tree species richness, diversity and density

Mani and Parthasarathy, (2006) examined tree diversity and stand structure in tropical dry evergreen forest and recorded a total of 77 species. Tree density varied from 596 to 2813 stems ha⁻¹, and basal area ranged between 12.4 and 36.5 m² ha⁻¹. Species richness did not show any significant variation within and between the inland and coastal areas. The number of species and stems decreased from the smallest to largest girth class

and showed, great differences in density and basal area, probably due to different geographical location and varying annual rainfall patterns.

Gupta *et al.* (2008) reported that urban forest in 43 ha of NEERI campus at Nagpur, Maharashtra has 135 vascular plants including 16 monocots and 119 dicots, belonging to 115 genera and 53 families. The taxa included 4 types of grasses, 55 herbs, 30 shrubs and 46 trees. The large number of species within very small area indicates rich biodiversity in this urban forest.

Chauhan *et al.* (2008) made a comparison between regeneration and tree diversity in natural and planted forests. Species diversity as well as species evenness was higher in natural forests (70) than in planted forests (59). Natural forests showed good regeneration of about 32.5 per cent. He opined that species richness, diversity and regeneration differed between natural forest and planted forest because of variation in their microclimate and edaphic characteristics.

Christine and Nestor, (2008) studied the diversity of tree species in traditional agroforestry systems of Benin region of West Africa and observed 45 species of plants belonging to 24 families. The major families were Fabaceae (with 5 species each), Moraceae, Bombaceae, Anacardiaceae (4 species each), Rubiaceae, Sterculiaceae and Meliaceae (with 3 species each). The total species richness was 18 species with an average of 6 species ha⁻¹ in the south, 33 species with an average of 4 species ha⁻¹ in the central region and 15 species with an average of 4 species ha⁻¹ in the north. The dominant species was oil palm (*Elaeis guineensis*) in the south. Northern region was dominated by shea butter (*Vitellaria paradoxa*) and locust bean (*Parkia biglobosa*) in tree parklands whereas in the central region, *Mangifera indica*, *Citrus sinensis*, *Irvingia gabonensis* and *Elaeis guineensis* were the most important trees on farmlands.

Henry *et al.* (2009) assessed the tree diversity in small holder farming system of western Kenya and recorded higher Shannon diversity index in home garden (1.3-1.6) followed by scattered planting (0.74-0.86), windrow (0.4-0.6) and least was recorded with wood lot (0.01). The most frequently occurred and dominant species was *Eucalyptus saligana*.

Munesh and Chatar, (2009) carried out phytosociological study in traditional hill agroforestry of Garhwal Himalaya. The study recorded 23 tree species across three sites out of which *Grewia oppositifolia* was the dominant species found in all the sites with a frequency of 100 per cent and the average number of trees in agroforestry recorded were in the range of 30 to 340 ha⁻¹.

Anitha *et al.* (2010) studied tree species diversity and community composition in a human-dominated tropical forest of Western Ghats of India. They recorded a total of 106 tree species with *Albizia amara*, *Nothopegia racemosa* and *Pleiospermium alatum* as dominants. Results indicated that, if degradation continues at the present scale the old growth which were present then would replace by the pioneer or the secondary species which led to the local extinction.

A study was conducted to assess the stem density, tree diversity, and biomass and carbon stocks of forests and to make recommendation for forest management based on priorities for biodiversity protection and carbon sequestration. Stem density ranged between 295 and 850 stem ha⁻¹. Shannon Wiener diversity index was between 0.28 and 1.75. Protecting conifer-dominated stands, especially those dominated by *Abies pindrow* and *Cedrus deodara* would have the largest impact, per unit area, on reducing carbon emissions from deforestation. (Sharma *et al.*, 2010).

Alex and Daniel, (2010) studied the structure and composition of agroforestry systems in Southeastern Ghana and recorded 146 species of 34 families and the most species rich families were Fabaceae, Euphorbiaceae, Sterculiaceae and Apocynaceae. The systems were dominated with nine trees which occurred in all the three-land use system. Further, they also recorded higher tree density in natural forest (470 trees ha⁻¹) followed by mixed food crop agroforestry (125 trees ha⁻¹) while cocoa agroforestry had 90 trees ha⁻¹. The higher Shannon-wiener index was recorded in natural forest (4.94) and the index least was noticed in cocoa agroforestry (2.46) while higher similarity index was observed between the two agroforestry systems (0.33).

The investigation on traditional perennial crop-based agroforestry system in West Java revealed occurrence of 76 plants of 34 families with a density of 324 trees ha⁻¹. Out

of the total species, 42 species were primarily used to produce fruit (20 species), timber (14), vegetables (4), industrial uses (2) and one each for medicine and fuel wood (Okubo *et al.*, 2010).

In North-East India, Tynsong and Tiwari, (2010) assessed diversity of plant species in Arecanut based agroforestry system at South Meghalaya. They recorded 160 plant species of 45 families dominated with Euphorbiaceae, Moraceae (11 species each) and 8 species each in Arecaceae and Lauraceae. Out of the total plants, 83 were trees, 41 were herbs, 14 were climbers. *Cinnamomum tamala*, *Atrocarpus heterophyllus*, *Cedrela toona* and *Cryptocarya andersoni* were the dominant tree species.

Varadaranganatha and Madiwalar, (2010) investigated species richness, diversity and density of trees/shrubs in agroforestry systems under three different agro-ecological situations (lower elevation, higher elevation and coastal area) and they observed higher species diversity in higher elevation (4.49) compared to coastal area (3.78) and lower elevation (1.75). Similarly, trees density was found higher in higher elevation (53.70 ha⁻¹) followed by coastal area (38.70 ha⁻¹) and lower elevation (23.45 ha⁻¹). The species richness also followed similar trend; 57, 28 and 18, respectively. Further, the most dominant tree species found in these different situations were mango (60.0%), teak (35.0%), cashew (31.66%) in lower elevation area, Areca nut and mango (83.33%), jack and cardamom (78.33%) in higher elevation area and cashew (95.00%), coconut (90.00%), casuarina and *Gliricidia sp.* (83.33%) in coastal area.

Rahman *et al.* (2011) estimated the status of natural regeneration and diversity of tree species in the North-eastern Bangladesh. This study showed that, *Tectona grandis* (29.66) and *Chukrasia tabularis* (10.8) had the highest IVI values for exotic and indigenous species respectively.

Omoro *et al.* (2011) observed the tree species diversity, richness, and similarity between exotic and indigenous forests. The indigenous forests showed higher diversities than the exotic forests. The high species diversity could be accounted due to higher levels of disturbance. The low regeneration observed in the exotic plots was observed due to the

absence of seed banks, since some of the plantations were established on bare land or the inherent physiology (allelopathy) of some of species preventing the regeneration of others.

Jayakumar and Nair, (2013) assessed species diversity and tree regeneration patterns of different vegetation types of Western Ghats, India. Results showed that, species diversity and regeneration pattern of trees differed in different vegetation types of the forest landscape. Species area and species-individual accumulation curve (rarefaction) against equal sized sampling area in different vegetation types showed that species heterogeneity was higher in vegetation types at mid elevations while their abundance was higher in vegetation types at higher elevations. Tree regeneration was higher in species rich vegetation type with no sign of human disturbances. Change in species composition across mature and regenerating phase was more frequent in disturbed forest as compared to undisturbed or less disturbed forests.

Adekunle *et al.* (2013) assessed the tree species diversity and structure of a Nigerian strict nature reserve. The most abundant species was *Celtis zenkeri*. The Shannon-Wiener index (3.75) and evenness (0.82) diversity indices were very high indicating that, the forest was a potential biodiversity hotspot. They also provided a baseline for the management of protected areas in developing countries highlighting the role of *in-situ* conservation in natural vegetation.

A study by Vipin and Madhuri, (2014) revealed that, *Ficus* was the most dominated genera followed by *Albizia lebbek*, *Terminalia alata* and *Grevillea robusta*. *Tectona grandis* was the most dominant species in the Singhori Wildlife Sanctuary, Madhya Pradesh. They recommend a well-planned strategy to conserve the rich tree diversity.

Sarkar and Devi, (2014) conducted a study to assess the diversity, population structure and regeneration status of tree species in Hollongapar Gibbon Wildlife Sanctuary, Assam, Northeast India. Study showed that, highest density (7756 individuals ha⁻¹) and species richness (73) were recorded in 0–30 cm girth class, while, highest basal area (9.62 m² ha⁻¹) was observed in 120–150 cm girth class. The overall population structure of tree species showed a reverse J-shaped population curve indicating that, good regeneration status which revealed that future communities might be sustained.

Omokhua, (2015) studied the tree species composition and diversity in Oban Forest reserve, Nigeria and estimated the basal area of $34.67 \text{ m}^2 \text{ ha}^{-1}$, species richness (10.60) and the value of Shannon's Index (H') was 3.795. The results showed that, the forest reserve was a well-stocked tropical rainforest in Nigeria.

Wondrade *et al.* (2015) reported that, species sampled ranged from 1 to 22 per plot and the overall mean stand density was $785 \text{ stems ha}^{-1}$. *Cupressus lucitanica* (60.09%), *Grevillea robusta* (28.65%) and *Eucalyptus citriodora* (20.87%) were the species with the highest IVI value.

Devagiri *et al.* (2015) carried out a study on species diversity, regeneration and dominance as influenced by canopy gaps and their characteristics in tropical evergreen forests of Western Ghats, India where the diversity and regeneration of woody species were compared with canopy gaps and intact vegetation. Results revealed that, species richness and diversity was higher in gaps than in intact vegetation. The study also indicated that, gap size was significantly influenced by species diversity and regeneration. These canopy gaps maintained the species diversity and favoured regeneration of woody species.

Gopalakrishnas *et al.* (2016) assessed the tree diversity in the tropical dry forest of Bannerghatta National Park in Eastern Ghats, Southern India. Totally, 128 tree species were recorded in the area with the plant density of 100.69. The species diversity accounted for about 2.56 and species richness was found to be 10.48.

According to Sunil *et al.* (2016) species richness showed a decreasing trend in agro-ecosystem compared to forest landscape of river Cauvery, Southern India. The Shannon-Wiener diversity index was higher for forest landscape (5.6) with more evenness in distribution. In the forest landscape, high Importance Value Index (IVI) was obtained for *Terminalia arjuna*, *Pongamia pinnata* and *Hopea parviflora*. In agro-ecosystem, species like *Pongamia pinnata*, *Ficus bengalensis* and *Salix tetraspermae* exhibited high IVI values. Expansion of agricultural activities and other biotic pressures might have led to the variation in species composition between the forest and agro-ecosystem.

Naidu and Kumar, (2015) assessed the tree diversity, stand structure and community composition of tropical forests in Eastern Ghats of Andhra Pradesh, India. It

was noticed that, Shannon-Weiner index (H') ranged from 3.76 to 3.96. Whereas, the Simpson index varied between 0.96 to 0.97. The species richness was between 10.04 to 11.24 with an evenness index ranging from 0.60 to 0.78. The study concluded that, the biodiversity of these forests was under threat due to the anthropogenic and upcoming mining activities.

2.2 Tree species diversity in garden

Gupta *et al.* (2008) reported that urban forest in 43 ha of NEERI campus at Nagpur; Maharashtra has 135 vascular plants including 16 monocots and 119 dicots, belonging to 115 genera and 53 families. The taxa included 4 types of grasses, 55 herbs, 30 shrubs and 46 trees. The large number of species within very small area indicates rich biodiversity in this urban forest.

Jayakumar *et al.* (2009) reported that the floristic inventory and diversity studies of evergreen forest in the Eastern Ghats of Tamil Nadu, India using various sampling methods viz. (a) ad hoc (AH) vegetation survey, (b) stratified random plot (SRP) and (c) bigger plot (BP). The mean stand density and mean basal areas was found to be 547 (SRP) and 478 (BP) stems ha⁻¹, and 46.74 (SRP) and 43.6 m² ha⁻¹ (BP), respectively on the study sites. Shannon Index (H') was found to be 3.140 (SRP) and 3.340 (BP).

Fard *et al.* (2015) stated that the tree diversity of two urban parks of Kio and Shariati in Khorramabad Country were (SWI = 1.5) and (SWI = 0.88) respectively.

Jaman *et al.* (2016) carried out a study to quantified total above and belowground carbon stock and tree species diversity in home garden around four villages of two Upazilas of Rangpur district situated in northern part of Bangladesh. In total 1671 trees were sampled and 32 different tree species were identified and recorded. The Shannon Wiener index was used to evaluate the tree diversity per home garden and it ranged from 1.00 to 2.2 with a mean value of 1.64.

2.3 Biomass estimation

Plant biomass (W) is the weight of living plant material contained above and below a unit of ground surface area at a given point in time. Production is the biomass or weight of organic matter assimilated by a community or species per unit land area per unit time.

Production of biomass (aboveground, belowground and total biomass) by different components of the system is mainly affected by age of the perennial woody component, nature and distribution of different components of the system and other abiotic factors. Nayak, (1996) also reported that the system above-ground biomass production was influenced due to species composition and distribution. Different management practices for perennial woody species such as training, pruning and other cultural practices for annual crops also affect the biomass production in agroforestry systems (Deshmukh, 1998). Whereas efficient use of limited resources for maintaining higher photosynthetic activities, leaf area index, better light interaction and water use efficiency were the biomass governing factors reported by Sehgal (1999) and Huxley (1983).

Silvi-pasture recorded highest above-ground carbon (59.40 t ha^{-1}), belowground carbon density (12.23 t ha^{-1}) and total vegetation carbon density (71.63 t ha^{-1}), whereas highest soil organic carbon (56.70 t ha^{-1}) from agri-silvi-horticulture. Soil organic carbon in grasslands and tree-based systems not showed too much difference. An intensive root cycling system, which has great content of lignin, is responsible to store organic carbon in soil by grassland equivalent to the other tree-based systems. In the long-term, areas under grasslands have similar potential to store total organic carbon as areas under tree-based systems (Franzluebbers *et al.*, 2000).

In an experiment, Kumar and Singh, (2003) studied five agroforestry systems viz., hortipastoral, silvi-pastoral, agri-horticulture, agri-silviculture, agri-horti-silviculture and natural grassland in mid hill conditions of Himachal Pradesh. Different land-use systems had significant variation in their total biomass production potential. Biomass production potential of hortipastoral, silvi-pastoral, agri-silviculture, agri-horticulture and agri-horti-silviculture was 3.15, 10.31, 3.55 and 3.97 times higher over natural grassland, respectively. The silvipastoral (59.72 t ha^{-1}) system produced the highest biomass followed by Agri-horti-silviculture system despite having lesser number of trees, whereas minimum was (5.79 t ha^{-1}) in natural grassland.

Sanneh, (2007) reported that maximum aboveground biomass (308.96 t ha^{-1}), belowground biomass (62.09 t ha^{-1}) and total biomass (371.06 t ha^{-1}) was in the forest land use system. It was followed by silvi-pasture, agri-silvipasture, agri-horticulture, agriculture

and grassland systems, respectively under different land-use systems in wet temperate north western Himalayas at different altitudinal gradients.

Minj, (2008) studied the biomass production potential of different land-use systems in low and mid hills of Himachal Pradesh and reported maximum mean aboveground biomass (188.60 t ha^{-1}), belowground biomass (49.04 t ha^{-1}) and total biomass (237.70 t ha^{-1}) in pure poplar plantation, followed by agroforestry, agriculture and pure grassland systems, respectively.

Singh and Lodhiyal, (2009) evaluated the biomass and carbon production potential in 8-years old agroforestry based *Populus deltoides* plantation in Tarai region of central Himalaya. They observed that the total biomass of plantation was 202.59 t ha^{-1} and the aboveground components contributed 78.68 per cent and belowground biomass contribution was 21.32 per cent to the total biomass.

In an experiment, Kumar *et al.* (2011) estimated the biomass and net primary productivity of different age (5-, 10- and 15-year-old) grouped *Butea monosperma* forest ecosystems in Western India. It was found that the tree biomass and net primary productivity increased with increasing age of the forest stand, whereas the herb biomass and net primary productivity decreased significantly with increase in the forest age. The all values of biomass and NPP of trees, shrubs and herbs were low in 5-year-old, moderate in 10-year-old and high in 15-year-old forest stands. The total forest biomass increased from 190.7 t ha^{-1} in the 5-year-old to 306.3 t ha^{-1} in 15-year-old forest. The tree biomass increased with age of forest stand from 183.7 to 298.3 t ha^{-1} .

The assessment of biomass production, carbon storage and carbon dioxide mitigation potential of plantations of *Populus deltoides*, *Eucalyptus tereticornis*, *Dalbergia sissoo*, *Mangifera indica*, *Litchi chinensis* and *Prunus salicina* were assessed in different tree-based systems of central Himalayan Tarai region by Kanime *et al.*, (2013). The maximum total biomass (94.8 Mg ha^{-1}) was observed in a 10-year-old *D. sissoo* monoculture plantation, followed by an 8-year-old *P. deltoides* block plantation (63.0 Mg ha^{-1}). Carbon stocks ranged from 4.51 Mg ha^{-1} in an 8-year-old *P. deltoides* boundary plantation to 43.39 Mg ha^{-1} in *D. sissoo* plantation. The carbon sequestration rate for *P.*

deltoides block and boundary plantations was estimated 2.75 and 0.43 Mg ha⁻¹ year⁻¹, respectively. Eucalyptus boundary plantation sequestered 0.84 Mg ha⁻¹ year⁻¹ while *D. sissoo* plantation sequestered 2.73 Mg ha⁻¹ year⁻¹. Among fruit trees, the highest sequestration rate was recorded in *M. indica* plantation, with 1.43 Mg ha⁻¹ year⁻¹.

Sharma and Kant, (2014) conducted a study in sub-tropical forest of districts Jammu and Samba of Jammu and Kashmir with the objective of determining floristic composition, species diversity and structure of woody vegetation in drier Kandi Shivaliks. The vegetation analysis revealed the dominance of *Mallotus philippensis* (SIV%, 6.4), *Acacia modesta* (10.44%) and *Pinus roxburghii* (24.27%) as over storey elements in northern dry mixed deciduous forests, Himalayan subtropical scrub and Himalayan subtropical pine forest, respectively.

2.4 Biomass carbon stock determination

Haripriya, (2000) reported that the aboveground biomass, density and carbon storage in major forest strata (21) of India for data collected from 1,70,000 sampling units distributed all over the country in 1993. Biomass ranged from 14 to 210 Mg ha⁻¹ with a mean of 67.4 Mg ha⁻¹, which equals around 34 Mg C ha⁻¹.

Cairns *et al.* (2003) reported that two methods of measuring sample tree biomass are available: (1) destructive and (2) non-destructive. Direct or destructive method of tree biomass involves felling an appropriate number of trees and estimating their fresh weights and oven-dry weights, a method that is accurate however it is impractical. Rather than performing destructive sampling all the time in the field, an alternative method (non-destructive) can be used that predicts biomass given some easily measurable predictor variable, such as “tree diameter” and “height” can be used.

Indian soils are largely carbon depleted but can be brought back to their native carbon carrying capacity by reforestation. Moreover, wastelands in India cover 56 million ha of which 70 per cent is low in carbon. These soils have been reported to have relatively high potential for accumulating organic carbon in vegetation and soil by growing suitable trees along with proper soil conservation measures Rai and Sharma, (2003).

Zheng *et al.* (2004) estimated the aboveground biomass of Chequamegon National Forest of Wisconsin USA using Landsat 7 ETM data. Total aboveground biomass of the study area was estimated to be 3.3 M tons, of that 76.5% was hard wood and mixed hardwood/pine forest. Aboveground biomass ranged from 1 to 358 Mg ha⁻¹.

Montagu *et al.* (2005) reported the assessment of biomass that provides information on the structure and functional attributes of trees. With approximately 50% of dry biomass comprises of carbon biomass assessments illustrate the amount of carbon that may be sequestered by trees.

Pearson *et al.* (2005b) stated that the carbon stocks of trees are estimated most accurately and precisely by direct methods, e.g., through a field inventory, where all the trees in the sample plots above a minimum diameter are measured. The diameter was wrapped around a tree and is specially designed to convert the tree circumference to tree diameter. Diameter was measured with the measuring tape. It was needed to convert each measurement after recorded because the diameter tape is actually measuring tree circumference. This was a very simple equation, just divide circumference by (3.14) use the equation for circumference and solve for diameter. The minimum diameter often is 5 cm in DBH but it can vary depending on the expected size of trees. For arid environments in which trees grow slowly, the minimum DBH may be as small as 2.5 cm; for humid environments in which trees grow rapidly, the minimum DBH may be up to 10 cm. DBH biomass and carbon stock are estimated using appropriate allometric equations applied to the tree measurements.

Dwivedi *et al.* (2009) reported the case of Kerwa urban forest area in Bhopal is another Indian case that supports several threatened and endangered plant, animal and bird species. It also plays a critical role as a carbon sink with a total storage of about 19.5 thousand tonnes of aboveground carbon.

Ullah and Al-Amin, (2012) estimated above and belowground carbon stock in natural forests of Bangladesh. They observed that *Dipterocarpus turbinatus* has the highest total (aboveground and belowground) biomass and total carbon (81.42 and 45.40 t ha⁻¹, respectively). Among shrub species, the highest total biomass and total carbon stock

(134.42 and 69.47 kg ha⁻¹, respectively) were found in *Melastoma malabathricum* and among the herbs and grass species, *Cynodon dactylon* contains the highest total biomass and total carbon (134.91 and 76.05 kg ha⁻¹, respectively).

Sundarapandian *et al.* (2013) estimated biomass and carbon stock of woody plants in different land use systems (four plantations and a natural forest) at Puthupet, Tamil Nadu. The aboveground biomass in the study sites were 32.7, 38.1, 121.1, 143.2 and 227.2 Mg ha⁻¹ in *Anacardium occidentale*, *Casuarina equisetifolia*, *Mangifera indica*, *Cocos nucifera* and natural forest, respectively. The maximum carbon stock was reported from the natural forest site (131.8 Mg ha⁻¹), while the minimum was from *Anacardium occidentale* plantation (19.5 Mg ha⁻¹). A significant positive relationship was observed between basal area with biomass and total carbon. The low values of biomass and carbon stocks in plantations may be due to less stand age structure.

Wondimu, (2013) stated that the aboveground carbon and belowground carbon of Biheretsige park in Addis Ababa were 21.7 Mg ha⁻¹ and 4.3 Mg ha⁻¹, respectively. He also added that the aboveground carbon of Central Park in Addis Ababa was 29.12 Mg ha⁻¹.

A study was carried out by Borah *et al.* (2013) in ten tropical forests of Cachar district to estimate aboveground biomass, carbon stocks and their relationship with density, basal area and diversity indices. The aboveground biomass was ranged from 32.47 Mg ha⁻¹ to 261.64 Mg ha⁻¹ and C-stocks ranged from 16.24 Mg ha⁻¹ to 130.82 Mg ha⁻¹. The small to medium trees contributed more aboveground biomass and C-stocks than the large trees. *Cynometra polyandra*, *Artocarpus chama*, *Sapium baccatum*, *Ficus benghalensis*, *Trewia nudiflora*, *Xerospermum glabratum*, *Pterygota alata* and *Semecarpus anacardium* were top contributor of aboveground biomass and C-stocks in different tropical forests of Cachar district of Assam. AGB showed significant relationship with basal area and diversity indices. The aboveground biomass, however, did not show significant relationship with tree densities.

Guleria *et al.* (2014) studied the effect of nitrogen fixing trees (*Acacia nilotica*, *Acacia auriculiformis*, *Acacia albida*, *Leucaena leucocephala*, *Albizia lebbeck*, *Acacia catechu*, *Dalbergia sissoo* and *Bauhinia variegata*) on the growth biomass, site

amelioration and carbon sequestration. They opined that carbon stocks in above and belowground parts of *Dalbergia sissoo* were 145.2 and 42.12 t ha⁻¹, respectively which was closely followed by *Acacia albida*. Carbon dioxide mitigation potential of *Dalbergia sissoo* was maximum among all the species to the tune of 28.42 t ha⁻¹ yr⁻¹. They concluded that *Dalbergia sissoo* is the highest carbon sequestering species with maximum survival and growth in subtropical climate.

Liu *et al.* (2014) estimated that the aboveground carbon and belowground carbon of Lesio-louna tropical rainforest of Congo were 168.60 Mg ha⁻¹ and 39.55 Mg ha⁻¹, respectively. Averti *et al.* (2014) reported that the aboveground carbon of humid tropical wetland forests of the Republic of Congo was 223 Mg ha⁻¹.

Zhao *et al.* (2014) examined the biomass and carbon pools in *Pinus tabuliformis* secondary forest stands in Northern China. The results showed that the tree biomass of *P. tabuliformis* stands was ranged from 123.8 Mg ha⁻¹ for the young stand to 344.8 Mg ha⁻¹ for the mature stand. The underground biomass ranged from 1.8 Mg ha⁻¹ in the middle-aged stand to 3.5 Mg ha⁻¹ in the young stand. Forest floor biomass increased steady with stand age, ranging from 14.9 to 23.0 Mg ha⁻¹. The highest mean carbon concentration across the stand was found in tree branch while the lowest mean carbon concentration was found in forest floor.

Justine *et al.* (2015) investigated the biomass stock and carbon sequestration across stand ages in *Pinus massoniana* plantations. The results revealed that plantation biomass increased with increasing stand ages, ranging from 0.84 tonnes per hectare in the three-year stand to 252.35 t ha⁻¹ in the 42-year stand. Carbon concentrations and storage in soil decreased with increasing soil depth. The total ecosystem carbon storage varies with stand age, ranging from 169.90 t ha⁻¹ in the five-year plantation to 326.46 t ha⁻¹ in the 42-year plantation, of which 80.29% comes from soil carbon and 19.71% from the vegetation.

Gautam and Mandal, (2016) quantified biomass, production and carbon dynamics in moist tropical forest of eastern Nepal. Results revealed that total stand biomass in undisturbed forest stand were 960.4 Mg ha⁻¹ while in disturbed forest stand it was 449.1 Mg ha⁻¹. The biomass of trees, shrubs and herbs in undisturbed was 948.0, 4.4 and 1.4 Mg

ha⁻¹, respectively, while in disturbed they were 438.4, 6.1 and 1.2 Mg ha⁻¹, respectively. Total carbon input into soil through litter plus root turnover was 6.78 and 3.35 Mg ha⁻¹ yr⁻¹ in undisturbed and disturbed, respectively.

Jaman *et al.* (2016) quantified total above and belowground carbon stock and tree species diversity in home garden around four villages of two Upazilas of Rangpur district situated in northern part of Bangladesh. A total 64 home gardens were sampled on size, diameter at breast height of trees and tree height. Mean carbon stock per unit area was higher in small home garden (69.15 Mg ha⁻¹) compared to medium (47.96 Mg ha⁻¹) and large (39.93 Mg ha⁻¹) home garden respectively.

Naeem *et al.* (2017) studied the rate of litter fall and decomposition in *Acacia modesta* dominated forest of Pakistan. It was revealed that the total amount of litter fall (including leaves, twigs and pods) in *Acacia modesta* dominated subtropical forest was 31.95 t ha⁻¹ yr⁻¹. Annually the highest litterfall was in April to September (72– 96%) while it was lowest (4-28%) between October to March.

Nero *et al.* (2018) stated that urban forestry has the potential to address many urban environmental and sustainability challenges. They also observed that tree density, diameter at breast height, height, basal area, aboveground carbon storage and species richness were significantly different among green spaces. The diversity was also significantly different among urban zones. The diameter at breast height distribution of trees followed a modified reverse J-shaped model. The urban forest structure and composition is quite unique. The practice of urban forestry has the potential to conserve biological diversity and combat climate change. The introduction of policies and actions to support the expansion of urban forest cover and diversity is widely encouraged.

2.5 Carbon sequestration in the ecosystem

Forests are major carbon sinks of ecosystem, but these sinks are encroached by humans for several activities. Meanwhile, extensive release of carbon to the atmosphere by several anthropogenic activities lead to imbalance in the ecosystem. Hence, trees play a major role in maintaining ecological balance by accumulating carbon from the atmosphere. Carbon sequestration capacity differs from one tree species to another. To reduce carbon

from atmosphere in greater quantities, trees with higher carbon sequestering potential are to be identified and grown in all the places.

Nowak and Crane, (2002) reported that urban trees in the Coterminous USA, store 700 million tons of carbon with a gross carbon sequestration rate of 22.8 million t C yr⁻¹. The national average urban forest carbon storage density is 25.1 t C ha⁻¹, compared with 53.5 t C ha⁻¹ in forest stands.

IPCC, (2007) reported that the phenomenon for the storage of CO₂ or other forms of carbon to mitigate global warming and its one of the important clauses of 8 Kyoto Protocol, through biological, chemical or physical processes; CO₂ is captured from the atmosphere.

Watson, (2008) reported that the main components of terrestrial carbon storage are aboveground and belowground biomass dead litter and soil organic matter.

Eric *et al.* (2008) stated that geologic carbon sequestration is a mechanism of injecting carbon dioxide directly into underground geological formations.

Sundquist *et al.* (2008) reported that oceans are natural CO₂ sinks and represent the largest active carbon sink on Earth. Among the global net sequestered CO₂ about 2 Gts of carbon released as a result of anthropogenic activities.

2.6 Carbon sequestration in Urban Park

Chiari and Seeland, (2004) have highlighted the role of urban forests as a place of social integration as they provide recreation and relief to the urban population from their hectic life.

Pataki *et al.* (2006) observed that in urbanizing regions, organic carbon is stored within and cycled through the air, soils, waters, plants, and the built environment itself. Although it is abundantly clear that cities and urbanizing areas affect local and global sinks and sources of CO₂, the exact magnitude of and mechanisms for carbon exchange remain highly uncertain for urbanizing regions.

IPCC (2007) reported that the amount of carbon dioxide in the atmosphere has increased from 280 ppm in the pre-industrial era (1750) to 379 ppm in 2005, and is increasing by 1.5 ppm per year.

Grimm *et al.* (2008) reported that in 1900 just 10% of the global population was living in urban areas which now exceeds 50% and is expected to further rise to 67% in the next 50 years.

Nero *et al.* (2018) stated that urban forestry has the potential to address many urban environmental and sustainability challenges. The vegetation inventory included a survey of 470,100 m² plots based on a stratified random sampling technique and six streets ranging from 50 m to 1 km. A total of 3757 trees, comprising 176 species and 46 families, were enumerated. Tree abundance and species richness were left skewed and unimodally distributed based on diameter at breast height. Trees in the diameter classes >60 cm together had the lowest species richness (17%) and abundance (9%), yet contributed more than 50% of the total carbon that stored in trees within the city. Overall, about 1.2 million tonnes of carbon is captured in aboveground components of trees in Kumasi, with a mean of 228 t C ha⁻¹.

2.7 Nutrient cycling and turnover

African tropical forests showed very high ($k \approx 4$) rates (Olson, 1963), indicating rapid nutrient cycling. The decay rates can, however, be below ($k < 1$) even in tropical areas, depending on litter type, season and altitude (Verhoef and Gunadi, 2001). The decomposition process has been described as having two phases, a leaching phase and a post-leaching phase, which are regulated by different litter quality parameters (Loranger *et al.*, 2002). Oliveria *et al.* (2003) reported that the decomposition rate, release of nutrients and bacterial population increased when there was favourable lignin: N and C:N ratios in legume litter.

Trees help in maintaining soil health by constant addition of litter, nitrogen fixation and arresting soil erosion. Canopy litterfall drives the major aboveground pathways by which nutrients are returned to the forest floor, thus enabling the nutrient cycling and maintaining the soil health of an ecosystem. Litter exerts immense influence on physical,

chemical and biological characteristics of soil, thereby on growth of trees (Pande *et al.*, 2002).

According to Semwal *et al.* (2003) significant effects of species, incubation time and species $\times$ incubation time interaction on monthly mass, N, P and K release rates were important. A linear combination of rainfall and temperature explained the variation in monthly mass loss better than rainfall and temperature independently. Annual decomposition constants of mass and N were positively correlated with C and N concentrations and negatively correlated with C/N, lignin/N, polyphenol /N and lignin + polyphenol/N ratios of fresh litter. As all the species studied showed the highest rates of N and P release during the rainy season, rainy season crops are not likely to be as much nutrient stressed as winter season crops if leaf litter of these species was assumed to be the sole source of nutrients to crops in tree-crop mixed agroforestry. *A. lebbeck*, *A. nepalensis*, *D. sissoo* and *F. glomerata* seemed to be more appropriate for rapid recovery in degraded lands as their litter decomposed faster than *B. rugulosa* and *F. roxburghii*. A diverse multipurpose tree community provides not only diverse products but may also render stable nutrient cycling.

Restrepo *et al.* (2013) evaluated the potential use of both active and passive models to restore soil biogeochemical nutrient cycles through fine litterfall and soil quality in tropical degraded dry lands. They found that in degraded soils the passive restoration model with a six-year-old native species (*Croton leptostachyus*) showed a higher capacity to re-establish nutrient cycling than with an active restoration model using a six-year-old plantation of neem (*Azadirachta indica*). In these degraded soils the supply of litter by the established or successional vegetation is a valuable source of organic matter and C. In the passive model the potential C return by leaf litter represented $114 \text{ kg C ha}^{-1} \text{ yr}^{-1}$, the k_j constant obtained in the study was 0.6, the MRT was 1.7 yrs., and the real carbon return was $72 \text{ kg ha}^{-1} \text{ yr}^{-1}$. Meanwhile, the potential C return in the active model (neem plantation) was $46 \text{ kg ha}^{-1} \text{ yr}^{-1}$ and the real C return of $33 \text{ kg ha}^{-1} \text{ yr}^{-1}$.

Leon and Osorio, (2014) conducted a study to know the nutrient turnover in degraded soils through different tree species in Columbia. The results indicate that in only

6–13 years it is possible to detect soil properties improvements due to litter fall and decomposition, where the nutrient cycling and nutrient turnover was found to be higher.

The decomposition of leaf litter is an important part of natural nutrient cycling in tree-based land use systems and forests. Amount of nutrients incorporated through annual litterfall into the soil and its decomposition, especially in closed ecosystems is important for sustaining production and therefore litter is an index of forest productivity (Attiwill and Leeper, 1987). The release of nutrients during litter decomposition is a key process governing the availability of nutrients in ecosystems (Moore *et al.* 2006) and plays a critical role in nutrient availability in forest and tree-based ecosystems. It is a complex process regulated by abiotic and biotic factors (Lavelle *et al.*, 1993; Reddy, 1995). The amount of nutrient added to a particular ecosystem differs with the species composition (Mahmood *et al.*, 2014; Hasanuzzaman and Hossain, 2014) and the climatic conditions (Mahmood *et al.*, 2007; Semwal *et al.*, 2003).

Nitrogen gradually increased with advancing litter decomposition but finally decreased for all the species in the forest, while C decreased throughout (Rai *et al.*, 2016). The species with higher initial N has lower initial lignin, lignin: N and C: N ratio in their litter, decomposed faster than the others as dry mix > *Hardwickia binnata* > *Butea monosperma* > *Tectona grandis* > *S. robusta*. Dry mix trees exhibited faster rate of decomposing litter, released more nutrients and were considered important for regulating organic matter and nutrient cycling in the forest *i.e.*, they had higher N content in their litter and is thus best predictor of N dynamics. Greater N in litter of these tree species indicates lower lignin with faster decomposition rates of their litter increasing carbon, nitrogen and microbial activities in the soil on which it is growing. The C: N (*i.e.*, < 25) and lignin: N ratio in the litter of dry mixed trees, *H. binnata* and *B. Monosperma* was high thus aiding faster mineral N release.

The potential nutrient return via leaf litter production in forest ecosystems has been widely reported in many studies. On the other hand, this kind of reports in restoration projects of tropical degraded lands is scarce. High values of N turnover via leaf litter (52–81 kg N ha⁻¹ yr⁻¹) were reported by Ren *et al.* (2013) in *A. mangium* established in degraded soils by alluvial gold mining. Likely, this high turnover

is due to the ability of this plant to form symbiotic association with N₂ fixing bacteria, which allow having high N concentration in the leaf litter (1.2%). This is a remarkable aspect desirable for a forest species selected for a soil reclamation project, as this symbiosis offers independence of the plant from the soil N reservoir.

2.8 Soil physical properties

Soil physical properties have long been considered to exert great influence on the distribution, growth and development of plants. Bulk density is a measure of percent pore space and solids in a soil. It affects root penetration and the amount of air and water that soil can hold. Texture and structure are two inherent soil characteristics that govern the bulk density. Most of the soils bulk densities range between 1.0 g/cm³ to 2.0 cm³ and root penetration is severely impacted at bulk densities greater than 1.6 g/cm³. Lower soil bulk density is desirable for plant growth, whether those plants are agricultural crops, trees, or turfgrass. Other factors that have some effect on bulk density are parent material and depth in the soil profile. Lower concentration of organic matter, less aggregation, fewer fine roots, the lower population of soil microorganism, all of which generally contribute to the higher bulk densities. The addition of organic residue to the soil can lower bulk density by improving soil structure and increasing pore space (Candel *et al.*, 2018).

Balamurugan *et al.* (2000) observed a slight decrease in bulk density under *Eucalyptus citrodora* plantation when compared to open space. Aweto and Dikinya, (2003) reported that bulk density was lower and total porosity was higher in the 0–10 cm layer of soil under the tree canopies than in the open savanna.

Feller *et al.* (2001) reported lower bulk densities in primary forests were (1.2-1.4 g cm⁻³) compared to cultivated areas (1.5 g cm⁻³). Observations on the lower bulk density on the soil surface of forest land were recorded by Dagar *et al.* (1995) in Andaman and Nicobar Island. The increase in bulk density in different soils coincided with a decrease in the soil organic matter content.

Biswas *et al.* (2003) studied the effect of seven tree species, viz., *Gliricidia sepium*, *Casuarina equisetifolia*, *Dalbergia sissoo*, *Gmelina arborea*, *Albizia lebbeck*, *Acacia auriculiformis* and *Eucalyptus* hybrid, on some soil properties under an agroforestry system

of West Bengal, India and found that the soil bulk density was lowest under *Acacia auriculiformis* but observed a significant increase in per cent aggregation of soil, and maximum water holding capacity.

Jolivet *et al.* (2003) concluded that, when a forest was cleared for maize cropping, the bulk density of soil increased, up to 28 years gradually and also observed that long term effects contributing to change in the relative proportion of sand, silt and clay in the soil.

Mishra *et al.* (2003) carried out a study on the changes undergone by soil characteristics of sodic wasteland after 3, 6 and 9 years of planting *Eucalyptus tereticornis*. The results reveal that there was an improvement in the bulk density, it was decreasing with the age of trees.

Rathod and Devar, (2003) reported that bulk density was low under all the plantations when compared to their control at surface soil layer of 0 -15 cm. Among different plantations, the decrease in bulk density was highest under *Tectona grandis* followed by *Acacia auriculiformis*. This may be attributed to a higher amount of leaf litter added and its better decomposition.

Gupta and Sharma, (2008) have shown that soil physical properties such as porosity, density and water holding capacity improved significantly under 4-year-old poplar plantation when compared to sole cropping is establishing the significant role of the woody perennial in improving physico-chemical properties of soil under agroforestry.

Imogie *et al.* (2008) while investigating the long-term effect of *Leucaena leucocephala* on the soil physical properties observed that structure and bulk density of the soil were significantly improved over the control. Similarly, Oyedele *et al.* (2009) carried out a study to evaluate the effects of 20 years of different species of hedgerow crops on the physical and chemical properties of soil and found a reduction in bulk density under the hedgerow species from a maximum of 1.52 g cm⁻³ under control to 1.33 g cm⁻³ under *Pterocarpus santalinoides* and *Enterolobium cyclocarpum* hedgerows.

Tandel *et al.* (2009) also reported that tree cover significantly contributed towards improving different physical properties such as particle density, bulk density, water holding

capacity and porosity. The reason for such improvement was attributed to the addition of organic matter to soil by trees in the form of leaf litter.

Soil physical properties have long been considered to exert great influence on the distribution, growth and development of plants. Bulk density is a measure of per cent pore space and solids in a soil. Most of the soils bulk densities range between 1.0 g cm^{-3} to 2.0 g cm^{-3} and root penetration is severely impacted at bulk densities greater than 1.6 g cm^{-3} (Candel *et al.*, 2018).

2.9 Soil chemical properties

The tree plantations influence the soil's physical, chemical and biological properties through litterfall addition and root turnover. A considerable amount of organic matter and nutrients are returned to the soil through litterfall, root exudates and root decay. Return of nutrients to soil varies with species, plantation age, decomposition rate, season and spacing. Trees can capture nutrients below the rooting zone of crops because of their deep root system and transfer them to surface soil. The effects of organic matter accumulation are higher on the surface than subsurface horizons. Generally higher soil organic carbon and nutrient content under the trees have been observed than the adjacent open sites (Munoz and Beer, 2001)

Miah *et al.* (1997) studied the chemical properties in an agroforestry system in the Philippines with *Gliricidia sepium*, *Acacia auriculiformis* and *A. mangium* intercropped with upland rice and mung bean, the results showed positive changes in fertility even in shorter (20 months) period, except for soil pH and exchangeable Mg and observed an increase in the agroforestry over monoculture/sole cropping by 9% organic C, 11.9% in total N, 11.2% in available P, 10.6% in exchangeable K, 17.8% in exchangeable Ca, and 1.7% in CEC (cation exchange capacity). The soil fertility improvement followed the order of *G. sepium*>*A. auriculiformis*>*A. mangium*. However, in contrast, the trees in alley farming systems, *G. sepium* was not observed to significantly improve soil organic matter, exchangeable cations and CEC under its canopy, compared with soil outside its canopy on the farmer's fields. Similarly, there was no significant build-up observed in the extractable micronutrients- iron, copper, manganese and zinc under the tree canopy. The frequent

cultivation and the burning of the vegetation slash and crop residue prior to cultivation may have reduced the build-up of organic matter and nutrients in the soil underneath the tree canopy (Akpokodje and Aweto, 2007).

The changes in soil chemical properties were evaluated under three tree canopy positions (mid-canopy, canopy edge and canopy gap) of *Acacia nilotica* trees in a traditional agroforestry system (12-year old) on organic C, total and mineral N and P, and soil pH, at 0-10, 10-20 and 20-30 cm soil depth of 10 rice fields by (Pandey *et al.*, 2000) and found that soil organic C, total N, total P, mineral N (NO_3 and NH_4^+) and P were greater under mid-canopy and canopy edge positions than in canopy gaps. While the soil organic C and N pool sizes were maximum at 0-10 cm depth and declined with increasing depth, the total and mineral P contents were nearly uniform across the depths.

Imayavaramban *et al.* (2001) also reported that pH and EC were reduced by the planting of *Leucaena leucocephala* to the extent of 7.62 from 8.28 and 1.94 from 5.37 dS m^{-1} respectively over a period of six years. The fertility of the soil was significantly enhanced as reflected by the increased organic carbon content of 0.64% over 0.38% and nutrient content of the soil viz., N, P_2O_5 and K_2O found to increase *i.e.*, 182.36, 13.42, 142.32 kg ha^{-1} respectively as compared to 142.36, 9.42 and 115.16 kg ha^{-1} in the control site. The fertility status of soil under *Acacia catechu* and *Aegle marmelos* plantations were improved compared to control. There was an increase in pH, EC and organic matter to a magnitude of 10.92%, 900% and 366% respectively under plantations. Available N, P and K increased up to a tune of 46.76%, 140% and 174% respectively (Verma *et al.*, 2001).

Yadav, (2001) reported that the average organic carbon was ranged from 2.2 to 2.4 per cent under four- and five-years old poplar plantations at CIMAP, Pant Nagar and maximum N was found in surface 0-15 cm layer.

George *et al.* (2002b) conducted a field experiment in western Kenya, to assess whether the agroforestry species *Tithonia diversifolia*, *Tephrosia vogelii*, *Crotalaria grahamiana* and *Sesbania sesban* had access to the forms of soil P unavailable to intercropped maize. They found that the soil pH increased up to 1 unit (from pH 4.85) and available P increased by up to 38% ($1 \mu\text{g P g}^{-1}$) in agroforestry plots with retention of

biomass, but in plots where biomass was removed, P availability decreased by up to 15%. Coincident with the declines in litterfall, soil pH decreased by up to 0.26 pH units, plant available P decreased in the range of 0.27 and 0.72 $\mu\text{g g}^{-1}$ and organic phosphorus concentration decreased by between 8 and 35 $\mu\text{g g}^{-1}$ in the agroforestry plots.

Rai *et al.* (2003) conducted a study to know the soil amelioration under Agri-silvicultural system and sole cropping under rainfed semi-arid region of Jhansi and reported improvement in soil nutrient status both under agroforestry system and sole cropping but the improvement was found to be more pronounced in Agri-silviculture system in terms of organic carbon, N and P than in sole cropping.

Khan and Shukla, (2003) reported that soil pH and EC decreased up to 8.2 and 0.2 mmhos cm^{-1} , from initial value of 10.5 and 0.736 mmhos cm^{-1} , respectively, in 11 years old multipurpose tree plantations on sodic soils, however, the soil organic carbon, available phosphorus and available potash showed increase trend.

While studying the effect of different agroforestry systems (AFS) on soil properties and fertility status in comparison with the natural forest of the same age group, Majumdar *et al.* (2004) noticed 1.17-to-1.65-fold increase in organic carbon in different AFS compared to the initial status of surface soil and the Silvi-horti-pastoral AFS (alder + pineapple + fodder grasses) recorded the maximum soil organic carbon. The exchangeable Ca, Mg, Na, K and Al and available N, P, K, Fe, Mn and Cu contents were higher in all agroforestry systems compared to natural forest and the content of these nutrients decreased with increasing soil depth. Multi-storeyed AFS (alder + tea + black pepper) was performed best from soil health and fertility point of view than others in acidic *Alfisols* of Meghalaya.

Patil *et al.* (2004) studied soil profile to understand the organic matter build up and nutritional status of soil under *Dendrocalamus strictus* based agroforestry system. They observed that the soil organic carbon and soil organic matter of these soils increased from 0.37-0.58% and 0.63-0.99% respectively at the harvesting age of bamboo.

The functioning of trees as a safety-net for capturing nutrients leached beyond the crop root zone was evaluated by investigating changes in exchangeable cations (Ca, Mg and K) and pH in a wide range of medium to long term alley cropping trials in the derived Savanna of West Africa and compared with no-tree control plots. Topsoil Ca content, effective CEC and pH was substantially higher under *Senna siamea* than under *Leucaena leucocephala*, *Gliricidia sepium*, or the no-tree control plots. While the increase in the Ca content of the topsoil under Senna compared to the no-tree (control) treatment was related to the cumulative amount of dry matter added since establishment, however, the lower increase in Ca accumulation under the other species was related to the potential recovery of Ca from the topsoil itself and/or substantial Ca leaching. Hence the accumulation of Ca in the topsoil under senna had a marked effect on the topsoil pH, the latter increasing significantly compared with the *Leucaena*, *Gliricidia*, and no-tree (control) treatments (Vanlauwe *et al.*, 2005).

Bekele and Olsson, (2006) undertook a study to evaluate the effect of exotic tree species on soil properties and found that afforestation of farmland with exotic trees increased total N, exchangeable K and exchangeable Ca in the surface layers but had little effect on available P and exchangeable Mg. However, the effects on N cycling and soil nutrient availability were dependent on tree species. Similarly, Aweto and Dikinya, (2003) reported that soil organic carbon, exchangeable potassium, calcium and magnesium and cation exchange capacity were higher in soil under the tree canopies was mainly due to the accumulation of litter under the tree canopies.

Campanha *et al.* (2007) studied the quantity and nutrient concentration in the litter, soil fertility and soil moisture under coffee-based monocrop and agroforestry systems. The agroforestry system, contributed 6.1 tonnes ha⁻¹year⁻¹ of litter dry matter while the monoculture produced 4.5 tonne ha⁻¹year⁻¹, which resulted in higher nutrient content. The agroforestry system provided higher K, Ca, Mg, sum of bases, cation exchange capacity, Cu and Zn levels in both soil depth (0-20 and 20-40 cm) whereas soil under monoculture presented higher P and organic matter content than the agroforestry system.

Ben *et al.* (2007) reported changes in soil chemical properties of soils of 14-year-old poplar plantation from China. The results reveal that the pH increased 1.5 units from

the initial value and there was a reduction in the content of available nitrogen and phosphorous of soil with increase in the age of the plantation in spite of the increased contents of organic matter.

Singh and Sharma, (2007) studied the tree growth and soil nutrient status at an interval of six months in one and four-year old poplar clone G-48 spaced at 5 m x4 m and concluded that soil organic carbon was significantly greater (6.83 g/kg) in older than the younger (5.35 g/kg) plantations and available macronutrients in soil increased at successive sampling times. The average Zn concentration at final (four-year age) sampling was 17% lower compared to initial sampling (one year age), whereas the other micronutrients (Fe, Mn and Cu) tended to increase with the age of poplar plantations due to increased inputs of organic matter.

The ameliorative effect of the trees became more distinct with the increasing age of plantation. With four-year tree plantation, very nominal changes were recorded in soil pH, electrical conductivity and organic carbon when compared to an initial value in Agri-silviculture system of *Albizia procera* at NRCAF, Jhansi (Biswas *et al.*, 2003). No significant impact of afforestation on soil pH of the calciorthent, but only marginal (8.74 to 8.43) reduction was observed. The high free calcium carbonate content in the soils (34%) was said to be the reason for low influence on soil pH resulted from the decomposition of leaf litter, dead root biomass and root exudates. While the integration of *Albizia procera* with the crop was found to improve soil fertility in terms of organic carbon, available N, P and K.

Chaudhry *et al.* (2007) carried from a poplar-based agroforestry system and conventional agricultural system on soil found that soil under agroforestry system had higher soil organic carbon, total N, available phosphorus and potassium compared to the sole cropping. Similarly, Gupta and Sharma, (2008) reported that chemical properties like pH, availability of nutrients, soil organic carbon, *etc.* also improved significantly under 4-year-old poplar plantation compared to sole cropping.

A study on Chinese fir and Masson pine recorded that the amounts of available N and P nutrients in low-density stands are greater than in middle and high-density stands (Liu, 2008).

A study showed that there was a significant decrease in the electric conductivity of the afforested area when compared to that of control. This may be due to the decomposition of organic matter with the release of organic acids in the afforested plots (Kumar *et al.*, 2008).

The N-fixing tree *A. auriculiformis* significantly improved the soil organic carbon, available N, available P, and available K in 0–15 cm soil depth compared with soil from an open area without trees. The activity of root symbionts such as nitrogen-fixing nodules could increase soil N levels and as the suitable carbon substrates provide an energy source for bacterial mineralization and thereby enhanced the availability of other soil nutrients (Das and Chaturvedi, 2008).

Jiang *et al.* (2009) carried out a study to assess the effects of land use on soil micronutrient status. The results reveal that land use effect and micronutrient interactions were found to be significantly different. The micronutrients decreased with soil depth. Woodland and the fallow fields had significantly higher micronutrients when compared to paddy fields and maize fields. Micronutrients were positively correlated with soil organic carbon, but negatively with soil pH in profiles. Overall, soil pH and nutrient cycling played a major role in increasing the soil micronutrient level in woodland and fallow fields. Also, in the case of paddy, it was recorded that higher soil pH and low organic matter content may inhibit micronutrient availability.

In research it was found that at 0 to 15 cm soil layer the pH was ranging between 9.1 to 9.6, at 15 to 30 cm it was between 9.8 to 10 in the case of *Prosopis juliflora* and *Terminalia arjuna* respectively (Nayak *et al.*, 2009). This research reveals that soil depth has an influence on soil pH, where soil pH increased with increase in soil depth.

Kukal *et al.* (2009) reported that the increase in soil organic carbon content of sole crop was 0.36% and in agroforestry was 0.66%. When it was checked with the type of soil;

loamy sand soil had higher organic carbon content when compared to sandy clay. The soil organic carbon increased with an increase in tree age.

An assessment of impact of land use systems on some physical and chemical properties of an Oxisol in the Humid Forest Zone of Southern Cameroon showed that at 4-5 years old *Chromolaena odorata* fallow and a 10-12 years old forest land in comparison with a mixed food crop field dominated by groundnut, maize and cassava, the soils of *Chromolaena odorata* fallows presented a higher fertility level than those under secondary forests and cocoa plantations (Agoumel and Birang, 2009).

Laik *et al.* (2009) conducted a study under 18-year-old forest tree plantations consisting of six tree species *i.e.*, *Pongamia pinnata*, *Albizia procera*, *Acacia lenticularis*, *Eucalyptus tereticornis*, *Swietenia mahagoni* and *Terminalia arjuna* in Bihar, India, to identify tree species that could grow and ameliorate calcareous soils. Most of the tree species studied were effective in bringing about improvement in the soil properties as reflected by the significant increases in electrical conductivity, soil organic carbon, available macronutrients and micro-nutrients. Of these tree species, *E. tereticornis* showed maximum soil organic carbon (7.54 g kg^{-1}) whereas higher available macronutrients were recorded under the leguminous tree species. The order of the levels of the micronutrients under different species varied but usually, *E. tereticornis*, *T. arjuna*, and *P. pinnata* were in higher order. *A. procera* was found to be the best among the tested tree species, for the agroforestry system to sustain long-term soil productivity in calcareous recent alluvial soils of Bihar.

Chandra *et al.* (2010) also recorded a marked improvement in the biochemical characteristics of degraded Oxisols as the soil nitrogen was improved by 39.8%, phosphorus 42.19%, potassium 37% and calcium 52% under tree plantations of 19-23 years age compared to the soils without trees. While iron, magnesium and zinc increased by 52% to 58.5% under tree plantations.

Ahmed *et al.* (2010) conducted a study to assess the changes in soil properties under four multipurpose tree species in the alley cropping system. The results revealed that soil organic C, total N, available P, exchangeable K and Ca, CEC and S increased by 25, 31.25,

16.69, 53.26, 38.87, 15.35 and 19.75%, respectively, as compared to the initial status of the experimental soil and concluded that *Gliricidia sepium*, *Indigofera teysmannii* and *Leucaena leucocephala* were better in building up of soil fertility than that of *Cassia siamea*. The better performance of *G. sepium*, *I. teysmannii* and *L. leucocephala* in building up soil fertility was attributed to higher nutrient content and faster decomposition rate of the pruned materials.

Singh *et al.* (2010) evaluated the effect of pure stands of tree species and poplar-based agroforestry system on soil organic carbon content and major soil nutrients viz., N, P and K. Significant higher soil organic carbon and available nutrients at 0 to 15 cm soil depth irrespective of tree species. In Siris, the organic carbon content increased by 90.3% followed by Kikar of 84.5%, Shisham of 82.2%, Subabul of 80.8% when compared to control. The major nutrients on the top layer of soil were higher in Subabul, Siris, Shisham and Kikar than the other tree species. In poplar-based agroforestry system, the average contents of organic carbon, nitrogen, phosphorous and potassium were higher by 22.2, 10.2, 33.6 and 4.5% respectively, than pure pearl millet-wheat rotation.

The influence of four tree species was evaluated on soil organic carbon, available macronutrients and DTPA micronutrient content in the soil of 17 years old *Leucaena leucocephala* (Subabul), *Dalbergia sissoo* (Shisham), *Acacia catechu* (Khair) and *Acacia nilotica* (Kikar) spaced at 3 m x 3 m and adjoining open area considered as control, at Punjab, India. The soil organic carbon increased by 107% under Shisham followed by Kikar (92.4%) over control (3.30 g kg⁻¹) in the surface soil layer. The N content was higher under Subabul (87.9 mg kg⁻¹ in the surface layer); whereas P and K were higher under Kikar (9.5 and 142 mg kg⁻¹, respectively in the surface layer) than other tree species. Available micronutrients were higher beneath Subabul and Kikar than Shisham and Khair in the surface layer as well as the whole soil profile (Singh and Sharma, 2012).

A study on the soil properties under different land use system in parts of the Chambal region of Rajasthan was carried out in sorghum/soyabean-wheat rotation which was continuously cultivated over 20 years, ten-years-old *Leucaena leucocephala* plantation, grasslands for more than 15 years with dominant species of *Heteropogon contortus* and *Dichanthium annulatum*, over 20 years old undisturbed forest of *Prosopis*

juliflora and shrubs and 12 years old *Acacia senegal* plantation. The results revealed that the soil properties were affected by different land use systems. The soil pH recorded lowest in *Acacia senegal* plantation followed by *Leucaena leucocephala* plantation and this was due to the presence of phenethylamine alkaloids. The soil pH influences the difference in uptake of exchangeable bases, N-fixation, production of litter in organic acid content and stimulation of mineral weathering. The soil EC was recorded significantly higher in the cropped area and this may be due to higher inflow of soluble salts through irrigation water. The available P content was higher in *Leucaena leucocephala* and was inversely depended on pH. Overall, the trees along with grasses recorded to maintain soil nutrient status for ecological sustainability (Somasundaram *et al.*, 2013).

Pal *et al.* (2013) examined the impact of land use on soil fertility in an *Alfisols* of Western Himalayan region, India. Forest soils recorded a pH of 5.22 and that of grassland was 5.72. The organic carbon content was 3.01% in case of forest soils which was higher when compared to grassland (2.16%) and agriculture land (0.36%). Higher nitrogen was recorded in the soils of forest (699, 654, 623 and 597 kg/ha, at 0-15, 15-30, 30-45 and 45-60 cm depth, respectively), followed by grassland, horticulture and agriculture and least in wasteland. The maximum exchangeable Ca (0.801 cmol kg⁻¹) and Mg (0.402 cmol kg⁻¹) were recorded in grassland. Forest land recorded higher exchangeable K (0.231 cmol kg⁻¹) and Al (1.89 cmol kg⁻¹) and was least in wasteland.

Muche *et al.* (2015) carried out a study to assess the acidity status and physicochemical properties of soil in different land use types (natural forest, cultivated land, plantation forest and grazing land) in Northwest Ethiopia. The results revealed that the natural forest had significantly ($p < 0.05$) higher soil pH and lower exchangeable acidity ($p < 0.01$). Similarly, significantly higher ($p < 0.01$) exchangeable bases (Ca, Mg, K), total nitrogen, organic matter, available potassium, cation exchange capacity and clay content were also registered from the soil of the natural forest compared to the other land use types. The study further revealed that there was a significant ($p < 0.05$) difference in available phosphorus among the different land use types. However, there was no significant difference in silt fraction, sand, bulk density and exchangeable sodium under soils of

different land uses. The results obtained from the study indicated that soils of grazing, cultivated land and plantation forest are strongly acidic ($\text{pH} < 5.5$).

Effects of land use change on soil physicochemical properties were studied under different land use systems (natural forest, natural savanna, grazing land, afforested land, farmland and eucalyptus plantation) in the North West region of Cameroon. The conversion of natural forest or savanna to farmland reduces the silt, moisture content, organic matter, organic carbon, total nitrogen, available phosphorus, pH, cation exchange capacity and exchangeable bases, but increases bulk density, electrical conductivity, exchangeable acidity and sand content significantly ($P < 0.05$). The results revealed that deforestation and subsequent cultivation of soil had negative effects on the measured soil properties (Tellen and Yerima, 2018).

Duan *et al.* (2019) studied the effect of five different planting densities which had 1667 trees per ha, 3333 trees per ha, 5000 trees per ha, 6667 trees per ha and 10,000 trees per ha of 36-year-old mature *Cunninghamia lanceolata* plantation in Guangxi province, China. The results revealed that, as the planting densities increases there is decrease in organic matter content, organic carbon, major nutrients, effective Fe content and bulk density, but there was increase in the soil pH, total K, and effective K. The planting density had no effect on exchangeable Ca and Mg. With increase in soil depth there was reduction in soil organic matter; organic carbon; total N and P; effective N, P, and K; exchangeable Ca and Mg; effective Fe content; and bulk density this was particularly observed with the soil depth of 30 cm. Also, excessively high planting density was not found to be beneficial to the long-term maintenance of soil fertility in Chinese fir plantations, and the planting density of Chinese fir plantations should be maintained below 3333 stems per ha (density A or B) to maintain soil fertility while ensuring high yields.

Nanganoa *et al.* (2019) studied the impact of different land-use systems (secondary forest, oil palm plantation, banana plantation, sugarcane plantation and rubber plantation) on some soil physicochemical properties and macrofauna abundance in the humid tropics of Cameroon. The results revealed that organic matter content and a greater number of macrofauna was recorded in secondary forest. The organic matter and bulk densities were

negatively correlated with each other. Based on the results, the secondary forest produced more organic matter and a higher number of macrofauna.

Lei *et al.* (2019) studied the characteristics of soil nutrient elements and the changes in biomass under different tree densities and soil layers of forest stand of Chinese fir (*Cunninghamia lanceolata*). The results revealed that the stand density had a significant effect on the soil nutrient content, understory vegetation and litter biomass. A low density is conducive to the accumulation of soil organic matter, hydrolytic N, available P, available K and total Ca. With the increase in soil depth, the contents of soil organic matter, total N, hydrolytic N and total P decreased gradually; pH and total Ca decreased gradually; and available P showed a trend of decrease. The soil layers had no significant effect on the total K, total Fe and total Mg concentrations. Low density was found to be beneficial to the growth of undergrowth vegetation and forest trees, the return of nutrients, long-term soil maintenance and the stable high yield of Chinese fir plantations.

Tesfahunegn and Gebru, (2020) studied the impacts of long-term cropping and land-use systems on soil properties and nutrient stocks under smallholder farmers' conditions in developing countries. The lowest and highest bulk density was determined from natural forest (NF) (1.19 Mg m^{-3}) and untreated gully (1.77 Mg m^{-3}), respectively. Soil pH, EC and CEC varied significantly among the long-term cropping and land-use systems. The highest CEC ($50.3 \text{ c mol kg}^{-1}$) was reported under treated gully followed by NF. The highest soil organic carbon stock ($175.3 \text{ Mg C ha}^{-1}$) and total nitrogen stock ($13.6 \text{ Mg C ha}^{-1}$) were also found in NF.

2.10 Soil Biological properties

Dehydrogenase activity is commonly used as an indicator of biological activity in soil. Dehydrogenase enzymes play a significant role in the biological oxidation of soil organic matter by transferring protons and electrons from substrates to acceptors. These processes, being a part of respiration pathways of soil microorganisms, are closely related to soil air-water conditions. The activity of soil enzymes is also important in making nutrients available for plants, for instance, the mineralization of organic phosphorus compounds. From the total amount of phosphorus in agricultural soils, only a small

proportion of it is immediately available for plant uptake. Phosphatases are extracellular enzymes that catalyse the hydrolysis of organic phosphates to inorganic orthophosphates thus are an important link between biologically unavailable phosphorus and available P. The average content of organic phosphorus in cultivated soils ranges from 5 to 50 per cent of total P. The mineralization of these organic fractions is of major importance and soil phosphatases have been accorded a major role in this mineralization process. Generally, soil enzyme activities are related to the soil organic matter content and management practices and reflect potential rather than the actual in-situ activity (Mungai *et al.*, 2005).

George *et al.* (2002a) identified and quantified the P active root exudates released into the rhizosphere of agroforestry species (*Tithonia diversifolia*, *Tephrosia vogelii* and *Crotalaria grahamiana*) compared to maize and observed enhanced phosphatase activity in the rhizosphere of all agroforestry species as *Tithonia diversifolia* (29.64 nmol MUB minute⁻¹g⁻¹soil) and *Crotalaria grahamiana* (36.08 nmol MUB minute⁻¹g⁻¹soil) had greater activity at 0-1 mm from their root than did maize (15.75 nmol MUB minute⁻¹g⁻¹soil). Overall, agroforestry species enhanced phosphatase activity in their rhizosphere. George *et al.* (2002b) also reported that phosphatase activity was greater under agroforestry species (0.40-0.50 nmol MUB s⁻¹g⁻¹) than maize (0.28 nmol MUB s⁻¹g⁻¹) or the bare fallow (0.25 nmol MUB s⁻¹g⁻¹).

Dehydrogenase, which indicates the overall metabolic activity was highest for *G. sepium* and *G. pinnata* (244.0 and 249.0 nmol TPF g⁻¹soil h⁻¹ respectively) and the activity under the control (126 nmol TPF g⁻¹ soil h⁻¹) indicated a 43.0–49.0% decrease in comparison to the tree rhizospheres. This confirmed that the microbial biomass is biologically more active in the tree rhizosphere principally because of higher amounts of SOC or substrates entering the soil system (Quilchano and Maranon, 2002).

Similarly, the overall activities of enzymes were observed to be higher in the rhizosphere as compared to the non-rhizosphere soils of four tree species, four horticulture plant species and two grass species of the arid region. The increased enzymatic activities might be due to higher microbial biomass in the rhizosphere than in non-rhizosphere soils (Panwar *et al.*, 2003).

Lalita, (2004) measured the dehydrogenase activity in normal soil (pH 7.2 to 8.9; EC 0.9 to 3.9 dS m⁻¹); an alkali soil (pH 9.0 to 10.4; EC 1.8 to 21.6 dS m⁻¹) and in saline soil (pH 7.5 to 8.0; EC 1.3 to 67.8 dS m⁻¹) under different cropping systems in Haryana, India. In normal soil, dehydrogenase activity was 103% greater under tree canopies compared to the rice-wheat system, whereas in saline soil it was 100% greater under pearl millet-wheat cropping sequence than under tree canopies and in alkali soil, dehydrogenase activity was 58% greater under rice-wheat (with 50% G.R.) and 37% greater under Karnal grass (*Leptochloa fusca*, without gypsum) as compared to under tree canopies. However, average dehydrogenase activity was 40.22, 36.79 and 13.73 micro g TPF g⁻¹ for normal, saline and alkali soils, respectively. Alkali soil showed minimum dehydrogenase activity, whereas, it was almost on par for saline and normal soils.

Wan and Chen, (2004) presented the enzyme characteristics of catalase, sucrase, urease and alkaline phosphatase under agroforestry systems in northern Jiangsu Province, China, showing that soil enzyme activities reduced gradually from top to bottom layer of the soil profile and the fluctuations of catalase and urease are smaller than those of sucrase and alkaline phosphatase. However, the soil enzyme activities differed significantly in the order poplar- crop intercropping segment > paulownia-crop intercropping segment > control. Furthermore, soil enzyme activities increased with intercropping age. Catalase, alkaline phosphatase and urease were found to be negatively related, while alkaline phosphatase and urease were positively related. Sucrase, urease and alkaline phosphatase are negatively correlated with the soil pH value.

Radersma and Grierson, (2004) identified major organic anions and measured acid phosphatase activity and P fractions in the rhizosphere soil of maize (*Zea mays* L.), as well as in the perennial woody species *Grevillea robusta*, *Cassia spectabilis*, *Tithonia diversifolia*, *Eucalyptus grandis* and *Cedrella serrata*. Acid phosphatase activity in rhizosphere soil of all species was two to five times greater in rhizosphere soil compared with non-rhizosphere soil.

Cadwell, (2005) also found that the activity of acid phosphatase was markedly higher in the tree rhizosphere relative to control and therefore suggesting a positive rhizosphere effect on phosphatase activity and P availability.

The deviation in dehydrogenase activity in soils under various tree species in irrigated conditions was noticed and it was significantly higher ($9.0\text{--}18.8\ \mu\text{g TPFg}^{-1}\ 24\ \text{hr}^{-1}$) than that in rainfed conditions ($9.9\text{--}15.0\ \mu\text{g TPFg}^{-1}\ 24\ \text{hr}^{-1}$) (Prasad and Mertia, 2005). The higher microbial activities in tree rhizosphere as compared to non-rhizosphere soil were said to be the result of increased supply of carbon and nutrients from dead root cells and rhizo-depositions.

According to Gil-Sotres *et al.* (2005), dehydrogenases represent enzymes, which indicate the status of the environment and microbial activity in the soil. Dehydrogenase activity assessments can be used in the evaluations of soil quality, the effect of soil utilization on soil quality, as well as a degree of recovery of degraded soils.

Studies show that enzyme activities are greater in agroforestry alley cropping practices due to differences in litter quantity and quality and root exudates (Mungai *et al.*, 2005). The impacts of different land use systems on faunal density, nutrient dynamics and biochemical properties of soil were also studied in Agri-silviculture system of Indian desert by Tripathi and Sharma, (2005). The selected fields had trees (*Zizyphus mauritiana*, *Prosopis cineraria*, *Acacia nilotica*) and crops (*Cuminum cyminum*, *Brassica nigra*, *Triticum aestivum*) in different combinations. They observed the soil temperature, moisture, organic carbon, nitrate-nitrogen, ammoniacal-nitrogen, available phosphorus, soil respiration and dehydrogenase activity to be greater under trees than tree plus cropping system. It showed that accumulation of nitrate-nitrogen in tree field is greater due to absence of crops, but nitrate-nitrogen accumulation was less as well as simultaneously utilized by crops in cultivated lands. Positive and significant correlation among organic carbon, nitrate-nitrogen and ammoniacal-nitrogen, phosphorus, soil respiration and dehydrogenase activity clearly reflect increase in soil nutrients with the increase in microbial and other biotic activity. *P. cineraria* field was found to be the best pedoecosystem, while *C. cyminum* was the best winter crop for cultivation in desert agroforestry system for soil biological health and soil sustainability.

The soil bacteria, actinomycetes, fungus and sucrase, urease, catalase, alkaline phosphatase activities in 0-20 cm, 20-40 cm soil layers of nine typical artificial forests in the northeast of Ulanbuh Desert were studied. The results showed that soil enzymatic

activities varied in different artificial forests and soil alkaline phosphatase was highest under *Hippophae rhamnoides* Linn. and *Elaeagnus angustifolia* L forests. In the study region, the soil enzyme activities had obvious vertical distribution characteristics and the phosphatase activities decreased with the soil depth (Li *et al.*, 2010).

Yadav *et al.* (2011) evaluated the effect of traditionally grown trees on soil biological characteristics and envisaged the substantial improvement in soil biological activity in terms of dehydrogenase and alkaline phosphatase activity under a different tree-based agroforestry systems as compared to a no tree control (cropping alone). There was 1.60–1.87-fold increase in dehydrogenase activity due to different MPTs based land use systems as compared to sole cropping, with maximum activity under *P. cineraria*-based agroforestry system. The increase in alkaline phosphatase activity in soil due to different MPTs based cropping systems ranged between 88.3–163% as compared to sole cropping. The significantly higher alkaline phosphatase activity was found under *P. cineraria* + cropping system followed by *D. sissoo* + cropping.

Yongjie *et al.* (2012) studied the effect of land-use conversion on the soil microbial community diversity. They found that soil enzyme activities, including dehydrogenase and urease activities, were significantly higher in natural forests and lowest in the orchard. Annual litterfall was also found to be highest in the four nature forests, followed by the plantation, and lowest in orchard soil. Their results suggested that the soil microbial diversity was indirectly influenced by land-use types. They also stated that changes in the amount of litterfall and the soil nutrient status that resulted from land-use conversion drove these indirect changes.

Soil biological properties were highest under surface soil of forest (576 mg kg⁻¹, 31.24 mg kg⁻¹, 6.55 mg kg⁻¹, 29.6 mg PNP g⁻¹ h⁻¹ and 35.65 µg TPF 24 h⁻¹ g⁻¹ dry soil, respectively for MBC, MBN, MBP, APHA and DHA) and least in 45-60 cm layer, under wasteland. The higher fertile soil and soil evaluation factor was recorded in forest soil followed by grassland, horticulture, agriculture as compared to wasteland (Pal *et al.*, 2013).

Changes in soil organic carbon, dehydrogenase activity, nutrient availability and leaf nutrient concentrations in a mango orchard soil were evaluated (Adak *et al.*, 2014).

Vermicompost, organic mulching and microbial inoculation significantly enhanced soil organic carbon content, available nutrients, dehydrogenase activity and leaf nutrient concentrations. Dehydrogenase activity was highest ($1.85 \mu\text{g TPF g}^{-1} \text{h}^{-1}$) in organically treated soils. Surface soil (0-10 cm depth) showed higher dehydrogenase activity (1.29 to $1.85 \mu\text{g TPF g}^{-1} \text{h}^{-1}$) as compared to lower soil depths in all the treatments.

Kujur and Patel, (2014) reported that forest soil increased microbial activity and biomass due to higher organic matter content and consequently exhibited higher maximum reaction velocity as compared to fresh mine soil. The soil dehydrogenase activity was positively correlated with all tested soil properties except bulk density, with which it had no correlation.

Blonska *et al.* (2017) assessed the effects of different types of land use (forest, tillage and pasture) on soil enzyme activity. There were significant differences in the enzyme activity between forest and agricultural soils, thus demonstrating that enzyme activity is influenced by the organic matter content of the soil. The highest enzyme activity was recorded in the forest soil within broadleaved stands, whilst the lowest activity was found in tillage soil because tillage soil contained significantly less organic matter.

2.11 Soil organic carbon

The soil organic carbon increased with an increase in tree age. The soils under agroforestry had $2.9\text{--}4.8 \text{ Mg ha}^{-1}$ higher soil organic carbon than in sole crop. The agroforestry trees *viz.*, poplar adds $3\text{--}4 \text{ t ha}^{-1}$ of litter (Rasool, 1996) from second to the fifth year of plantation and physical barriers like root and stem (Garrett and McGraw, 2000) in alley cropping lead to an increase in soil organic carbon through reduced soil erosion, these are likely to influence the physico-chemical characteristics of soil particularly their resistance (soil erodibility) to the impact of falling raindrops.

Grossman and Reinsch, (2002) stated that bulk density values are also used as a measure of soil quality, indicating the ease of root penetration, water movement and soil strength.

Total organic matter accumulated in the soil constitutes a major portion of the world's fix carbon reserves. The distribution of organic matter among soil type is highly variable and generally not easily predictable from aboveground vegetation type. Decreased soil carbon content with time in agricultural plot in arid region with a loss of SOC by 56 per cent during 5 years period was studied by Singh *et al.* (2005). He further reported that integration of trees reduced SOC loss which was 3.2 per cent under *Emblia officinalis*, 22 per cent under *Hardwickia binnata* and 35.5 per cent under *Colophospermum mopan* based agroforestry system as compared to 56 per cent under agricultural plots. Ramachandran *et al.* (2007) estimated 3.48 Tg soil carbon in the natural forests in Eastern Ghats of Tamil Nadu, India. The Himalayan zones, with dense forest vegetation, cover nearly 19 per cent of India and contain 33 per cent of SOC reserves of the country (Bhattacharyya *et al.*, 2008).

Watson, (2008) observed that SOM is influenced through land use and management activities that affect the litter input. In SOM accounting, factors affecting the estimates include the depth to which carbon is accounted, commonly 30 cm, and the time lag until the equilibrium stock is reached after a land use change, commonly 20 years.

Reum *et al.* (2009) reported that the soil carbon stock for a *Pinus densiflora* forest at Gwangneung, central Korea was estimated using the soil carbon model, Yasso. The soil carbon stock measured in the forest was 43.73 Mg ha⁻¹.

Kumar, (2010) while studying the distribution, growth and biological yield potential of bamboos in Himachal Pradesh found organic carbon in the range of 2.43- 3.0 per cent which decreased with increasing soil depth.

Sakin, (2012) reported that the Bulk density depends on several factors such as compaction, consolidation and amount of SOC present in the soil but it is highly correlated to the organic carbon content, soil organic carbon (SOC), soil organic matter (SOM) and the correlation between bulk densities.

Swai *et al.* (2014) estimated that in Hanang forest, Tanzania where soil organic carbon was 64.2, 41.93 and 31.0 Mg ha⁻¹ in the upper (0-15 cm), mid (> 15-30 cm) and lower (>30-45 cm) layer, respectively.

Zheng *et al.* (2017) carried out a study in how tree species identity and diversity affect soil properties. Forest soil profiles were sampled at a fixed depth (0–10, 10–20, 20–40 and 40–60 cm). The soil properties were compared by species to demonstrate the influence of tree species identity. Shannon diversity index was evaluated to know tree species diversity effects on soil properties. They found that tree species diversity only showed a negative effect on soil carbon stock; in contrast, a positive effect on soil nitrogen stock in the 0- to 10-cm soil layer was found. High diversity could lead to a change in the soil nutrient conditions in the form of C/N ratio decreases.

Amanuel *et al.* (2018) investigated the soil organic carbon variation in four land use systems viz., natural and mixed forest, cultivated land, Eucalyptus plantation and open bushland. The results reveal that higher soil organic carbon content was recorded in natural and mixed forest land use system when compared to cultivated and eucalyptus plantation. This may be due to greater inputs of vegetation and reduced decomposition of organic matter. Also, the lowest soil organic carbon content in cultivated land could be due to reduced inputs of organic matter and frequent tillage which encouraged oxidation of organic matter.

III MATERIAL AND METHODS

The present study entitled “Studies on Ecosystem services at Mahatma Gandhi Botanical Garden, GKVK, Bangalore” was carried out at University of Agricultural Sciences, GKVK, Bangalore, Karnataka. The details of experimental materials used, methods adopted and procedures followed during the course of the investigations have been described in this chapter under the following sub-heads:

3.1 Experimental site

The study was conducted in Mahatma Gandhi Botanical Garden at University of Agricultural Sciences, GKVK, Bangalore, Karnataka. It is located in 13.04° North Latitude and 77.34° East Longitude at an elevation of 3,100 feet (930 m). The garden is spread over 65 acres (26 ha) of land and supports an array of plants (much emphasis on the Angiosperm group). The garden is divided into 10 blocks and species are planted block-wise systematically following the Bentham and Hooker’s System of Classification (1862 - 1883) and the lay out of the Mahatma Gandhi Botanical Garden was depicted in Plate 1. The soil texture was sandy clay loam. Placement of trees based on their families are presented in the Table 1.

3.2 Climatic conditions

GKVK has a tropical climate with distinct wet and dry seasons. The maximum and minimum temperature is 29.6° C and 18.2° C respectively. The annual rainfall for the period 1986 to 2019 ranged from 461 mm to 1115.8 mm with a mean of 712 mm. The average relative humidity at 7:00 a.m. and 2:00 p.m. ranged from 89% and 47% respectively. The average wind speed recorded was 6.4 kmph. The annual mean sunshine hours are 6.7 hours.

3.3 Diversity indices (Species richness)

Species richness is the number of different species represented in an ecological community, landscape or region. Species richness is simply a count of species and it does not take into account the abundances of the species or their relative abundance distributions.

3.3.1 Shannon-Wiener index (H')

Shannon -Wiener index is the measure of the average degree of uncertainty in predicting to what species individuals chosen at random from a collection of ‘S’ species

and ‘N’ individuals will belong (Magurran, 2003). This average uncertainty increases as the number of species increases and as the distribution of individuals among the species becomes even. Thus, $H' = 0$ when all species are represented by the same number of individuals. It is estimated by using formula:

$$H' = \sum_{i=1}^S [(n_i/N) \ln (n_i/N)]$$

Where,

n_i = Number of individuals belonging to the i^{th} species

N = Total number of individuals in the sample

S = No of species

Table 1: Placement of trees in different blocks based on their families

Sl. No.	Blocks	Family/Plants
1	Block-1	Medicinal plants
2	Block-2	Annonaceae, Menispermaceae, Polygalaceae, Clusiaceae, Theaceae, Malvaceae and Bombacaceae.
3	Block-3	Sterculiaceae, Tiliaceae, Linaceae, Malphigiaceae, Zygophyllaceae, Geraniaceae, Rutaceae and Ochnaceae.
4	Block-4	Hippocrateaceae, Rhamnaceae, Vitaceae, Sapindaceae, Anacardiaceae, Moringaceae and Celastraceae.
5	Block-5	Fabaceae, Caesalpiniaceae, Mimosaceae, Rosaceae and Rhizophoraceae.
6	Block-6	Combretaceae, Myrtaceae, Lecythidaceae, Melastomataceae, Lythraceae, Araliaceae and Rubiaceae.
7	Block-7	Asteraceae, Sapotaceae, Ebenaceae, Symplocaceae and Oleaceae
8	Block-8	Apocynaceae, Loganiaceae, Convolvulaceae, Bignoniaceae, Acanthaceae, Verbenaceae and Lamiaceae.
9	Block-9	Polygonaceae, Myristicaceae, Lauraceae, Proteaceae, Thymelaeaceae, Elaeagnaceae, Santalaceae, Euphorbiaceae, Moraceae, Ulmaceae and Casuarinaceae.
10	Block-10	Musaceae, Arecaceae, Liliaceae, Poaceae, Cycadaceae and Coniferaceae.

A community with only one species would have an H' value of 0. If the species are evenly distributed then the H' value would be high. So, the H' value allows us to know not only the number of species but how the abundance of the species is distributed among all the species in the community.

3.3.2 Simpson diversity index

This Simpson index (Simpson, 1949) popularly used to know the evenness in distribution or degree of concentration and calculated by using the formula.

$$\lambda = \sum_{i=1}^n P_i^2$$

Where, 'P_i' is the proportion of individuals of ith species relative to the total number of species on the farm; 'n' is the total number of species.

Simpson's Diversity Index is a measure of diversity. It is often used to quantify the biodiversity of a habitat. It takes into account the number of species present, as well as the abundance of each species (Magurran, 2003). It can also be estimated through the following formula:

$$\text{Simpson's index of diversity} = 1 - D \text{ (Simpson dominance index)}$$

3.4 Estimation of structural parameters

3.4.1 Basal area

The basal area is the cross-sectional area of all the trees of a given species combined. Based on the girth (≥ 30 cm) recorded, the basal area was estimated by using the formula as shown below:

$$\text{Basal area (m}^2 \text{ ha}^{-1}) = (GBH)^2 / 4\pi$$

Basal area of individual tree in each block was calculated and summed to get total basal area of the blocks, further it was be extrapolated to per hectare basis and expressed in m² ha⁻¹.

$$\text{Basal area (m}^2 \text{ ha}^{-1}) = (\text{Basal area of blocks/Area of blocks}) \times 10000$$

Where,

‘g’ is the girth at breast height (1.37 m)

π is the constant which is equals to 3.142

3.5 Population parameters

3.5.1 Importance Value Index (IVI)

Data collected was subjected to analysis by assessing relative frequency, relative density and relative dominance. Based on these parameters the importance value index (IVI) at species level was calculated following the method of Curtis and Mointosh, (1950). The IVI is the sum of assessing relative frequency, relative density and relative dominance for each species. However, IVI also gives the importance of species in the community by assessing rank to individual species, based on the pooled data of relative density and relative frequency of trees.

$$\text{Density} = \text{Number of individuals of the species 'A'}$$

- Relative density % (RD)= (Number of individual of species ‘A’ / Total number of individuals of all species) x 100
- Relative dominance % (Rd)= (Total basal area of species ‘A’ / Total basal area of all the species) x100
- Frequency (f) = (Number of times which species ‘A’ occurs / Total number of blocks) x 100
- Relative Frequency % (Rf)= (Frequency value of each species ‘A’ / Sum of Frequency value of all species) x 100
- The IVI for each species was,

$$\text{IVI} = \text{Relative density \% (RD)} + \text{Relative dominance \% (Rd)} + \text{Relative Frequency \% (Rf)}$$

3.5.2 Girth class distribution

Based on the girth recorded at breast height, frequency distributions of the various girth classes of the tree species were arrived. Then, the proportions of each girth class under each land use types were depicted in a bar graph using excel.

3.5.3 Height class distribution

Based on the height recorded, frequency distributions of the various height classes of the tree species were arrived. Then the proportion of the height class under each land use types were depicted in a bar graph using excel.

3.6 Carbon stock estimation of tree species

All the trees measuring ≥ 30 cm GBH was considered and their respective girth and total tree height was measured.

3.6.1 Biomass estimation of trees

3.6.1.1 Tree volume estimation

The height of all the trees in each land use system was measured using a Ravi altimeter. Girth at breast height (GBH) was measured at 1.37 m from the ground level over the bark with the help of measuring tape. Non-destructive method of biomass estimation was carried out using volume (tree height, GBH) and wood density. The wood density of different tree species was referred from FAO (2010) and World Agroforestry Centre (WAC).

The following formula was used for calculating the standing volume of trees (Bitlerlich, 1984)

$$\begin{aligned}\text{Volume (m}^3\text{)} &= \text{Basal Area} \times \text{Height} \times \text{Form factor} \\ &= (G^2/4\pi) \times H \times \text{Form factor}\end{aligned}$$

Where, $\pi = 3.14$, G is the Girth at breast height (GBH; m), and H is the height of the tree (m).

3.6.1.2 Aboveground biomass:

To calculate aboveground biomass, volume of the tree is estimated using girth at breast height (GBH) and height of the tree. The volume (m^3) of each tree is then multiplied with its specific wood density (kg m^{-3}) to get above ground biomass (Ravindranath and Ostwald, 2008).

$$\text{AGB (kg tree}^{-1}\text{)} = \text{Volume (m}^3\text{)} \times \text{Wood density (kg m}^{-3}\text{)}.$$

3.6.1.3 Belowground biomass

Belowground biomass (BGB) of the tree includes live root biomass, excluding fine roots and was calculated using 0.26 factor of root: shoot ratio (Ravindranath and Ostwald, 2008).

$$\text{BGB (kg tree}^{-1}\text{)} = \text{AGB (kg tree}^{-1}\text{)} \times 0.26$$

3.6.1.4 Total biomass (TB)

Sum of AGB and BGB gives total biomass (TB) of the tree

$$\text{TB (kg tree}^{-1}\text{)} = \text{AGB (kg tree}^{-1}\text{)} + \text{BGB (kg tree}^{-1}\text{)}$$

3.6.2 Carbon estimation

Carbon estimation is measurement of total carbon accumulated in a tree out of total biomass of the tree. Generally, for any plant species 45-50 per cent of its biomass is considered as carbon (Pearson *et al.*, 2005a) *i.e.*,

$$\text{Carbon Storage} = \text{Biomass} \times 50\%$$

3.6.3 CO₂ sequestration by trees

The CO₂ in the atmosphere is assimilated by trees in the process of photosynthesis. In order to derive the amount of CO₂ converted into carbon and retained in the biomass. The molecular weight relation between carbon and oxygen is used as follows. Atomic weight of carbon is 12 and oxygen is 16.

$$\text{CO}_2 = (12 + (16 \times 2))/12 = 44/12 = 3.67.$$

Thus, one molecule of carbon= 3.67 molecules of CO₂ or 1 ton of carbon = 3.67 ton of CO₂.

3.7 Soil Sampling

Soil samples were collected using the motorized screw auger. Composite soil samples were taken from all the 10 blocks of the Mahatma Gandhi Botanical Garden, GKVK, Bengaluru. Since it is the tree-based system, the soil was collected at vacant places in between the trees from different depths (0-30 cm, 30-60 cm and 60-90 cm). One subset of each sample was air-dried at room temperature and gently ground to pass through a 2 mm sieve after removing all visible debris and stored in a moisture-free environment and used for analysing the physico-chemical properties. The other sub set was stored in a deep freezer at -80°C for determination of soil biological properties.

3.8 Soil physical properties

3.8.1 Soil texture

Distribution of sand silt and clay in soil samples was determined using an International pipette method as defined in Piper, (1966) using sodium hydroxide as a dispersing agent. From the scattered suspension, based on the suspension temperature, an aliquot of clay + silt and clay were pipetted out of the defined depth at their respective time intervals.

The total sand retrieved was transferred into 0.05 mm mesh size sieve through continuous decanting of silt and clay particles. The fraction that was finer than 0.05 mm was added to silt determined initially by pipetting to have particle size classes as per USDA system.

3.8.2 Bulk density

Bulk density was determined by using keen's cup method with principle that the soil being saturated gives bulk density of soil given by Piper, (1966). The inner diameter of keen's cup was measured. At the bottom of keen's cup filter paper was placed and weight

of filter paper and keen's cup was recorded. Soil was placed up to the brim of cup and weighed again. Later the cup was placed in a trough of water for saturation for about 24 h. After saturation, excess water was drained out and weight of saturated soil was recorded. The saturated soil was kept in oven at 105 °C for drying. The bulk density was calculated using the following formula.

$$\text{B.D (Mg m}^{-3}\text{)} = \frac{(\text{Weight of keen's cup + dry soil}) - (\text{weight of keen's cup})}{\text{Volume of keen's cup}}$$

3.8.3 Particle density

The particle density was determined by Keen–Raczkowski cup method (Piper, 1966).

3.8.4 Maximum water holding capacity and porosity

Keen's box method (Piper, 1966) was followed for determination of water holding capacity. In this method weight of empty keen's box and filter paper was taken by electronic balance and the weighted filter paper was kept in the keens box followed by filling of keen's box tightly with the 2 mm sieved soil. Then the keen's box was kept over water up to a mark of its soil level for overnight. In the next day the soil of keen's box become saturated and the weight of keen's box with saturated soil sample was noted and kept in hot air oven for 48 h at constant temperature of 105°C. The water holding capacity of soil was determined by the following calculation method.

$$\text{Water holding capacity (\%)} = \frac{\text{Weight of saturated soil} - \text{weight of oven dried soil}}{\text{Weight of oven dried soil}} \times 100$$

3.8.5 Pore space

The pore space was determined by Keen–Raczkowski cup method (Piper, 1966). Keen's box method (Piper, 1966) was followed for determination of porosity of soil samples. In this method weight of empty keen's box and filter paper was taken by electronic

balance and the weighted filter paper was kept in the keens box followed by filling of keen's box tightly with the 2 mm sieved soil. Then the keen's box was kept over water up to a mark of its soil level for overnight. In the next day the soil of keen's box become saturated and the weight of keen's box with saturated soil sample was noted and kept in hot air oven for 48 h. at constant temperature of 105°C.

$$\text{Porosity (\%)} = (1 - \text{Bulk density} / \text{particle density}) \times 100$$

3.9 Soil chemical properties

3.9.1 Soil pH

For determination of soil pH, 10 grams of soil was taken in a 100 ml beaker with 20 ml. distilled water. The solution was stirred for 30 minutes and soil pH was measured using glass electrode digital pH meter (Jackson, 2005).

3.9.2 Electrical conductivity

The same soil suspension prepared for determination of pH was used. After recording the soil pH, allowed the suspension in the beaker to settle until a clear supernatant was obtained. The EC of soil depth wise was determined using Electrical Conductivity Meter (Jackson, 2005).

3.9.3 Organic carbon

The organic carbon in soil samples was determined by treating a known weight (0.50 g) of finely ground soil sample (0.2 mm sieved) with a known excess quantity of chromic acid (Sulphuric acid and potassium chromate) to oxidize the organic carbon present in soil to carbon dioxide. After oxidation, the un-reacted potassium dichromate left in the contents was back titrated against standard ferrous ammonium sulfate using diphenylamine indicator (Walkley and Black, 1934). Soil organic carbon was then determined using the following formula:

$$\text{Soil organic carbon (\%)} = \frac{(\text{Blank} - \text{titrant value}) \times \text{Normality of FAS} \times 0.003 \times 100}{\text{Weight of sample}}$$

3.9.4 Available soil nitrogen

Alkaline potassium permanganate method was followed to estimate available nitrogen content in soil (Subbiah and Asija, 1956). Five grams of soil was taken with 25 ml of 0.32 % KMnO_4 solution. A small amount of paraffin wax was added to reduce frothing and bumping and placed in the Kjeldhal distillation unit. 2.5% NaOH solution and 40% boric acid solution were used. For titration, 0.01N H_2SO_4 solution was used. The automated distillation and titration system were used (Gerhardt –vapodest 50s, Germany).

3.9.5 Available phosphorus

Available phosphorus in soil samples was determined by Bray's method (Olsen, 1954). The phosphorus content in soil extract was determined by recording the intensity of blue color using spectrophotometer at 660 nm after standardization. Available P (kg ha^{-1}) was then calculated using the following equation

$$\text{Available P}_2\text{O}_5 (\text{kg ha}^{-1}) = (\text{P}_s \times 25 \times 50 \times 2.24) / (5 \times 2.5)$$

Where P_s = Concentration of P (ppm) in samples from the standard curve.

3.9.6 Available potassium

The available potassium in soil was determined by taking 10 gram of soil and adding 50 ml of neutral normal ammonium acetate solution. The soil solution was subjected to shaking for five minutes and filtered. Soil extract solution fed to flame photometer after standardization. Available K_2O was then calculated using the following equation (Jackson, 2005).

$$\text{Available K}_2\text{O} (\text{kg ha}^{-1}) = \frac{\text{R} \times \text{volume of extract (ml)} \times 2.24}{\text{Weight of soil taken (10 g)}}$$

Where R = ppm K in the extract obtained from the calibrated instrument for standards.

3.9.7 Exchangeable calcium and magnesium

Exchangeable calcium was estimated by titrating suitable aliquot of ammonium acetate extract of soil against standard EDTA solution using sodium hydroxide and

murexide indicator. Exchangeable calcium plus magnesium were estimated by titrating a separate aliquot of ammonium acetate extract of soil against EDTA solution using ammonium chloride and ammonium hydroxide buffer and EBT indicator. Exchangeable magnesium content in soil was calculated by subtracting exchangeable calcium content from exchangeable calcium plus magnesium content of the soil (Jackson, 1973).

3.9.8 Available sulphur

The Sulphur in the soil is extracted with calcium chloride (0.15%) solution and the extracted sulphate is treated with barium chloride to convert into barium sulphate in the presence of conditioning/ stabilizing agent. The turbidity formed is estimated using a spectrophotometer at 420 nm (Jackson, 1973).

3.9.9 Micronutrients

The number of micronutrients such as Zn, Cu, Mn and Fe was measured using the process of extraction from DTPA (Diethylene tri amine penta acetic acid) established by Lindsay and Norwell, (1978). Ten grams of soil for extracting micronutrient cations was continuously shaken with 20 ml of DTPA extractant for 2 h to determine the concentration of various micronutrients in the soil sample at their respective wavelengths, atomic absorption spectrophotometer system was followed.

3.10 Soil biological properties

3.10.1 Bacteria, fungi and actinomycetes population

Soil was ground and passed through 0.2 mm mesh. Then, 5 g of soil was weighed for all the samples. Water blanks were prepared for all the samples for serial dilution. 5gm of each sample soil was added to 9 ml water blank and shaken well. Serial dilution was done up to 10^{-5} , 10^{-5} and 10^{-3} for bacteria, fungi and actinomycetes respectively. Then those serial diluted samples were inoculated by pour plate method to the following media (Vlassak *et al.*, 1992):

- Nutrient agar (Allen, 1953) was used to culture the bacterial colonies.
- Martin's Rose Bengal Agar (Martin, 1950) was used to culture the fungal colonies.

- Kuster's Agar (Kuster and Williams, 1964) was used to culture the actinomycetes colonies.

After inoculating the respective media, the petri plates were sealed properly to avoid contamination by other microbes and then incubated for 2 days. Later bacterial count, fungal count and actinomycetes count were taken.

$$\text{Colony forming units (CFU g}^{-1} \text{ of soil)} = \frac{\text{No. of Colonies in a plate} \times \text{Dilution factor}}{\text{Dry weight of the sample}}$$

3.10.2 Dehydrogenase enzyme activity

Soil dehydrogenase activity was assayed by the method given by Casida *et al.* (1964). Activity of dehydrogenase enzyme in soil was determined by estimating the rate of reduction of triphenyl tetrazolium chloride (TTC) to a pink coloured compound triphenyl formazan (Casida *et al.*, 1964), 1g of air-dried soil was treated with 0.2ml of 3% TTC solution, 0.5ml of 1% glucose solution and incubated at 28° C for 24 hours. 10ml methanol was added to incubated samples due to which TTC got converted to triphenyl formazan (TPF) and pink colour appeared. Pink colour intensity was measure at a wavelength of 485 nm by using spectrophotometer.

3.10.3 Phosphatase activity

Activity of phosphatase enzyme in soil was determined by the method developed by Tabatabai and Bremner, (1969). It involved the colorimetric estimation of p-nitrophenyl (PNP) released by phosphatase activity, when the soil was incubated with buffer (at pH 6.5 and 11 for acidic and alkaline phosphatase activity, respectively), p- nitrophenyl phosphate solution and toluene. 1 g of soil was mixed with 0.2 ml toluene, 4ml of modified universal buffer and 1ml p-nitrophenyl phosphate. Samples were incubated at 37°C for an hour, then enzyme activity was stopped and yellow colour was developed by adding 1ml of 0.5 M CaCl₂ and 4 ml of 0.5 M NaOH. Soil suspension was filtered and yellow colour intensity was measured at 420 nm.

3.10.4 Urease activity

Urease activity was determined by the method given by Tabatabai and Bremner, (1972). 5 g of soil was taken in 50 ml of clean dry conical flask, in each conical flask 0.2 ml of toluene and 9ml of 0.05 M THAM buffer (pH 9.0) was added. The conical flasks were incubated in water bath for two hours at 37°C. After two hours of incubation, the conical flask was removed from the water bath and approximately 35ml of 2.5 M potassium chloride, silver sulphate (KCl-Ag₂SO₄) solution was added. The content was shaken for 15 mins and filtered later about 5ml of filtrate was taken in the 25 ml volumetric flask. To this add 1 ml of 10% sodium tartrate, 0.5ml of 1% gum acacia and 2.5 ml Nessler's reagent make up the volume to 25 ml. yellow colour intensity was measured at 410 nm.

3.11 Soil organic carbon stock

The organic carbon concentration in the soil was converted to total SOC pool as per Kukal *et al.* (2009) as follows:

$$\text{Total SOC (kg ha}^{-1}\text{)} = \text{SOC\%} \times \text{BD (g cm}^{-3}\text{)} \times \text{SD (cm)} \times 1000$$

where, total SOC pool is weight of soil organic carbon (kg ha⁻¹), SOC is soil organic carbon (%), BD is soil bulk density of 0–30 cm/30-60 cm/ 60-90 cm layer (g cm⁻³), SD is soil depth in cm and 1000 is the volume of 1 ha furrow slice (m³).

3.12 Nutrient turnover

To find out the total nutrients added to the soil over the years after the establishment of Botanical Garden, the following formula is used.

Nutrient turnover (kg ha⁻¹) = Nutrient content in each block of garden – nutrient content in uncultivated barren soil.

3.13 Economic valuation of CO₂ sequestration by different tree species

The tree CO₂ and soil CO₂ were pooled together to arrive at total CO₂ pool in a land use system. As per the existing carbon trading mechanism, one CER (Certified Emission Reduction) is equal to one tonne of CO₂. At present market price of one CER is \$0.4

(UNFCCC, 2017), which is equal to Rs. 29.4 per CER. The total CO₂ sequestered is multiplied with CER to arrive at the economic value of CO₂ sequestered.

1 CER= 1 tonne

Value of 1 tonne CO₂= Rs. 29.4

3.14 Economic valuation of nutrient turnover

The economic value of the nutrients added to the soil is derived based on the current market value of the respective inorganic nutrients. The fertilizer quantity, price and nutrient content are given in Table 2. The fertilizer price was multiplied with total nutrient added in different blocks of Mahatma Gandhi Botanical Garden to arrive at the value of nutrients added to soil due to litter decomposition.

Table 2: Nutrient content and market price of different fertilizers

Fertilizer name	Nutrient	Quantity (kg)	Price (Rs)	Percent nutrient	Net nutrient/ bag	Price/kg
Urea	N	45	266	46	20.70	12.85
SSP	P	50	410	16	8.00	51.25
MOP	K	50	680	60	30.00	22.67
Calcium nitrate	Ca	25	825	18.5	4.63	178.38
Magnesium sulphate	Mg	25	450	9.5	2.38	189.47
Bentonite Sulphur	S	10	300	90	9.00	33.33

3.15 Statistical Analysis

The experimental data obtained during the course of investigation were subjected to statistical analysis by applying the technique of analysis of variance (ANOVA) appropriate to the design to test the significance of the overall differences among treatments by the “F” test. The data were analysed statistically for different soil attributes by factorial design using Microsoft Excel 2019. The two-way ANOVA without replications were

applied to the soil properties of different blocks at three depths. When the 'F-Value' was found to be significant, means for different blocks and soil depth were compared by using Tukey HSD procedure (Steel and Torrie, 1960). Differences in mean were considered to be statistically significant at ($P = 0.05$) level of significance.

IV RESULTS AND DISCUSSION

The complete enumeration of trees having girth size more than 30 cm was carried out in the Mahatma Gandhi Botanical Garden, GKVK, Bengaluru during 2020-2021 to find out the different tree composition, biodiversity and their carbon stock. The results of the survey are presented in tabular form and discussed simultaneously.

4.1 Tree composition of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru

Botanical Garden was established during the year 1971, before that the entire area was natural forest, which was under the maintenance of Karnataka Forest Department. But the portion the area was cleared for construction of building. Hence at present botanical garden has both natural forest tree species and planted tree species.

Mahatma Gandhi Botanical Garden is divided into 10 blocks, where each block was found to be 2.6 ha and species were planted block-wise systematically following the Bentham and Hooker's System of Classification (1862 - 1883). The Garden contains around 700 species of plants, herbs, shrubs and trees (Nagaraja *et al.*, 2020). After field survey, a total of 186 tree species were found in the garden and the list of tree species are mentioned in Table 3.

The number of tree species (186) having girth at breast height more than 30 cm found in Mahatma Gandhi Botanical Garden was less than the number of species reported by Fathima *et al.* (1974), where they recorded 530 plant species in the entire GKVK campus. This may be due to clearance of natural forest to construct the Botanical Garden. Number of young trees were planted every year to conserve endangered and rare plant species in Botanical Garden.

Out of 186 tree species present in Mahatma Gandhi Botanical Garden, 12 tree species were naturally grown (Table 4) in the area even well before the establishment of Botanical Garden and remaining 174 tree species were periodically planted (Table 5). These tree species were classified into exotic and indigenous tree species. Out of 186 tree species, 86 were exotic tree species (Table 6) and 100 tree species were native to India tree species (Table 7) which have been conserved in the garden.

Table 3: Different tree composition in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Tree species	Sl. No.	Tree species
1	<i>Acacia auriculiformis</i>	35	<i>Callistemon viminalis</i>
2	<i>Acacia ferruginea</i>	36	<i>Canthium parviflorum</i>
3	<i>Acrocarpus fraxinifolius</i>	38	<i>Cassia fistula</i>
4	<i>Adina cordifolia</i>	39	<i>Cassia spectabilis</i>
5	<i>Adonidia merrillii</i>	40	<i>Cassine paniculata</i>
6	<i>Aegle marmelos</i>	41	<i>Casuarina equisetifolia</i>
7	<i>Agathis robusta</i>	42	<i>Cedrus deodara</i>
8	<i>Ailanthus excelsa</i>	43	<i>Celtis tetrandra</i>
9	<i>Ailanthus malabarica</i>	44	<i>Celtis wightii</i>
10	<i>Alangium lamarckii</i>	45	<i>Chrysophyllum cainito</i>
11	<i>Albizia amara</i>	46	<i>Chukrasia tabularis</i>
12	<i>Albizia lebbeck</i>	47	<i>Citharexylum quadrangulare</i>
13	<i>Albizia odoratissima</i>	48	<i>Clausena dentata</i>
14	<i>Alstonia scholaris</i>	49	<i>Clusia rosea</i>
15	<i>Amoora lawii</i>	50	<i>Cocos nucifera</i>
16	<i>Anacardium occidentale</i>	51	<i>Colvillea racemosa</i>
17	<i>Anamirta cocculus</i>	52	<i>Combretum erythrophyllum</i>
18	<i>Anthocephalus cadamba</i>	53	<i>Commiphora wightii</i>
19	<i>Antiaris toxicaria</i>	54	<i>Couroupita guianensis</i>
20	<i>Araucaria cookii</i>	55	<i>Crescentia cujete</i>
21	<i>Araucaria cunninghamii</i>	56	<i>Croton oblongifolius</i>
22	<i>Artocarpus heterophyllus</i>	57	<i>Cupressus sempervirens</i>
23	<i>Artocarpus lacucha</i>	58	<i>Cupressus torulosa</i>
24	<i>Averrhoa carambola</i>	59	<i>Dalbergia latifolia</i>
25	<i>Azadirachta indica</i>	60	<i>Delonix regia</i>
26	<i>Barringtonia acutangula</i>	61	<i>Dimocarpus longan</i>
27	<i>Barringtonia asiatica</i>	62	<i>Diospyros buxifolia</i>
28	<i>Bauhinia purpurea</i>	63	<i>Diospyros melanoxylon</i>
29	<i>Bridelia retusa</i>	64	<i>Diospyros montana</i>
30	<i>Broussonetia papyrifera</i>	65	<i>Diospyros sylvatica</i>
31	<i>Butea monosperma</i>	66	<i>Dolichandrone atrovirens</i>
32	<i>Caesalpinia coriaria</i>	67	<i>Elaeis guineensis</i>
33	<i>Caesalpinia platyloba</i>	68	<i>Elaeocarpus tuberculatus</i>
34	<i>Callistemon sp.</i>	69	<i>Enterolobium contortisiliquum</i>

Sl. No.	Tree species	Sl. No.	Tree species
70	<i>Erythroxylum monogynum</i>	107	<i>Ligustrum perrottettii</i>
71	<i>Eucalyptus citriodora</i>	108	<i>Limonia acidissima</i>
72	<i>Eucalyptus globulus</i>	109	<i>Litsea coriacea</i>
73	<i>Eucalyptus tereticornis</i>	110	<i>Madhuca indica</i>
74	<i>Ficus amplissima</i>	111	<i>Madhuca longifolia</i>
75	<i>Ficus benghalensis</i>	112	<i>Mallotus philippensis</i>
76	<i>Ficus benjamina</i>	113	<i>Mangifera indica</i>
77	<i>Ficus drupacea</i>	114	<i>Manihot glaziovii</i>
78	<i>Ficus elastica</i>	115	<i>Manilkara hexandra</i>
79	<i>Ficus hispida</i>	116	<i>Melia dubia</i>
80	<i>Ficus krishnae</i>	117	<i>Mesua ferrea</i>
81	<i>Ficus lyrate</i>	118	<i>Milicia excelsa</i>
82	<i>Ficus microcarpa</i>	119	<i>Millettia pinnata</i>
83	<i>Ficus neriifolia</i>	120	<i>Millingtonia hortensis</i>
84	<i>Ficus racemosa</i>	121	<i>Mimusops elengi</i>
85	<i>Ficus religiosa</i>	122	<i>Mitragyna parviflora</i>
86	<i>Ficus tsjahela</i>	123	<i>Moringa oleifera</i>
87	<i>Ficus virens</i>	124	<i>Olea dioica</i>
88	<i>Gardenia latifolia</i>	125	<i>Oroxylon indicum</i>
89	<i>Gliricidia sepium</i>	126	<i>Peltophorum pterocarpum</i>
90	<i>Gmelina arborea</i>	127	<i>Persea macrantha</i>
91	<i>Gmelina asiatica</i>	128	<i>Phoenix dactylifera</i>
92	<i>Grevillea robusta</i>	129	<i>Phoenix sylvestris</i>
93	<i>Guazuma ulmifolia</i>	130	<i>Pinus roxburghii</i>
94	<i>Hamelia patens</i>	131	<i>Plumeria alba</i>
95	<i>Hardwickia binata</i>	132	<i>Podocarpus chinensis</i>
96	<i>Hibiscus tiliaceus</i>	133	<i>Podocarpus macrophyllus</i>
97	<i>Holoptelea integrifolia</i>	134	<i>Polyalthia longifolia</i>
98	<i>Hopea parviflora</i>	135	<i>Psidium guajava</i>
99	<i>Ixora brachiate</i>	136	<i>Pterocarpus dalbergioides</i>
100	<i>Jacaranda mimosifolia</i>	137	<i>Pterocarpus marsupium</i>
101	<i>Khaya grandifoliola</i>	138	<i>Pterocarpus santalinus</i>
102	<i>Khaya senegalensis</i>	139	<i>Pterospermum diversifolium</i>
103	<i>Kingiodendron pinnatum</i>	140	<i>Pterospermum rubiginosum</i>
104	<i>Lagerstroemia lanceolata</i>	141	<i>Reutealis trisperma</i>
105	<i>Lagerstroemia speciosa</i>	142	<i>Roystonea regia</i>
106	<i>Leucaena leucocephala</i>	143	<i>Samanea saman</i>

Sl. No.	Tree species	Sl. No.	Tree species
144	<i>Santalum album</i>	166	<i>Tabebuia impetiginosa</i>
145	<i>Sapindus laurifolius</i>	167	<i>Tabebuia rosea</i>
146	<i>Saraca asoca</i>	168	<i>Tamarindus indica</i>
147	<i>Schefflera actinophylla</i>	169	<i>Tecoma stans</i>
148	<i>Schleichera oleosa</i>	170	<i>Tectona grandis</i>
149	<i>Schotia brachypetala</i>	171	<i>Terminalia arjuna</i>
150	<i>Securinega leucopyrus</i>	172	<i>Terminalia bellirica</i>
151	<i>Semecarpus anacardium</i>	173	<i>Terminalia catappa</i>
152	<i>Senna siamea</i>	174	<i>Terminalia mantaly</i>
153	<i>Simarouba glauca</i>	175	<i>Terminalia tomentosa</i>
154	<i>Spondias pinnata</i>	176	<i>Thespesia populnea</i>
155	<i>Sterculia balanghas</i>	177	<i>Thuja occidentalis</i>
156	<i>Sterculia foetida</i>	178	<i>Toona ciliate</i>
157	<i>Sterculia urens</i>	179	<i>Vepris bilocularis</i>
158	<i>Sterculia guttata</i>	180	<i>Vitex altissima</i>
159	<i>Streblus asper</i>	181	<i>Wrightia tinctoria</i>
160	<i>Suregada angustifolia</i>	182	<i>Wrightia tomentosa</i>
161	<i>Swietenia macrophylla</i>	183	<i>Xylia xylocarpa</i>
162	<i>Swietenia mahagoni</i>	184	<i>Zanthoxylum rhetsa</i>
163	<i>Syzygium cumini</i>	185	<i>Ziziphus xylopyrus</i>
164	<i>Syzygium operculatum</i>	186	<i>Zizipus rugosa</i>
165	<i>Tabebuia aurea</i>		

Table 4: List of naturally grown tree species in Mahatma Gandhi Botanical Garden GKV, Bengaluru.

Sl. No.	Tree species
1	<i>Acacia auriculiformis</i>
2	<i>Acacia ferruginea</i>
3	<i>Albizia amara</i>
4	<i>Albizia lebbeck</i>
5	<i>Albizia odoratissima</i>
6	<i>Erythroxylum monogynum</i>
7	<i>Eucalyptus citriodora</i>
8	<i>Eucalyptus globulus</i>
9	<i>Eucalyptus tereticornis</i>
10	<i>Hardwickia binata</i>
11	<i>Millettia pinnata</i>
12	<i>Syzygium cumini</i>

Table 5: List of planted tree species in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Tree species	Sl. No.	Tree species
1	<i>Acrocarpus fraxinifolius</i>	29	<i>Callistemon sp.</i>
2	<i>Adina cordifolia</i>	30	<i>Callistemon viminalis</i>
3	<i>Adonidia merrillii</i>	31	<i>Canthium parviflorum</i>
4	<i>Aegle marmelos</i>	32	<i>Careya arborea</i>
5	<i>Agathis robusta</i>	33	<i>Cassia fistula</i>
6	<i>Ailanthus excelsa</i>	34	<i>Cassia spectabilis</i>
7	<i>Ailanthus malabarica</i>	35	<i>Cassine paniculata</i>
8	<i>Alangium lamarckii</i>	36	<i>Casuarina equisetifolia</i>
9	<i>Alstonia scholaris</i>	37	<i>Cedrus deodara</i>
10	<i>Amoora lawii</i>	38	<i>Celtis tetrandra</i>
11	<i>Anacardium occidentale</i>	39	<i>Celtis wightii</i>
12	<i>Anamirta cocculus</i>	40	<i>Chrysophyllum cainito</i>
13	<i>Anthocephalus cadamba</i>	41	<i>Chukrasia tabularis</i>
14	<i>Antiaris toxicaria</i>	42	<i>Citharexylum quadrangulare</i>
15	<i>Araucaria cookii</i>	43	<i>Clausena dentata</i>
16	<i>Araucaria cunninghamii</i>	44	<i>Clusia rosea</i>
17	<i>Artocarpus heterophyllus</i>	45	<i>Cocos nucifera</i>
18	<i>Artocarpus lacucha</i>	46	<i>Colvillea racemosa</i>
19	<i>Averrhoa carambola</i>	47	<i>Combretum erythrophyllum</i>
20	<i>Azadirachta indica</i>	48	<i>Commiphora wightii</i>
21	<i>Barringtonia acutangula</i>	49	<i>Couroupita guianensis</i>
22	<i>Barringtonia asiatica</i>	50	<i>Crescentia cujete</i>
23	<i>Bauhinia purpurea</i>	51	<i>Croton oblongifolius</i>
24	<i>Bridelia retusa</i>	52	<i>Cupressus sempervirens</i>
25	<i>Broussonetia papyrifera</i>	53	<i>Cupressus torulosa</i>
26	<i>Butea monosperma</i>	54	<i>Dalbergia latifolia</i>
27	<i>Caesalpinia coriaria</i>	55	<i>Delonix regia</i>
28	<i>Caesalpinia platyloba</i>	56	<i>Dimocarpus longan</i>

Sl. No.	Tree species	Sl. No.	Tree species
57	<i>Diospyros buxifolia</i>	87	<i>Holoptelea integrifolia</i>
58	<i>Diospyros melanoxydon</i>	88	<i>Hopea parviflora</i>
59	<i>Diospyros montana</i>	89	<i>Ixora brachiata</i>
60	<i>Diospyros sylvatica</i>	90	<i>Jacaranda mimosifolia</i>
61	<i>Dolichandrone atrovirens</i>	91	<i>Khaya grandifoliola</i>
62	<i>Elaeis guineensis</i>	92	<i>Khaya senegalensis</i>
63	<i>Elaeocarpus tuberculatus</i>	93	<i>Kingiodendron pinnatum</i>
64	<i>Enterolobium contortisiliquum</i>	94	<i>Lagerstroemia lanceolata</i>
65	<i>Ficus amplissima</i>	95	<i>Lagerstroemia speciosa</i>
66	<i>Ficus benghalensis</i>	96	<i>Leucaena leucocephala</i>
67	<i>Ficus benjamina</i>	97	<i>Ligustrum perrottettii</i>
68	<i>Ficus drupacea</i>	98	<i>Limonia acidissima</i>
69	<i>Ficus elastica</i>	99	<i>Litsea coriacea</i>
70	<i>Ficus hispida</i>	100	<i>Madhuca indica</i>
71	<i>Ficus krishnae</i>	101	<i>Madhuca longifolia</i>
72	<i>Ficus lyrata</i>	102	<i>Mallotus philippensis</i>
73	<i>Ficus microcarpa</i>	103	<i>Mangifera indica</i>
74	<i>Ficus neriifolia</i>	104	<i>Manihot glaziovii</i>
75	<i>Ficus racemosa</i>	105	<i>Manilkara hexandra</i>
76	<i>Ficus religiosa</i>	106	<i>Melia dubia</i>
77	<i>Ficus tsihela</i>	107	<i>Mesua ferrea</i>
78	<i>Ficus virens</i>	108	<i>Milicia excelsa</i>
79	<i>Gardenia latifolia</i>	109	<i>Millingtonia hortensis</i>
80	<i>Gliricidia sepium</i>	110	<i>Mimusops elengi</i>
81	<i>Gmelina arborea</i>	111	<i>Mitragyna parvifolia</i>
82	<i>Gmelina asiatica</i>	112	<i>Moringa oleifera</i>
83	<i>Grevillea robusta</i>	113	<i>Olea dioica</i>
84	<i>Guazuma ulmifolia</i>	114	<i>Oroxylum indicum</i>
85	<i>Hamelia patens</i>	115	<i>Peltophorum pterocarpum</i>
86	<i>Hibiscus tiliaceus</i>	116	<i>Persea macrantha</i>

Sl. No.	Tree species	Sl. No.	Tree species
117	<i>Phoenix dactylifera</i>	146	<i>Sterculia urens</i>
118	<i>Phoenix sylvestris</i>	147	<i>Sterulia guttata</i>
119	<i>Pinus roxburghii</i>	148	<i>Streblus asper</i>
120	<i>Plumeria alba</i>	149	<i>Suregada angustifolia</i>
121	<i>Podocarpus chinensis</i>	150	<i>Swietenia macrophylla</i>
122	<i>Podocarpus macrophyllus</i>	151	<i>Swietenia mahagoni</i>
123	<i>Polyalthia longifolia</i>	152	<i>Syzygium operculatum</i>
124	<i>Psidium guajava</i>	153	<i>Tabebuia aurea</i>
125	<i>Pterocarpus dalbergioides</i>	154	<i>Tabebuia impetiginosa</i>
126	<i>Pterocarpus marsupium</i>	155	<i>Tabebuia rosea</i>
127	<i>Pterocarpus santalinus</i>	156	<i>Tamarindus indica</i>
128	<i>Pterospermum diversifolium</i>	157	<i>Tecoma stans</i>
129	<i>Pterospermum rubiginosum</i>	158	<i>Tectona grandis</i>
130	<i>Reutealis trisperma</i>	159	<i>Terminalia arjuna</i>
131	<i>Roystonea regia</i>	160	<i>Terminalia bellirica</i>
132	<i>Samanea saman</i>	161	<i>Terminalia catappa</i>
133	<i>Santalum album</i>	162	<i>Terminalia mantaly</i>
134	<i>Sapindus laurifolius</i>	163	<i>Terminalia tomentosa</i>
135	<i>Saraca asoca</i>	164	<i>Thespesia populnea</i>
136	<i>Schefflera actinophylla</i>	165	<i>Thuja occidentalis</i>
137	<i>Schleichera oleosa</i>	166	<i>Toona ciliata</i>
138	<i>Schotia brachypetala</i>	167	<i>Vepris bilocularis</i>
139	<i>Securinega leucopyrus</i>	168	<i>Vitex altissima</i>
140	<i>Semecarpus anacardium</i>	169	<i>Wrightia tinctoria</i>
141	<i>Senna siamea</i>	170	<i>Wrightia tomentosa</i>
142	<i>Simarouba glauca</i>	171	<i>Xylia xylocarpa</i>
143	<i>Spondias pinnata</i>	172	<i>Zanthoxylum rhetsa</i>
144	<i>Sterculia balanghas</i>	173	<i>Ziziphus xylopyrus</i>
145	<i>Sterculia foetida</i>	174	<i>Zizipus rugosa</i>

Table 6: List of exotic tree species in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Tree species	Sl. No.	Tree species
1	<i>Acacia auriculiformis</i>	23	<i>Casuarina equisetifolia</i>
2	<i>Adonidia merrillii</i>	24	<i>Celtis tetrandra</i>
3	<i>Agathis robusta</i>	25	<i>Celtis wightii</i>
4	<i>Ailanthus malabarica</i>	26	<i>Chrysophyllum cainito</i>
5	<i>Albizia amara</i>	27	<i>Citharexylum quadrangulare</i>
6	<i>Albizia lebbek</i>	28	<i>Clausena dentata</i>
7	<i>Anacardium occidentale</i>	29	<i>Clusia rosea</i>
8	<i>Anthocephalus cadamba</i>	30	<i>Colvillea racemosa</i>
9	<i>Antiaris toxicaria</i>	31	<i>Combretum erythrophyllum</i>
10	<i>Araucaria cookii</i>	32	<i>Couropita guianensis</i>
11	<i>Araucaria cunninghamii</i>	33	<i>Crescentia cujete</i>
12	<i>Averrhoa carambola</i>	34	<i>Croton oblongifolius</i>
13	<i>Barringtonia acutangula</i>	35	<i>Cupressus sempervirens</i>
14	<i>Barringtonia asiatica</i>	36	<i>Delonix regia</i>
15	<i>Broussonetia papyrifera</i>	37	<i>Dimocarpus longan</i>
16	<i>Caesalpinia coriaria</i>	38	<i>Elaeis guineensis</i>
17	<i>Caesalpinia platyloba</i>	39	<i>Enterolobium contortisiliquum</i>
18	<i>Callistemon sp.</i>	40	<i>Eucalyptus citriodora</i>
19	<i>Callistemon viminalis</i>	41	<i>Eucalyptus globulus</i>
20	<i>Canthium parviflorum</i>	42	<i>Eucalyptus tereticornis</i>
21	<i>Cassia spectabilis</i>	43	<i>Ficus lyrata</i>
22	<i>Cassine paniculata</i>	44	<i>Ficus microcarpa</i>

Sl. No.	Tree species	Sl. No.	Tree species
45	<i>Gliricidia sepium</i>	66	<i>Roystonea regia</i>
46	<i>Grevillea robusta</i>	67	<i>Samanea saman</i>
47	<i>Guazuma ulmifolia</i>	68	<i>Schefflera actinophylla</i>
48	<i>Hamelia patens</i>	69	<i>Schotia brachypetala</i>
49	<i>Hibiscus tiliaceus</i>	70	<i>Securinega leucopyrus</i>
50	<i>Holoptelea integrifolia</i>	71	<i>Simarouba glauca</i>
51	<i>Jacaranda mimosifolia</i>	72	<i>Spondias pinnata</i>
52	<i>Khaya grandifoliola</i>	73	<i>Streblus asper</i>
53	<i>Khaya senegalensis</i>	74	<i>Swietenia macrophylla</i>
54	<i>Leucaena leucocephala</i>	75	<i>Swietenia mahagoni</i>
55	<i>Manihot glaziovii</i>	76	<i>Syzygium operculatum</i>
56	<i>Milicia excelsa</i>	77	<i>Tabebuia aurea</i>
57	<i>Millingtonia hortensis</i>	78	<i>Tabebuia impetiginosa</i>
58	<i>Peltophorum pterocarpum</i>	79	<i>Tabebuia rosea</i>
59	<i>Phoenix dactylifera</i>	80	<i>Tecoma stans</i>
60	<i>Phoenix sylvestris</i>	81	<i>Terminalia mantaly</i>
61	<i>Plumeria alba</i>	82	<i>Thespesia populnea</i>
62	<i>Podocarpus chinensis</i>	83	<i>Thuja occidentalis</i>
63	<i>Podocarpus macrophyllus</i>	84	<i>Toona ciliata</i>
64	<i>Psidium guajava</i>	85	<i>Vepris bilocularis</i>
65	<i>Reutealis trisperma</i>	86	<i>Xylia xylocarpa</i>

Table 7: List of native to India tree species in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Tree species	Sl. No.	Tree species
1	<i>Acacia ferruginea</i>	36	<i>Ficus elastica</i>
2	<i>Acrocarpus fraxinifolius</i>	37	<i>Ficus hispida</i>
3	<i>Adina cordifolia</i>	38	<i>Ficus krishnae</i>
4	<i>Aegle marmelos</i>	39	<i>Ficus neriifolia</i>
5	<i>Ailanthus excelsa</i>	40	<i>Ficus racemosa</i>
6	<i>Alangium lamarckii</i>	41	<i>Ficus religiosa</i>
7	<i>Albizia odoratissima</i>	42	<i>Ficus tsjahela</i>
8	<i>Alstonia scholaris</i>	43	<i>Ficus virens</i>
9	<i>Amoora lawii</i>	44	<i>Gardenia latifolia</i>
10	<i>Anamirta cocculus</i>	45	<i>Gmelina arborea</i>
11	<i>Artocarpus heterophyllus</i>	46	<i>Gmelina asiatica</i>
12	<i>Artocarpus lacucha</i>	47	<i>Hardwickia binata</i>
13	<i>Azadirachta indica</i>	48	<i>Hopea parviflora</i>
14	<i>Bauhinia purpurea</i>	49	<i>Ixora brachiata</i>
15	<i>Bridelia retusa</i>	50	<i>Kingiodendron pinnatum</i>
16	<i>Butea monosperma</i>	51	<i>Lagerstroemia lanceolata</i>
17	<i>Careya arborea</i>	52	<i>Lagerstroemia speciosa</i>
18	<i>Cassia fistula</i>	53	<i>Ligustrum perrottettii</i>
19	<i>Cedrus deodara</i>	54	<i>Limonia acidissima</i>
20	<i>Chukrasia tabularis</i>	55	<i>Litsea coriacea</i>
21	<i>Cocos nucifera</i>	56	<i>Madhuca indica</i>
22	<i>Commiphora wightii</i>	57	<i>Madhuca longifolia</i>
23	<i>Cupressus torulosa</i>	58	<i>Mallotus philippensis</i>
24	<i>Dalbergia latifolia</i>	59	<i>Mangifera indica</i>
25	<i>Diospyros buxifolia</i>	60	<i>Manilkara hexandra</i>
26	<i>Diospyros melanoxylon</i>	61	<i>Melia dubia</i>
27	<i>Diospyros montana</i>	62	<i>Mesua ferrea</i>
28	<i>Diospyros sylvatica</i>	63	<i>Millettia pinnata</i>
29	<i>Dolichandrone atrovirens</i>	64	<i>Mimusops elengi</i>
30	<i>Elaeocarpus tuberculatus</i>	65	<i>Mitragyna parvifolia</i>
31	<i>Erythroxylum monogynum</i>	66	<i>Moringa oleifera</i>
32	<i>Ficus amplissima</i>	67	<i>Olea dioica</i>
33	<i>Ficus benghalensis</i>	68	<i>Oroxylum indicum</i>
34	<i>Ficus benjamina</i>	69	<i>Persea macrantha</i>
35	<i>Ficus drupacea</i>	70	<i>Pinus roxburghii</i>

Sl. No.	Tree species	Sl. No.	Tree species
71	<i>Polyalthia longifolia</i>	86	<i>Sterulia guttata</i>
72	<i>Pterocarpus dalbergioides</i>	87	<i>Suregada angustifolia</i>
73	<i>Pterocarpus marsupium</i>	88	<i>Syzygium cumini</i>
74	<i>Pterocarpus santalinus</i>	89	<i>Tamarindus indica</i>
75	<i>Pterospermum diversifolium</i>	90	<i>Tectona grandis</i>
76	<i>Pterospermum rubiginosum</i>	91	<i>Terminalia arjuna</i>
77	<i>Santalum album</i>	92	<i>Terminalia bellirica</i>
78	<i>Sapindus laurifolius</i>	93	<i>Terminalia catappa</i>
79	<i>Saraca asoca</i>	94	<i>Terminalia tomentosa</i>
80	<i>Schleichera oleosa</i>	95	<i>Vitex altissima</i>
81	<i>Semecarpus anacardium</i>	96	<i>Wrightia tinctoria</i>
82	<i>Senna siamea</i>	97	<i>Wrightia tomentosa</i>
83	<i>Sterculia balanghas</i>	98	<i>Zanthoxylum rhetsa</i>
84	<i>Sterculia foetida</i>	99	<i>Ziziphus xylopyrus</i>
85	<i>Sterculia urens</i>	100	<i>Zizipus rugosa</i>

Table 8: Tree density and basal area of tree species in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Blocks	Tree density	Basal area (m ²)
1	Block-1	295	20.72
2	Block-2	188	18.22
3	Block-3	222	18.65
4	Block-4	171	12.66
5	Block-5	192	15.51
6	Block-6	325	23.38
7	Block-7	208	14.29
8	Block-8	241	16.16
9	Block-9	195	18.69
10	Block-10	103	7.50
Grand Total		2140	165.78

4.1.1 Tree density and basal area of tree species

Total number of trees in Mahatma Gandhi Botanical Garden were 2140 and these have the total basal area of 165.78 m². Tree density was found to be highest in block-6 (325) followed by block-1 (295), block-8 (241), block-3 (222) and block-7 (208), and lowest in block-10 (103) (Table 8). Basal area was found to be highest in block-6 (23.38 m²), this might be because of the presence of a greater number of trees (325) and lowest in the block-10 (7.50 m²), where the number of trees were less among all the blocks of Botanical Garden. Basal area of trees was also an indication of the ratio of area occupied by the trees to the total land area of the region. Here from the Table 8, it was observed that in spite of having greater tree density in block-3 (222), it is having lesser basal area (18.65 m²) than the block-9 (18.69 m²), where the tree density (195) was found to be less than the block-3, this indicates that the trees in block-9 are having higher girth size than the trees in block-3.

4.2 Diversity indices

Tree diversity in Mahatma Gandhi Botanical Garden was presented in this section.

4.2.1 Shannon-Wiener index (H')

Shannon-Wiener index showed that the diversity of trees in Mahatma Gandhi Botanical Garden, GKVK exhibit a higher diversity value 5.52 (Table 9). Shannon-Wiener index was highest for the block-1 (4.83), block-9 (4.75) and block-3 (4.44). This shows that these blocks contain a greater number of diversified tree species than other blocks. Block-2 (3.94) and block-7 (3.96) was found to have least Shannon-Wiener index, which indicates that these blocks have very less tree diversity when compared to other blocks in the Botanical Garden. Shannon-wiener index of KNUST botanic garden in Kumasi, Ghana (Acheampong *et al.*, 2021) was found to be 3.36, which is less than that of Botanical Garden, GKVK, Bengaluru.

4.2.2 Simpson's Diversity Index (1-D)

Simpson's Diversity Index shows that the diversity in Mahatma Gandhi Botanical Garden was very high (0.96). The Simpson's diversity index (Table 10) in the garden

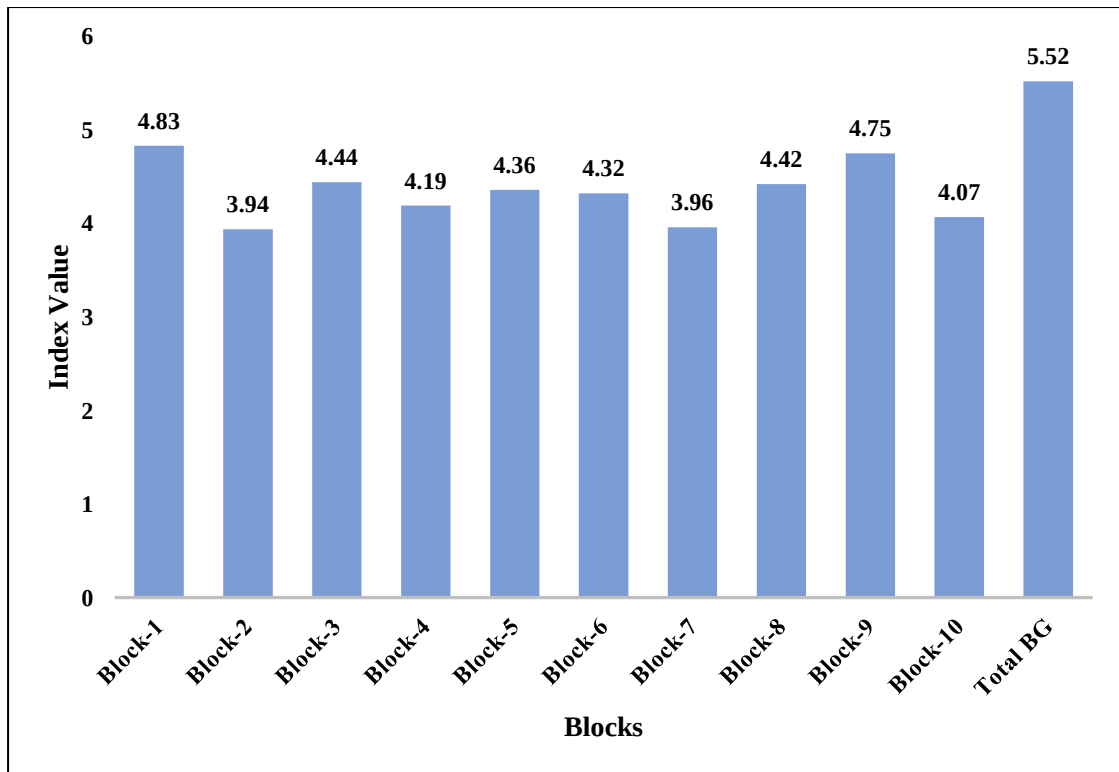


Fig. 1: Shannon wiener diversity index of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

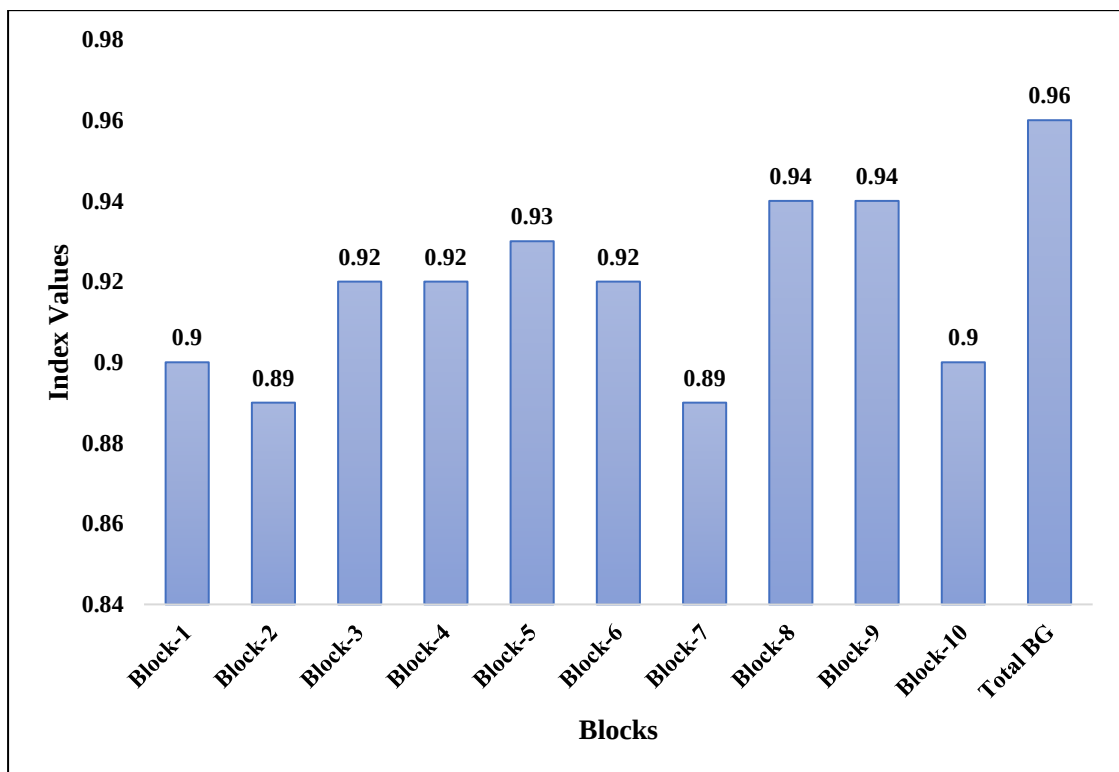


Fig. 2: Simpson's diversity index of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

ranged from 0.89 to 0.94. It was found that block-1 had comparatively moderate value of Simpson's index even though it had highest Shannon-Wiener index (Table 9), this clearly indicates that block-1 had a greater number of tree species but those trees were not evenly distributed all over the block-1. It was observed that diversity and distribution of tree species was highest in block-8 and block-9 and lowest in block-2 and block-7.

The Shannon-Wiener index and Simpson's Diversity Index in Mahatma Gandhi Botanical Garden was found to be greater when compared to diversity of Hulikal Ghat natural forest reported by Vinayaka *et al.* (2016).

Simpson's diversity index indicates the diversity and distribution of tree species all over the Botanical Garden. Table 10 shows that block-8 (0.94) and block-9 (0.94) have the highest Simpson's index when compared to all other blocks. This indicates that those blocks contain high diversity and the tree species are well distributed all over the block. Comparatively lower Simpson's index was found in block-2 (0.89) and block-7 (0.89).

4.2.3 Comparison between Shannon diversity index and Simpson's diversity index

Shannon diversity index of block-1 (4.83) was found highest among all other blocks but its Simpson's index was comparatively lower than other blocks. This indicates that the block-1 has highest number of tree species in Botanical Garden but those tree species were not properly distributed. Block-10 has greater diversity ($H'=4.75$) of tree species and those are distributed ($1-D=0.94$) evenly all over the block.

Block-2 ($H'=3.94$ and $1-D=0.89$) and block-7 ($H'=3.96$ and $1-D=0.89$) was found to have lesser diversity and tree species were not uniformly distributed all over the blocks. Overall, the Shannon index (5.52) and Simpson's index (0.96) of Mahatma Gandhi Botanical Garden was 5.52 and 0.96 respectively. This indicates that Botanical Garden had higher tree diversity *i.e.*, around 186 tree species (Table 3) having girth size >30 cm was found and those were evenly distributed all over the garden.

Table 9: Shannon wiener index in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Blocks	Index value
Block-1	4.83
Block-2	3.94
Block-3	4.44
Block-4	4.19
Block-5	4.36
Block-6	4.32
Block-7	3.96
Block-8	4.42
Block-9	4.75
Block-10	4.07
Total garden	5.52

Table 10: Simpson's diversity index in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Blocks	Index value
Block-1	0.90
Block-2	0.89
Block-3	0.92
Block-4	0.92
Block-5	0.93
Block-6	0.92
Block-7	0.89
Block-8	0.94
Block-9	0.94
Block-10	0.90
Total garden	0.96

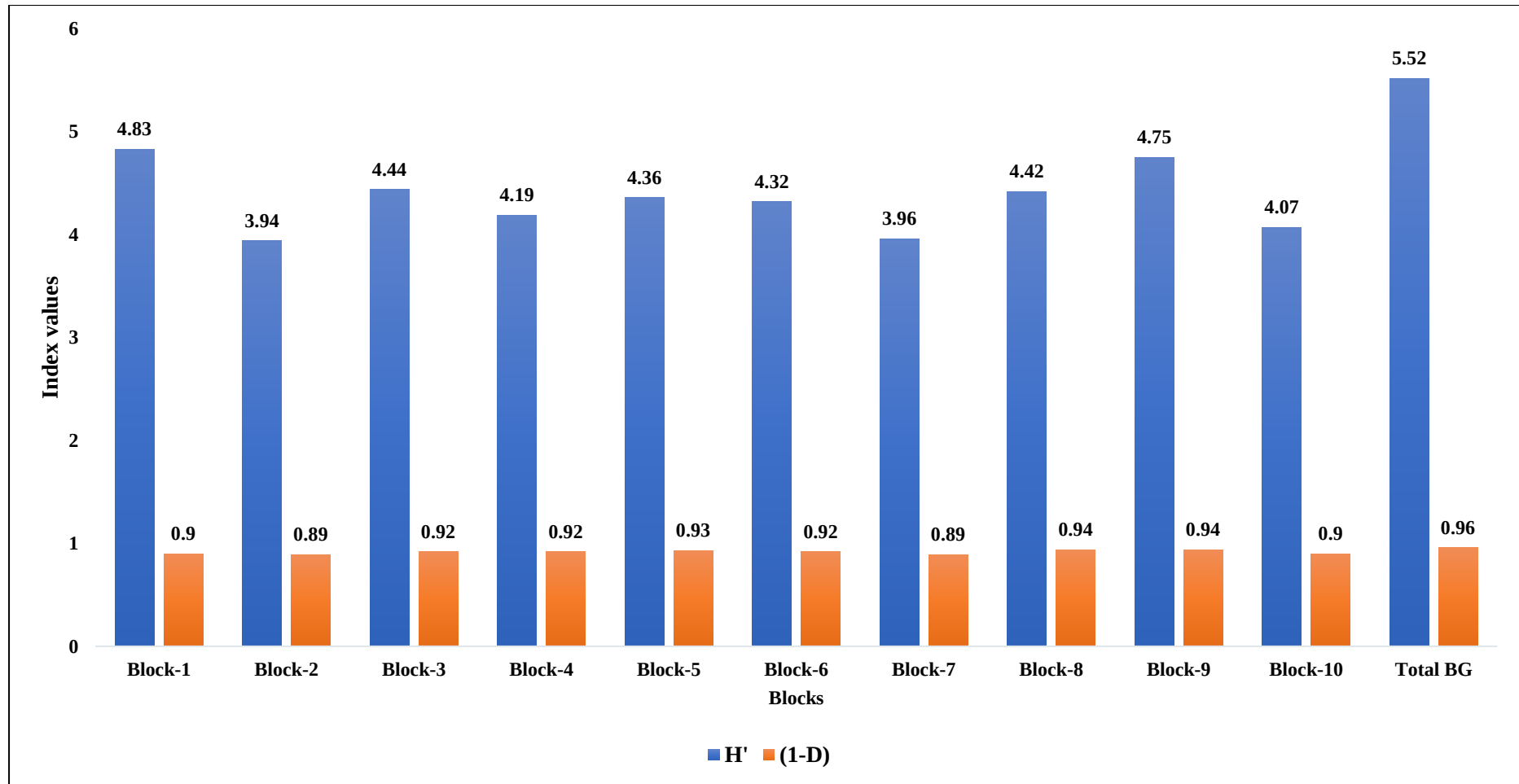


Fig. 3: Comparison between Shannon and Simpson's diversity index of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

4.2.4 Importance Value Index

Millettia pinnata (IVI=25.71), *Azadirachta indica* (IVI=25.17) and *Albizia lebbeck* (IVI=16.59) are the three major tree species (Table 12), which were present in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru. These three tree species almost comprise around 27.73 percentage of the total tree population in the Botanical Garden. These three species were left unfelled while converting natural forest area into Botanical Garden, this might be the reason for their dominance in the Garden. Even though the frequency of occurrence of *Albizia amara* is 1, it's IVI (6.32) is lesser than *Millettia pinnata* (IVI=25.17), *Azadirachta indica* (IVI=25.17), *Albizia lebbeck* (IVI=16.59) and *Anacardium occidentale* (IVI=11.10), this is mainly because the relative dominance of these four species was much larger than that of *Albizia amara*. The tree species which have the frequency of 0.1 indicates that the particular tree species is present only in a particular block out of total ten blocks. So, the distribution of those tree species was confined only to a single block but the tree species having higher IVI and frequency of occurrence was dominant and distributed all over the Botanical Garden.

Table 11: Comparison between Shannon diversity index (H') and Simpson's diversity index (1-D).

Blocks	H'	(1-D)
Block-1	4.83	0.90
Block-2	3.94	0.89
Block-3	4.44	0.92
Block-4	4.19	0.92
Block-5	4.36	0.93
Block-6	4.32	0.92
Block-7	3.96	0.89
Block-8	4.42	0.94
Block-9	4.75	0.94
Block-10	4.07	0.90
Total	5.52	0.96

Table 12: Importance Value Index of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Tree species	Relative density %	Relative dominance %	Relative frequency %	IVI	Frequency of species
1	<i>Millettia pinnata</i>	11.64	11.71	2.37	25.71	1.0
2	<i>Azadirachta indica</i>	12.06	10.75	2.37	25.17	1.0
3	<i>Albizia lebbeck</i>	5.14	9.08	2.37	16.59	1.0
4	<i>Anacardium occidentale</i>	3.22	5.51	2.37	11.10	1.0
5	<i>Syzygium operculatum</i>	3.97	3.92	1.90	9.78	0.8
6	<i>Grevillea robusta</i>	4.53	2.72	1.18	8.44	0.5
7	<i>Polyalthia longifolia</i>	5.14	1.74	0.47	7.35	0.2
8	<i>Cassia fistula</i>	3.79	1.39	2.13	7.31	0.9
9	<i>Hardwickia binata</i>	2.52	2.55	1.90	6.97	0.8
10	<i>Leucaena leucocephala</i>	2.15	3.29	1.42	6.86	0.6
11	<i>Delonix regia</i>	2.71	2.38	1.42	6.52	0.6
12	<i>Albizia amara</i>	1.64	2.32	2.37	6.32	1.0
13	<i>Eucalyptus citriodora</i>	2.34	2.38	1.42	6.14	0.6
14	<i>Acacia auriculiformis</i>	1.96	2.44	1.66	6.06	0.7
15	<i>Albizia odoratissima</i>	1.64	1.93	1.90	5.46	0.8
16	<i>Tamarindus indica</i>	1.31	2.00	1.90	5.20	0.8
17	<i>Ailanthus excelsa</i>	0.51	2.62	1.66	4.80	0.7
18	<i>Butea monosperma</i>	1.36	1.23	2.13	4.72	0.9
19	<i>Roystonea regia</i>	1.96	2.21	0.47	4.65	0.2
20	<i>Eucalyptus globulus</i>	1.68	1.21	1.66	4.56	0.7
21	<i>Senna siamea</i>	1.92	1.12	1.42	4.46	0.6
22	<i>Eucalyptus tereticornis</i>	0.89	1.40	1.18	3.47	0.5
23	<i>Melia dubia</i>	0.61	1.43	1.42	3.46	0.6
24	<i>Erythroxylum monogynum</i>	1.07	0.66	1.42	3.15	0.6
25	<i>Simarouba glauca</i>	0.93	0.53	1.66	3.13	0.7
26	<i>Tectona grandis</i>	1.73	0.38	0.95	3.06	0.4
27	<i>Gliricidia sepium</i>	0.65	0.40	1.90	2.95	0.8
28	<i>Diospyros melanoxylon</i>	0.70	1.43	0.71	2.84	0.3
29	<i>Santalum album</i>	0.89	0.33	1.42	2.64	0.6
30	<i>Mangifera indica</i>	0.42	0.27	1.42	2.11	0.6
31	<i>Canthium parviflorum</i>	0.37	0.22	1.42	2.02	0.6
32	<i>Tabebuia rosea</i>	0.84	0.53	0.47	1.85	0.2

Sl. No.	Tree species	Relative density %	Relative dominance %	Relative frequency %	IVI	Frequency of species
33	<i>Sterculia balanghas</i>	0.51	0.84	0.47	1.83	0.2
34	<i>Casuarina equisetifolia</i>	0.42	0.26	0.95	1.63	0.4
35	<i>Ixora brachiata</i>	0.47	0.15	0.95	1.56	0.4
36	<i>Bridelia retusa</i>	0.28	0.19	0.95	1.42	0.4
37	<i>Samanea saman</i>	0.28	0.86	0.24	1.37	0.1
38	<i>Toona ciliata</i>	0.28	0.34	0.71	1.33	0.3
39	<i>Amoora lawii</i>	0.56	0.25	0.47	1.28	0.2
40	<i>Caesalpinia coriaria</i>	0.37	0.42	0.47	1.27	0.2
41	<i>Ficus religiosa</i>	0.14	0.64	0.47	1.25	0.2
42	<i>Schleichera oleosa</i>	0.23	0.29	0.71	1.24	0.3
43	<i>Araucaria cookii</i>	0.23	0.29	0.71	1.23	0.3
44	<i>Syzygium cumini</i>	0.19	0.79	0.24	1.22	0.1
45	<i>Ficus virens</i>	0.19	0.78	0.24	1.21	0.1
46	<i>Terminalia catappa</i>	0.28	0.11	0.71	1.11	0.3
47	<i>Diospyros montana</i>	0.23	0.39	0.47	1.09	0.2
48	<i>Madhuca indica</i>	0.19	0.19	0.71	1.09	0.3
49	<i>Artocarpus heterophyllus</i>	0.19	0.19	0.71	1.09	0.3
50	<i>Sapindus laurifolius</i>	0.19	0.18	0.71	1.08	0.3
51	<i>Bauhinia purpurea</i>	0.23	0.13	0.71	1.07	0.3
52	<i>Olea dioica</i>	0.19	0.13	0.71	1.03	0.3
53	<i>Sterculia urens</i>	0.23	0.31	0.47	1.01	0.2
54	<i>Spondias pinnata</i>	0.28	0.24	0.47	0.99	0.2
55	<i>Hopea parviflora</i>	0.19	0.04	0.71	0.94	0.3
56	<i>Khaya senegalensis</i>	0.14	0.55	0.24	0.92	0.1
57	<i>Ziziphus xylopyrus</i>	0.28	0.15	0.47	0.91	0.2
58	<i>Mallotus philippensis</i>	0.28	0.14	0.47	0.90	0.2
59	<i>Plumeria alba</i>	0.23	0.19	0.47	0.90	0.2
60	<i>Swietenia mahagoni</i>	0.19	0.23	0.47	0.89	0.2
61	<i>Ficus drupacea</i>	0.09	0.53	0.24	0.86	0.1
62	<i>Colvillea racemosa</i>	0.23	0.13	0.47	0.83	0.2
63	<i>Ficus microcarpa</i>	0.19	0.37	0.24	0.80	0.1
64	<i>Celtis tetrandra</i>	0.14	0.14	0.47	0.75	0.2
65	<i>Peltophorum pterocarpum</i>	0.05	0.45	0.24	0.74	0.1
66	<i>Agathis robusta</i>	0.14	0.12	0.47	0.74	0.2
67	<i>Phoenix dactylifera</i>	0.19	0.07	0.47	0.73	0.2

Sl. No.	Tree species	Relative density %	Relative dominance %	Relative frequency %	IVI	Frequency of species
68	<i>Sterculia foetida</i>	0.14	0.10	0.47	0.72	0.2
69	<i>Wrightia tinctoria</i>	0.09	0.15	0.47	0.72	0.2
70	<i>Streblus asper</i>	0.14	0.08	0.47	0.69	0.2
71	<i>Moringa oleifera</i>	0.14	0.04	0.47	0.65	0.2
72	<i>Alstonia scholaris</i>	0.09	0.06	0.47	0.63	0.2
73	<i>Hibiscus tiliaceus</i>	0.09	0.06	0.47	0.63	0.2
74	<i>Pterocarpus santalinus</i>	0.19	0.20	0.24	0.62	0.1
75	<i>Pterocarpus marsupium</i>	0.09	0.05	0.47	0.61	0.2
76	<i>Mesua ferrea</i>	0.09	0.04	0.47	0.61	0.2
77	<i>Vepris bilocularis</i>	0.09	0.04	0.47	0.60	0.2
78	<i>Crescentia cujete</i>	0.09	0.03	0.47	0.60	0.2
79	<i>Ficus benghalensis</i>	0.14	0.22	0.24	0.59	0.1
80	<i>Terminalia tomentosa</i>	0.23	0.12	0.24	0.59	0.1
81	<i>Acacia ferruginea</i>	0.09	0.02	0.47	0.59	0.2
82	<i>Khaya grandifoliola</i>	0.14	0.19	0.24	0.57	0.1
83	<i>Cedrus deodara</i>	0.28	0.04	0.24	0.56	0.1
84	<i>Pinus roxburghii</i>	0.19	0.13	0.24	0.55	0.1
85	<i>Manilkara hexandra</i>	0.14	0.17	0.24	0.54	0.1
86	<i>Ligustrum perrottetii</i>	0.14	0.15	0.24	0.53	0.1
87	<i>Lagerstroemia lanceolata</i>	0.14	0.15	0.24	0.53	0.1
88	<i>Acrocarpus fraxinifolius</i>	0.14	0.15	0.24	0.52	0.1
89	<i>Ficus elastica</i>	0.05	0.22	0.24	0.51	0.1
90	<i>Swietenia macrophylla</i>	0.05	0.21	0.24	0.49	0.1
91	<i>Aegle marmelos</i>	0.19	0.05	0.24	0.48	0.1
92	<i>Podocarpus macrophyllus</i>	0.09	0.15	0.24	0.48	0.1
93	<i>Millingtonia hortensis</i>	0.09	0.14	0.24	0.47	0.1
94	<i>Reutealis trisperma</i>	0.14	0.09	0.24	0.47	0.1
95	<i>Artocarpus lacucha</i>	0.14	0.09	0.24	0.47	0.1
96	<i>Callistemon viminalis</i>	0.14	0.09	0.24	0.46	0.1
97	<i>Dimocarpus longan</i>	0.19	0.02	0.24	0.45	0.1
98	<i>Gmelina asiatica</i>	0.14	0.06	0.24	0.44	0.1
99	<i>Vitex altissima</i>	0.05	0.16	0.24	0.44	0.1
100	<i>Dolichandrone atrovirens</i>	0.14	0.06	0.24	0.44	0.1
101	<i>Kingiodendron pinnatum</i>	0.14	0.05	0.24	0.43	0.1
102	<i>Limonia acidissima</i>	0.09	0.10	0.24	0.43	0.1

Sl. No.	Tree species	Relative density %	Relative dominance %	Relative frequency %	IVI	Frequency of species
103	<i>Chukrasia tabularis</i>	0.09	0.10	0.24	0.43	0.1
104	<i>Xylia xylocarpa</i>	0.09	0.09	0.24	0.43	0.1
105	<i>Holoptelea integrifolia</i>	0.05	0.13	0.24	0.41	0.1
106	<i>Careya arborea</i>	0.09	0.08	0.24	0.41	0.1
107	<i>Anthocephalus cadamba</i>	0.09	0.07	0.24	0.41	0.1
108	<i>Mitragyna parviflora</i>	0.09	0.07	0.24	0.40	0.1
109	<i>Cassine paniculata</i>	0.09	0.07	0.24	0.40	0.1
110	<i>Terminalia arjuna</i>	0.09	0.06	0.24	0.39	0.1
111	<i>Ficus krishnae</i>	0.05	0.11	0.24	0.39	0.1
112	<i>Semecarpus anacardium</i>	0.09	0.06	0.24	0.39	0.1
113	<i>Celtis wightii</i>	0.09	0.06	0.24	0.39	0.1
114	<i>Zizipus rugosa</i>	0.05	0.10	0.24	0.38	0.1
115	<i>Diospyros buxifolia</i>	0.05	0.10	0.24	0.38	0.1
116	<i>Podocarpus chinensis</i>	0.09	0.04	0.24	0.37	0.1
117	<i>Saraca asoca</i>	0.09	0.04	0.24	0.37	0.1
118	<i>Ailanthus malabarica</i>	0.05	0.09	0.24	0.37	0.1
119	<i>Jacaranda mimosifolia</i>	0.05	0.09	0.24	0.37	0.1
120	<i>Cassia spectabilis</i>	0.09	0.04	0.24	0.37	0.1
121	<i>Tabebuia impetiginosa</i>	0.09	0.03	0.24	0.36	0.1
122	<i>Hamelia patens</i>	0.09	0.03	0.24	0.36	0.1
123	<i>Dalbergia latifolia</i>	0.09	0.02	0.24	0.35	0.1
124	<i>Gmelina arborea</i>	0.05	0.07	0.24	0.35	0.1
125	<i>Lagerstroemia speciosa</i>	0.09	0.02	0.24	0.35	0.1
126	<i>Wrightia tomentosa</i>	0.05	0.06	0.24	0.35	0.1
127	<i>Chrysophyllum cainito</i>	0.05	0.06	0.24	0.35	0.1
128	<i>Combretum erythrophyllum</i>	0.05	0.06	0.24	0.35	0.1
129	<i>Oroxylon indicum</i>	0.05	0.06	0.24	0.35	0.1
130	<i>Elaeis guineensis</i>	0.05	0.06	0.24	0.34	0.1
131	<i>Ficus hispida</i>	0.05	0.05	0.24	0.34	0.1
132	<i>Anamirta cocculus</i>	0.05	0.05	0.24	0.33	0.1
133	<i>Ficus tsjahela</i>	0.05	0.05	0.24	0.33	0.1
134	<i>Alangium lamarckii</i>	0.05	0.05	0.24	0.33	0.1
135	<i>Caesalpinia platyloba</i>	0.05	0.05	0.24	0.33	0.1
136	<i>Pterospermum rubiginosum</i>	0.05	0.04	0.24	0.33	0.1
137	<i>Enterolobium contortisiliquum</i>	0.05	0.04	0.24	0.33	0.1

Sl. No.	Tree species	Relative density %	Relative dominance %	Relative frequency %	IVI	Frequency of species
138	<i>Suregada angustifolia</i>	0.05	0.04	0.24	0.32	0.1
139	<i>Citharexylum quadrangulare</i>	0.05	0.04	0.24	0.32	0.1
140	<i>Cocos nucifera</i>	0.05	0.04	0.24	0.32	0.1
141	<i>Couroupita guianensis</i>	0.05	0.04	0.24	0.32	0.1
142	<i>Milicia excelsa</i>	0.05	0.04	0.24	0.32	0.1
143	<i>Zanthoxylum rhetsa</i>	0.05	0.04	0.24	0.32	0.1
144	<i>Adonidia merrillii</i>	0.05	0.04	0.24	0.32	0.1
145	<i>Broussonetia papyrifera</i>	0.05	0.03	0.24	0.32	0.1
146	<i>Ficus amplissima</i>	0.05	0.03	0.24	0.31	0.1
147	<i>Madhuca longifolia</i>	0.05	0.03	0.24	0.31	0.1
148	<i>Ficus lyrata</i>	0.05	0.03	0.24	0.31	0.1
149	<i>Thespesia populnea</i>	0.05	0.03	0.24	0.31	0.1
150	<i>Schefflera actinophylla</i>	0.05	0.03	0.24	0.31	0.1
151	<i>Manihot glaziovii</i>	0.05	0.03	0.24	0.31	0.1
152	<i>Croton oblongifolius</i>	0.05	0.02	0.24	0.31	0.1
153	<i>Adina cordifolia</i>	0.05	0.02	0.24	0.31	0.1
154	<i>Averrhoa carambola</i>	0.05	0.02	0.24	0.31	0.1
155	<i>Clausena dentata</i>	0.05	0.02	0.24	0.31	0.1
156	<i>Ficus benamina</i>	0.05	0.02	0.24	0.31	0.1
157	<i>Phoenix sylvestris</i>	0.05	0.02	0.24	0.31	0.1
158	<i>Araucaria cunninghamii</i>	0.05	0.02	0.24	0.31	0.1
159	<i>Terminalia bellirica</i>	0.05	0.02	0.24	0.31	0.1
160	<i>Pterospermum diversifolium</i>	0.05	0.02	0.24	0.30	0.1
161	<i>Cupressus torulosa</i>	0.05	0.02	0.24	0.30	0.1
162	<i>Securinega leucopyrus</i>	0.05	0.02	0.24	0.30	0.1
163	<i>Schotia brachypetala</i>	0.05	0.02	0.24	0.30	0.1
164	<i>Commiphora wightii</i>	0.05	0.02	0.24	0.30	0.1
165	<i>Gardenia latifolia</i>	0.05	0.02	0.24	0.30	0.1
166	<i>Antiaris toxicaria</i>	0.05	0.01	0.24	0.30	0.1
167	<i>Guazuma ulmifolia</i>	0.05	0.01	0.24	0.30	0.1
168	<i>Terminalia mantaly</i>	0.05	0.01	0.24	0.30	0.1
169	<i>Diospyros sylvatica</i>	0.05	0.01	0.24	0.30	0.1
170	<i>Mimusops elengi</i>	0.05	0.01	0.24	0.30	0.1
171	<i>Persea macrantha</i>	0.05	0.01	0.24	0.30	0.1
172	<i>Ficus racemosa</i>	0.05	0.01	0.24	0.29	0.1
173	<i>Barringtonia asiatica</i>	0.05	0.01	0.24	0.29	0.1
174	<i>Callistemon sp.</i>	0.05	0.01	0.24	0.29	0.1

Sl. No.	Tree species	Relative density %	Relative dominance %	Relative frequency %	IVI	Frequency of species
175	<i>Ficus neriifolia</i>	0.05	0.01	0.24	0.29	0.1
176	<i>Sterulia guttata</i>	0.05	0.01	0.24	0.29	0.1
177	<i>Tecoma stans</i>	0.05	0.01	0.24	0.29	0.1
178	<i>Cupressus sempervirens</i>	0.05	0.01	0.24	0.29	0.1
179	<i>Tabebuia aurea</i>	0.05	0.01	0.24	0.29	0.1
180	<i>Thuja occidentalis</i>	0.05	0.01	0.24	0.29	0.1
181	<i>Elaeocarpus tuberculatus</i>	0.05	0.01	0.24	0.29	0.1
182	<i>Litsea coriacea</i>	0.05	0.01	0.24	0.29	0.1
183	<i>Barringtonia acutangula</i>	0.05	0.01	0.24	0.29	0.1
184	<i>Clusia rosea</i>	0.05	0.01	0.24	0.29	0.1
185	<i>Psidium guajava</i>	0.05	0.01	0.24	0.29	0.1
186	<i>Pterocarpus dalbergioides</i>	0.05	0.01	0.24	0.29	0.1
Total		100	100	100	300	42.2

Table 13: Top ten dominant tree species of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Tree species	No. of trees	% Of total trees
1	<i>Azadirachta indica</i>	258	12.06
2	<i>Millettia pinnata</i>	249	11.64
3	<i>Albizia lebbbeck</i>	110	5.14
4	<i>Polyalthia longifolia</i>	110	5.14
5	<i>Grevillea robusta</i>	97	4.53
6	<i>Syzygium operculatum</i>	85	3.97
7	<i>Cassia fistula</i>	81	3.79
8	<i>Anacardium occidentale</i>	69	3.22
9	<i>Delonix regia</i>	58	2.71
10	<i>Hardwickia binata</i>	54	2.52
Total		1171	54.72

Table 14: Dominant top three tree species in different blocks of Mahatma Gandhi Botanical Garden, GKV, Bengaluru.

Blocks	Tree species	No. of individuals	% Of block tree population
Block-1	<i>Polyalthia longifolia</i>	83	28.14
	<i>Grevillea robusta</i>	27	9.15
	<i>Roystonea regia</i>	19	6.44
Block-2	<i>Syzygium operculatum</i>	47	25.00
	<i>Polyalthia longifolia</i>	27	14.36
	<i>Millettia pinnata</i>	24	12.77
Block-3	<i>Azadirachta indica</i>	50	22.52
	<i>Syzygium operculatum</i>	19	8.56
	<i>Cassia fistula</i>	18	8.11
Block-4	<i>Azadirachta indica</i>	30	17.54
	<i>Anacardium occidentale</i>	21	12.28
	<i>Cassia fistula</i>	18	10.53
Block-5	<i>Azadirachta indica</i>	26	13.54
	<i>Millettia pinnata</i>	26	13.54
	<i>Grevillea robusta</i>	23	11.98
Block-6	<i>Millettia pinnata</i>	64	19.69
	<i>Grevillea robusta</i>	32	9.85
	<i>Azadirachta indica</i>	27	8.31
Block-7	<i>Azadirachta indica</i>	55	26.44
	<i>Millettia pinnata</i>	31	14.90
	<i>Albizia lebbeck</i>	17	8.17
Block-8	<i>Azadirachta indica</i>	30	12.45
	<i>Tectona grandis</i>	28	11.62
	<i>Hardwickia binata</i>	22	9.13
Block-9	<i>Millettia pinnata</i>	28	14.36
	<i>Azadirachta indica</i>	27	13.85
	<i>Albizia lebbeck</i>	15	7.69
Block-10	<i>Roystonea regia</i>	23	22.33
	<i>Millettia pinnata</i>	15	14.56
	<i>Albizia lebbeck</i>	12	11.65

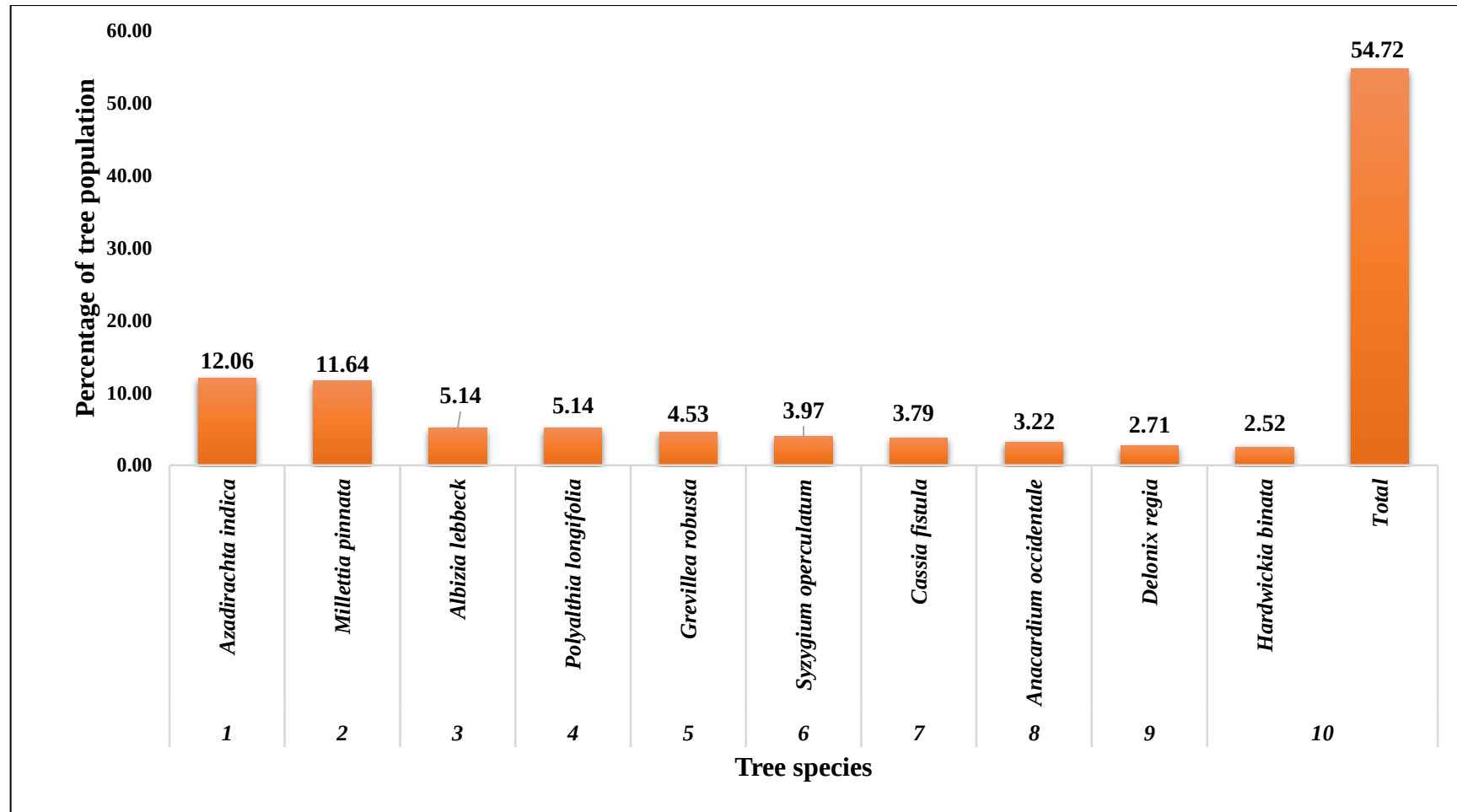


Fig. 4: Top ten dominant tree species of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Botanical Garden was spread over an area of 26 hectare and found 2140 trees distributed among 186 tree species (Table 3). *Azadirachta indica* and *Millettia pinnata* were more frequently found in almost all the blocks, these trees comprise of 12.06% (Table 13) and 11.64% of total trees respectively. *Albizia lebbbeck* and *Polyalthia longifolia* contributes about 110 trees each to the total number of trees in the garden, which is about 10.28% (Table 13) of total tree population. *Grevillea robusta*, *Syzygium operculatum*, *Cassia fistula*, *Anacardium occidentale*, *Delonix regia* and *Hardwickia binata* comprise about 4.53%, 3.97%, 3.79%, 3.22%, 2.71% and 2.52% (Table 13) of total tree population in garden. These major 10 tree species were found in large numbers in the garden, this might be because these trees are well adapted to the tropical environment and have good root and shoot growth. Most of these trees are belonged to Fabaceae family, which are well adapted to tropical conditions (Narain and Singh, 2013).

Block-1 was dominated by *Polyalthia longifolia*, *Grevillea robusta* and *Roystonea regia* (Table 14) where these three constitutes about 43.73% of the tree population in the block. Block-2 was dominated by *Syzygium operculatum* (25%) and block-3, block-4, block-5, block-7 and block-8 were dominated by *Azadirachta indica*, where it contributes about 22.52%, 17.54%, 13.54%, 8.31% and 12.45% to the tree population of each block respectively.

4.3 Girth classes

Girth class distribution of trees in Botanical Garden varies from 0.3 m to 3.6 m (Table 15). The girth class of 0.3-0.6 m has highest number of individuals (732) and girth class 3.3-3.6 m has least number of individuals (2). This result was similar to the findings of Reddy *et al.* (2008), where Mudumalai wildlife sanctuary was having 65.4% of trees with girth size 0.3 m to 0.6 m.

In Botanical Garden it was observed that trees having higher girth size was lesser in number, which gives an inverted 'J' shaped curve (Fig. 5). Out of total 2140 trees, girth classes 0.3-0.6 m, 0.6-0.9 m, 0.9-1.2 m and 1.2-1.5 m comprise about 732, 726, 423 and 146 trees respectively, which aggregate to form about 94.73% of total tree population in the garden. But remaining girth classes contributes about only about 5.27%. This clearly

Table 15: Girth class distribution of tree species in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Girth class (m)	No. of trees	Percentage (%)
0.3-0.6	732	34.21
0.6-0.9	726	33.93
0.9-1.2	423	19.77
1.2-1.5	146	6.82
1.5-1.8	40	1.87
1.8-2.1	32	1.50
2.1-2.4	22	1.03
2.4-2.7	11	0.51
2.7-3.0	3	0.14
3-3.3.0	3	0.14
3.3-3.6	2	0.09
Total	2140	100.00

Table 16: Height class distribution of trees in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Height class (m)	No. of trees	Percentage (%)
1-3	75	3.50
3-6	143	6.68
6-9	548	25.61
9-12	481	22.48
12-15	287	13.41
15-18	237	11.07
18-21	272	12.71
21-24	93	4.35
24-27	4	0.19
Total	2140	100.00

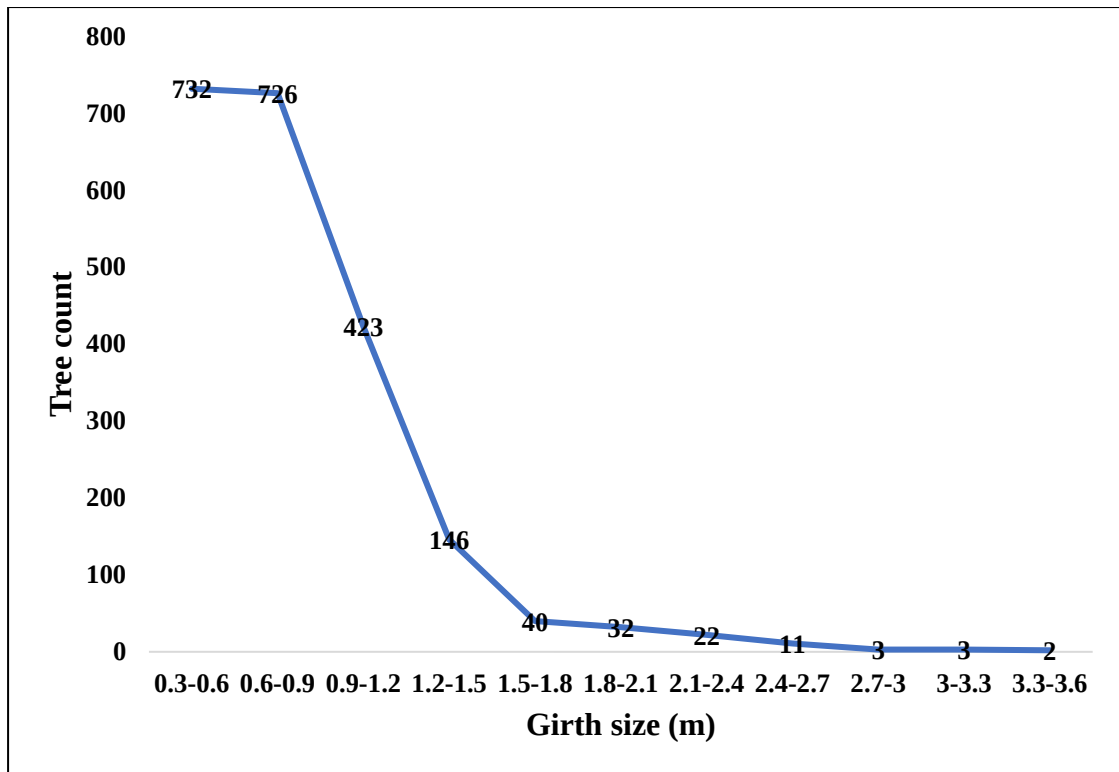


Fig. 5: Girth class distribution of tree species in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

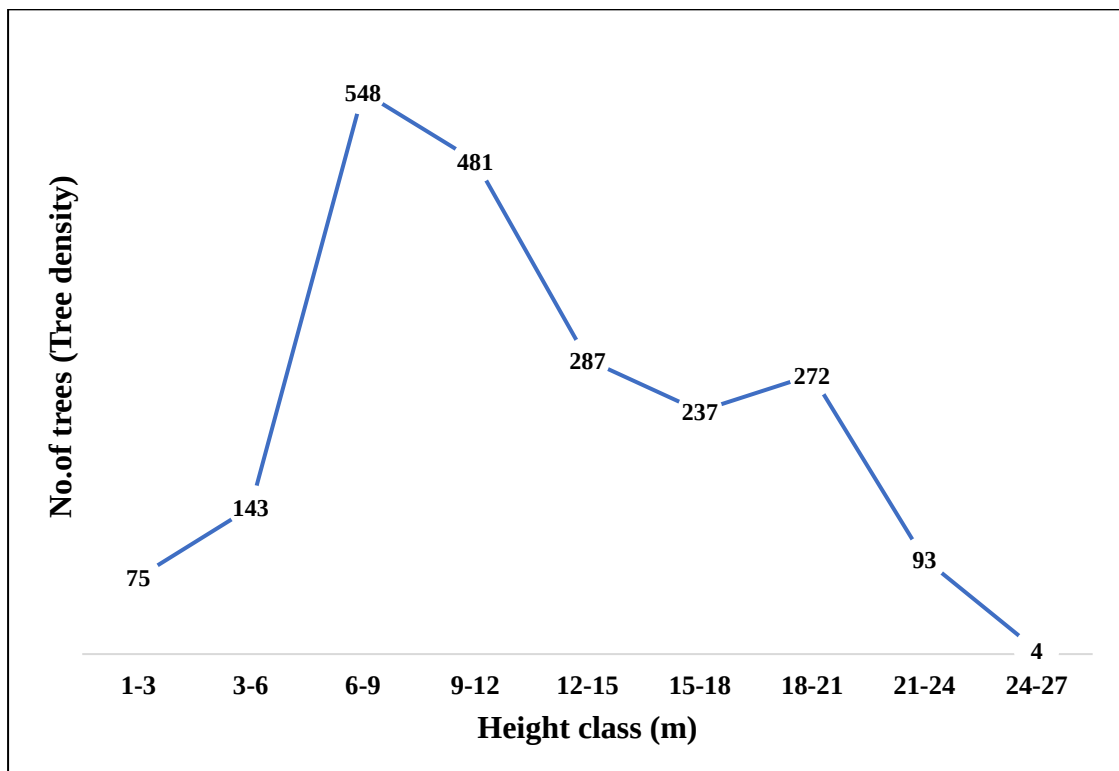


Fig. 6: Height class distribution of trees in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

indicates that more tree girth size class were lesser, which indicates that most of the trees in the Botanical Garden are younger with smaller to medium girth size. This might be due to good regeneration capacity of trees and most of the trees are planted in the garden few years back.

In a similar type of research conducted by Ndah *et al.* (2013) in Takamanda Rainforest, Cameroon found that with increasing girth size number of trees were decreased gradually and resulted in inverted 'J' shaped curve.

4.4 Height class distribution of trees

The relative height ensemble in the forest was an important criterion for understanding the nature of the forest. The tree heights in Botanical Garden ranged from 1 m to 27 m (Table 16). Most of the trees in Botanical Garden falls under the height class 6-9 m, where it comprises about 25.61% of total tree population and it was followed by 9-12 m height class, which consists about 22.48% of total tree population. From the Table-16, it was clear that trees were more under medium range height class (6-15 m), where around 61.5% (1316 trees out of 2140) of trees falls under this category. The height classes 1-3 m, 3-6 m, 12-15 m, 15-18 m, 18-21m, 21-24 m and 24-27 m contains 3.50%, 6.68%, 11.07%, 12.71%, 4.35% and 0.19% of trees respectively, which aggregates about 38.5% (824 individuals out of 2140 trees).

Trees having less height, tree density was also less and with increasing tree height, the tree density increases up to 9 m, later tree density followed the decreasing trend (Fig. 6). Similar type of results was found, where tree density increases with increasing height in natural forest and most of them categorized under the height class 10-20 m (Alamgir and Al-amin, 2005).

4.5 Carbon stock estimation of trees

4.5.1 Aboveground biomass and belowground biomass

For the estimation of above and belowground biomass carbon stock Botanical Garden was measured on the basis of girth at breast height (GBH) and height and also

calculated by using the desired equations. The aboveground biomass in botanical garden ranged from 45.76 Mg to 232.49 Mg (Table 17), where highest was recorded in block-6 (232.49 Mg) and lowest was recorded in block-10 (45.76 Mg). The AGB value was also close to those reported by Muller, (1982) for the tropical forests of eastern hardwood region of USA (330 Mg ha⁻¹), and by Brown and Lugo, (1982) for the tropical rain forests in Malaysia (225-446 Mg ha⁻¹) and Cameroon (238-341 Mg ha⁻¹). Borah *et al.* (2013) reported that AGB was ranged from 32.47 Mg ha⁻¹ to 261.64 Mg ha⁻¹.

Table 17: Aboveground biomass, belowground biomass and total tree biomass.

Blocks	Tree density	AGB (Mg)	BGB (Mg)	Total tree Biomass (Mg)
Block-1	295	166.55	43.30	209.85
Block-2	188	184.28	47.91	232.19
Block-3	222	195.37	50.80	246.17
Block-4	171	106.85	27.78	134.63
Block-5	192	162.47	42.24	204.72
Block-6	325	232.49	60.45	292.94
Block-7	208	122.13	31.75	153.89
Block-8	241	152.97	39.77	192.75
Block-9	195	156.60	40.72	197.32
Block-10	103	45.76	11.90	57.66
Grand Total	2140	1525.48	396.63	1922.11

AGB-Above ground biomass

BGB- Below ground biomass.

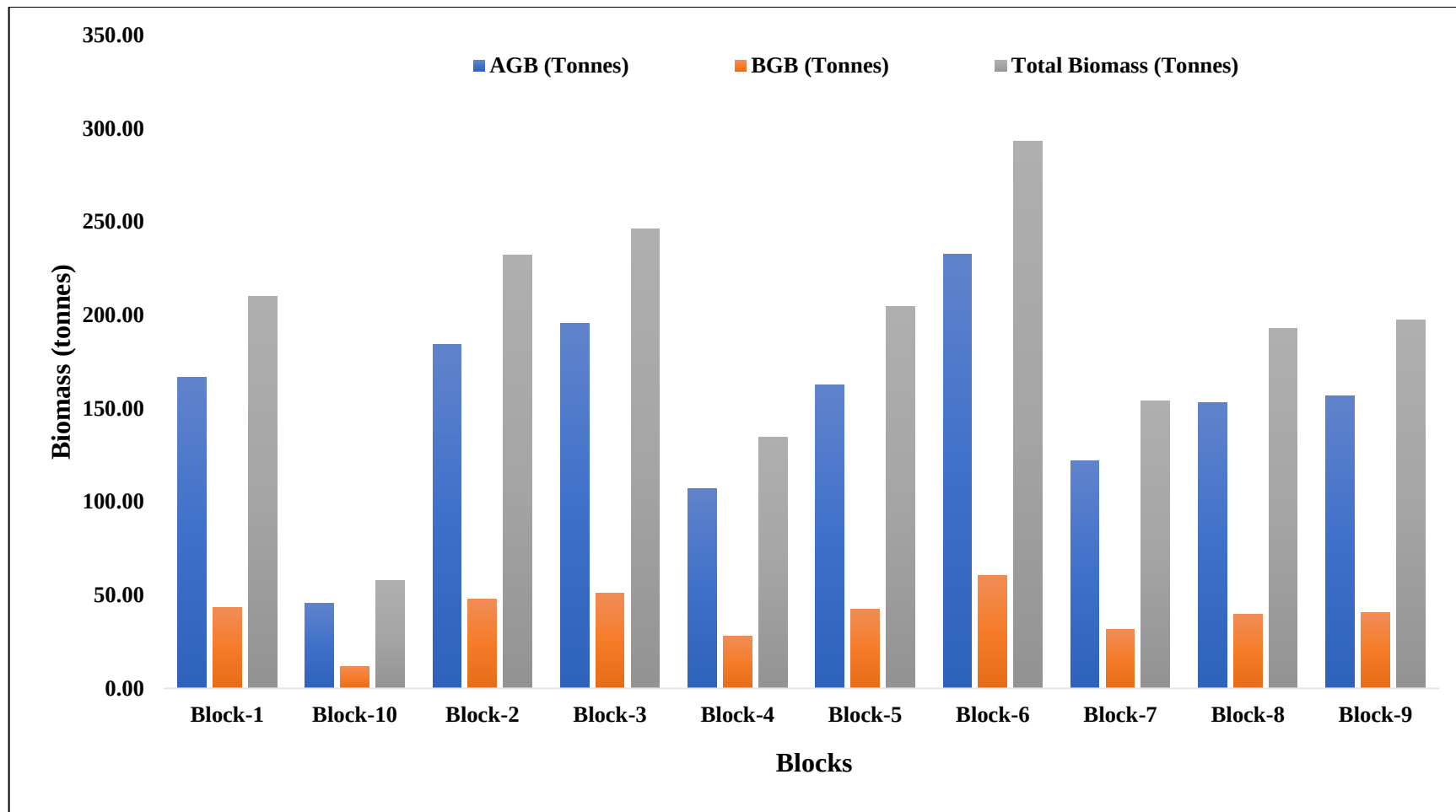


Fig. 7: Above ground biomass, below ground biomass and total tree biomass.

Belowground biomass in Mahatma Gandhi Botanical Garden ranged from 11.90 Mg to 60.45 Mg, where lowest was found in block-10 and highest in block-6. Total biomass from all the ten blocks was about 1922.11 Mg. Similar type of results was found by Jaman *et al.* (2016), where they recorded mean above and belowground biomass carbon stocks 53.53 Mg ha⁻¹ in home garden around four villages of two Upazilas of Rangpur district. Liu *et al.* (2014) also recorded that the AGC and BGC of Lesio-louna tropical rainforest of Congo were 168.60 Mg ha⁻¹ and 39.55 Mg ha⁻¹, respectively. Wondimu (2013) stated that the AGC and BGC of Biheretsige park in Addis Ababa were 21.7 Mg ha⁻¹ and 4.3 Mg ha⁻¹, respectively. The biomass accumulated by trees mainly depends on the tree girth size and height, higher the area occupied by the tree, more will be the biomass (Sudha and Ravindranath, 2000).

4.5.2 Biomass carbon in trees

Generally, for any plant species 45-50% of its biomass is considered as carbon (Pearson *et al.*, 2005b). Biomass carbon is the actual carbon content in the trees, it reflects the carbon sequestering capacity of trees.

Albizia lebbeck has the highest aboveground biomass (93.35 Mg) and belowground biomass carbon (24.27 Mg) followed by *Millettia pinnata*, *Azadirachta indica* and *Syzygium operculatum*. *Albizia lebbeck* trees in Botanical Garden have greater girth size, height and tree density, this might be the viable reason for highest tree biomass carbon in garden. *Millettia pinnata*, *Azadirachta indica* and *Syzygium operculatum* are greater in numbers (Table 13) in Botanical Garden, hence this might be the reason for their large tree biomass carbon. These top 20 tree species comprise around 762.74 Mg of aboveground biomass carbon, 198.32 Mg of belowground biomass carbon and 961.06 Mg of total tree biomass carbon (Table 18).

Millettia pinnata has the highest basal area (19.38 m²) (Table 19) with the tree density of 249 and total tree carbon stock was 96.56 Mg, which was 10.05% of total tree biomass carbon in the Botanical Garden. Even though *Albizia lebbeck* having lesser tree density (110) it's basal area (15.03 m²) was high and total tree carbon (117.62 Mg) was more than *Millettia pinnata*. *Albizia lebbeck* and *Ailanthus excelsa* are very large trees, hence have greater tree carbon and basal area even though the tree density was less

comparatively. The top ten tree species with respect to basal area comprise about 90.59 m² (54.64% of total basal area) of basal area, 1021 number of trees (47.71% of total trees) and 526.89 Mg of tree biomass carbon (54.82% of total tree biomass carbon in garden).

The total tree carbon for exotic species was 509.81 Mg and for native species was 451.25 Mg (Table 20). Block-3, block-7, block-8 and block-9 showed greater tree biomass carbon for native tree species than exotic tree species, this might be due to these blocks contain a greater number of native tree species than exotic species (Table 6 and Table 7). The native species like *Syzygium cumini*, *Albizia odoratissima* and *Hardwickia binata* were large trees, which can accumulate greater quantities of carbon in their tissues (Sharma *et al.*, 2020). Since the population of *Azadirachta indica* and *Millettia pinnata* were more in these blocks contribute to greater carbon than exotic trees. Remaining all other blocks were dominated by different exotic tree species, where exotic trees like *Acacia auriculiformis*, *Albizia amara*, *Albizia lebbeck*, *Eucalyptus citriodora*, *Ficus lyrata* etc., were naturally grown and were present before establishment of botanical garden, hence they have adopted to the surrounding conditions and they were older than other indigenous tree species and grown large in size, hence due to more exposure of canopy to sunlight, vertical competition for resources is less, which increases the photosynthesis rate in those exotic tree species. This may be the reason for greater biomass carbon in exotic tree species in botanical garden than indigenous/native to India tree species. The results of Luyssaert *et al.* (2008) and Sharma *et al.* (2010) support the present findings that taller, older trees with larger girths store larger amounts of carbon. Whereas native species like *Millettia pinnata*, *Tectona grandis*, *Terminalia arjuna*, *Polyalthia longifolia*, *Mangifera indica*, *Ixora brachiata* etc., were more in numbers distributed all over the botanical garden. These tree species were having comparatively less canopy and smaller in size, hence the biomass accumulation among these native tree species was lesser than exotic tree species.

Overall, the exotic tree species in botanical garden were having higher biomass carbon when compared to native tree species, because the exotic tree species like *Acacia auriculiformis*, *Albizia lebbeck*, *Eucalyptus spp.* and *Syzygium operculatum* were naturally present well before the establishment of botanical garden and are huge in size when compared to native trees and few *Ficus spp.*, also contributes to carbon stock of exotic tree species. This shows that the exotic tree species were well adopted to the indigenous conditions.

Table 18: Above ground biomass carbon, below ground biomass carbon and total biomass carbon of top 20 trees in Botanical Garden.

Sl. No.	Tree species	Tree density	AGB C (Mg)	BGB C (Mg)	Total Biomass C (Mg)
1	<i>Albizia lebbeck</i>	110	93.35	24.27	117.62
2	<i>Millettia pinnata</i>	249	76.63	19.93	96.56
3	<i>Azadirachta indica</i>	258	68.84	17.90	86.73
4	<i>Syzygium operculatum</i>	85	42.67	11.09	53.77
5	<i>Eucalyptus citriodora</i>	50	28.44	7.40	35.84
6	<i>Leucaena leucocephala</i>	46	27.87	7.25	35.12
7	<i>Hardwickia binata</i>	54	27.72	7.21	34.92
8	<i>Delonix regia</i>	58	24.21	6.30	30.51
9	<i>Albizia amara</i>	35	22.90	5.95	28.85
10	<i>Grevillea robusta</i>	97	21.64	5.63	27.27
11	<i>Acacia auriculiformis</i>	42	21.46	5.58	27.04
12	<i>Albizia odoratissima</i>	35	21.39	5.56	26.95
13	<i>Tamarindus indica</i>	28	19.71	5.12	24.83
14	<i>Ailanthus excelsa</i>	11	19.00	4.94	23.95
15	<i>Anacardium occidentale</i>	69	18.98	4.93	23.91
16	<i>Eucalyptus tereticornis</i>	19	17.82	4.63	22.45
17	<i>Diospyros melanoxylon</i>	15	13.86	3.60	17.46
18	<i>Roystonea regia</i>	42	11.41	2.97	14.38
19	<i>Eucalyptus globulus</i>	36	11.36	2.95	14.31
20	<i>Melia dubia</i>	13	9.26	2.41	11.67
Total		1352	598.52	155.62	754.14
Grand total of BG		2140	762.74	198.32	961.06

AGB C- Above ground biomass carbon

BGB C- Below ground biomass carbon

BG- Botanical Garden

Table 19: Top ten tree species based on total basal area with their tree density, total carbon accumulation in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Tree species	Sum of Basal Area (m ²)	Tree density	Total tree biomass carbon (Mg)	Percentage of total tree carbon
1	<i>Millettia pinnata</i>	19.38	249	96.56	10.05
2	<i>Azadirachta indica</i>	17.79	258	86.73	9.02
3	<i>Albizia lebbeck</i>	15.03	110	117.62	12.24
4	<i>Anacardium occidentale</i>	9.12	69	23.91	2.49
5	<i>Syzygium operculatum</i>	6.70	85	53.77	5.59
6	<i>Leucaena leucocephala</i>	5.45	46	35.12	3.65
7	<i>Grevillea robusta</i>	4.51	97	27.27	2.84
8	<i>Ailanthus excelsa</i>	4.34	11	23.95	2.49
9	<i>Hardwickia binata</i>	4.22	54	34.92	3.63
10	<i>Acacia auriculiformis</i>	4.04	42	27.04	2.81
Total		90.59	1021	526.89	54.82
Grand Total of garden		165.78	2140	961.06	100
Percentage (%)		54.64	47.71	54.82	54.82

Table 20: Total carbon stock of exotic and native tree species in different blocks of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Total carbon (Mg 2.6 ha ⁻¹)											
Type of trees	Block-1	Block-2	Block-3	Block-4	Block-5	Block-6	Block-7	Block-8	Block-9	Block-10	Grand Total
Exotic	63.49	59.98	60.62	35.68	75.42	86.69	30.87	39.79	38.71	18.56	509.81
Native	41.44	56.12	62.46	31.63	26.94	59.78	46.07	56.58	59.96	10.27	451.25
Grand Total	104.93	116.09	123.09	67.32	102.36	146.47	76.94	96.37	98.66	28.83	961.06

Table 21: Total carbon of natural and planted tree species in different blocks of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Total carbon (Mg 2.6 ha ⁻¹)											
Type of trees	Block-1	Block-2	Block-3	Block-4	Block-5	Block-6	Block-7	Block-8	Block-9	Block-10	Grand Total
Natural	41.19	33.26	21.69	29.41	60.43	84.48	42.89	45.40	46.14	13.29	418.20
Planted	63.74	82.83	101.39	37.90	41.93	61.99	34.05	50.98	52.52	15.53	542.86
Grand Total	104.93	116.09	123.09	67.32	102.36	146.47	76.94	96.37	98.66	28.83	961.06

Table 22: Top ten tree species of Mahatma Gandhi Botanical Garden based on CO₂ sequestration.

Sl. No.	Tree species	Tree density	Total biomass Carbon (Mg)	Total CO ₂ sequestration (Mg)	CO ₂ Sequestration (%)	CO ₂ sequestration per tree (Mg tree ⁻¹)
1	<i>Albizia lebbeck</i>	110	117.62	431.68	12.24	3.92
2	<i>Millettia pinnata</i>	249	96.56	354.38	10.05	1.42
3	<i>Azadirachta indica</i>	258	86.73	318.31	9.02	1.23
4	<i>Syzygium operculatum</i>	85	53.77	197.32	5.59	2.32
5	<i>Eucalyptus citriodora</i>	50	35.84	131.53	3.73	2.63
6	<i>Leucaena leucocephala</i>	46	35.12	128.88	3.65	2.80
7	<i>Hardwickia binata</i>	54	34.92	128.17	3.63	2.37
8	<i>Delonix regia</i>	58	30.51	111.97	3.17	1.93
9	<i>Albizia amara</i>	35	28.85	105.89	3.00	3.03
10	<i>Grevillea robusta</i>	97	27.27	100.08	2.84	1.03
Total		1042	547.20	2008.21	56.94	1.93
Grand Total of garden		2140	961.06	3527.07	100	1.65

Botanical garden contains about 174 planted tree species and 12 tree species were naturally present before the establishment of botanical garden (Table 4 and Table 5). Since the number of planted tree species in botanical garden was much higher than that of natural trees, the biomass carbon accumulated by planted tree species (542.86 Mg) found greater than natural tree species (418.20 Mg). In all the blocks except block-5, block-6 and block-7, the biomass carbon of planted trees was more than that of natural tree species, this might be due to the presence of greater number of planted trees than natural tree species. But in block-5, block-6 and block-7, were dominated by natural tree species like *Azadirachta indica*, *Millettia pinnata* and *Albizia lebbeck* (Table 21), where these three tree species comprise around 20-45% of the total tree population of respective blocks, hence these three blocks have more total carbon than that of planted trees.

Shrestha *et al.* (2016) reported that individual trees of the same species may differ in their growth and biomass production in different sites. Other researchers confirmed that the number of trees and species varied with the nature of the species, tree age, stand conditions, species composition, edaphic conditions and degree of biotic disturbance. Hence, the variation in biomass carbon in native and exotic trees as well as between planted trees and natural trees may be due to difference in tree age, tree density and adopting capacity of the particular tree species to its surrounding environmental conditions

4.5.3 CO₂ sequestration by trees

Nowadays due to conversion of forest land into farmlands, urban areas and mining to meet the several requirements of human, which decreases the capacity of natural carbon sinks. Hence, the carbon released due to extensive human activities polluting the nature. In order to decrease the carbon content in atmosphere, it is necessary to know the carbon sequestration capacity of different tree species and plant them all over the polluted areas. From Table 22, it is evident that *Albizia lebbeck* has the highest capacity to accumulate carbon dioxide (431.68 Mg) in its tissues, which amounts to 12.24% of total CO₂ sequestered by the trees in Botanical Garden. Carbon sequestration by *Millettia pinnata*, *Azadirachta indica*, *Syzygium operculatum* and *Eucalyptus citriodora* trees were 354.38 Mg, 318.31 Mg, 197.32 Mg and 131.53 Mg of CO₂ respectively in their biomass. The top ten tree species accumulated about 2008.21 Mg (Table 22) of CO₂, which forms about

Table 23: Tree biomass carbon and CO₂ sequestration by trees of different families in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Family	Tree density	Total carbon (Mg)	Total CO ₂ sequestration (Mg)
1	Fabaceae	873	482.09	1769.27
2	Myrtaceae	199	137.61	505.01
3	Meliaceae	302	119.21	437.49
4	Proteaceae	97	27.27	100.08
5	Simaroubaceae	32	27.10	99.47
6	Anacardiaceae	86	26.99	99.06
7	Ebenaceae	22	23.03	84.52
8	Moraceae	38	21.92	80.44
9	Arecaceae	50	15.69	57.60
10	Malvaceae	25	14.20	52.11
11	Bignoniaceae	31	6.41	23.52
12	Sapindaceae	13	5.67	20.80
13	Casuarinaceae	9	4.46	16.37
14	Lamiaceae	42	3.97	14.59
15	Annonaceae	110	3.85	14.13
16	Sapotaceae	10	3.56	13.07
17	Araucariaceae	9	3.04	11.17
18	Rubiaceae	26	3.04	11.16
19	Oleaceae	7	3.02	11.08
20	Apocynaceae	10	3.02	11.07
21	Erythroxylaceae	23	2.83	10.38
22	Combretaceae	16	2.76	10.15
23	Santalaceae	19	2.76	10.14
24	Rutaceae	10	2.46	9.04

Sl. No.	Family	Tree density	Total carbon (Mg)	Total CO ₂ sequestration (Mg)
25	Euphorbiaceae	13	2.27	8.35
26	Rhamnaceae	7	2.03	7.44
27	Cannabaceae	5	1.69	6.22
28	Lythraceae	5	1.62	5.94
29	Ulmaceae	1	1.38	5.07
30	Phyllanthaceae	6	1.01	3.70
31	Pinaceae	10	0.88	3.22
32	Lecythidaceae	5	0.81	2.97
33	Podocarpaceae	4	0.71	2.62
34	Celastraceae	2	0.45	1.66
35	Cornaceae	1	0.32	1.17
36	Calophyllaceae	2	0.27	1.00
37	Dipterocarpaceae	4	0.24	0.89
38	Verbenaceae	1	0.23	0.85
39	Menispermaceae	1	0.21	0.78
40	Sterculiaceae	1	0.21	0.76
41	Cupressaceae	3	0.14	0.52
42	Araliaceae	1	0.14	0.51
43	Moringaceae	3	0.14	0.51
44	Oxalidaceae	1	0.12	0.43
45	Burseraceae	1	0.07	0.25
46	Lauraceae	2	0.07	0.25
47	Clusiaceae	1	0.04	0.16
48	Elaeocarpaceae	1	0.03	0.09
Grand Total		2140	961.06	3527.07

56.94% of total CO₂ sequestered by all the tree in Botanical Garden. Some important physiological features which enhance carbon dioxide uptake, photosynthetic efficiency and thus carbon sequestration include: Tree crown architecture, phyllotaxy, number and orientation of stomata on leaf surface, availability of CO₂ around stomata, stomatal aperture and conductance *etc.* (Tripathi, 2016). These might be the reason for dominance of these ten tree species (Table 22) with respect to CO₂ sequestration.

Among the top ten dominant tree species carbon sequestration per tree was found to be highest in *Albizia lebbeck* (3.92 Mg ha⁻¹) followed by *Albizia amara* (3.03 Mg ha⁻¹), which might be due to their faster growth rate as well as higher carbon sequestration potential (Sharma *et al.*, 2020).

Fabaceae was the most dominant family consists of 873 trees in Botanical Garden (Table 23), which accumulated about 482.09 Mg of tree biomass carbon and sequestered about 1769.27 Mg of CO₂ from the atmosphere followed by Myrtaceae (137.61 Mg), Meliaceae (119.21 Mg), Proteaceae (27.27 Mg), Simaroubaceae (27.10 Mg). The low total tree carbon was found in Burseraceae, Lauraceae, Clusiaceae and Elaeocarpaceae that is 0.07 Mg, 0.07 Mg, 0.04 Mg and 0.03 Mg respectively, this might be due to their lesser tree density.

Albizia lebbeck, *Leucaena leucocephala*, *Hardwickia binata*, *Delonix regia*, *Albizia amara* and *Tamarindus indica* trees were large, which have wider canopy. When greater area of canopy exposed to sunlight leads to higher photosynthesis, which in turn increases the biomass carbon accumulation. Ultimately more amount of CO₂ will be sequestered by trees. Similar findings were reported by Abd Rahman *et al.* (2014) and they observed that trees belong to Fabaceae family grow faster, accumulate higher amounts of carbon and have the higher CO₂ sequestering potential, this was mainly because these trees were resistant to environmental stress, tolerant to drought conditions and can survive in soils containing less nutrients.

4.6 Depthwise distribution of soil properties in different blocks

Slight variation in textural properties (sand, silt and clay proportions) of soils at different depths was observed in all the blocks. The textural classes and particle size distribution of soils at different depths is presented in Table 24.

4.6.1 Particle size distribution at different depths

4.6.1.1 Per cent sand

Sand percentage in the soil varied significantly at different depths and but not among the blocks. The sand percentage was found highest at the depth 60-90 cm, followed by 0-30 cm in all the blocks (Table 24). The sand percentage among blocks at different depths ranged from 55.1% to 57.7%. The average sand percentage among all the blocks at the depths 0-30 cm, 30-60 cm and 60-90 cm are 56.09%, 55.50% and 56.10% respectively. The sand percentage initially decreased from 0-30 cm depth to 30-60 cm, but later it increased at the depth of 60-90 cm. These results were in agreement with the findings of Amgain *et al.* (2020).

4.6.1.2 Per cent silt

The silt percentage in soils at different depths varied significantly but there was no significant difference among the blocks was observed. The silt content was found between 22 to 33.55 per cent (Table 24). Maximum of silt was found at the depths 0-30 cm and 60-90 cm. The average silt percentage in different blocks at the depths 0-30 cm, 30-60 cm and 60-90 cm were 33.16%, 23.12% and 33.10%. The variation in silt content on the surface might be due to erosion (Amgain *et al.*, 2020). In 60-90 cm depth the increase in silt might due to sedimentation of silt particles along with water. There was no definite sequence of increase or decrease in silt content was observed in different blocks.

4.6.1.3 Per cent clay

Clay content (Table 24) of soils differed significantly at different depths and but no significant differences were recorded among the different blocks. Clay percentage in

Table 24: Particle size distribution and textural class at different depths in Mahatma Gandhi Botanical Garden, GKV, Bengaluru.

Blocks	Soil Depth (cm)	Sand %	Silt%	Clay%	Textural class
B-1	0-30	56.10	33.20	10.70	Sandy loam
	30-60	55.75	23.70	20.55	Sandy clay loam
	60-90	56.50	33.30	10.20	Sandy loam
B-2	0-30	56.90	32.95	10.15	Sandy loam
	30-60	55.70	22.70	21.60	Sandy clay loam
	60-90	56.75	33.20	10.05	Sandy loam
B-3	0-30	56.15	33.15	10.70	Sandy loam
	30-60	55.30	23.25	21.45	Sandy clay loam
	60-90	56.75	32.95	10.30	Sandy loam
B-4	0-30	56.10	33.35	10.55	Sandy loam
	30-60	55.35	23.30	21.35	Sandy clay loam
	60-90	56.65	32.35	11.00	Sandy loam
B-5	0-30	56.75	33.20	10.05	Sandy loam
	30-60	55.10	23.25	21.65	Sandy clay loam
	60-90	57.70	32.20	10.10	Sandy loam
B-6	0-30	55.50	33.30	11.20	Sandy loam
	30-60	55.40	23.05	21.55	Sandy clay loam
	60-90	56.10	33.25	10.65	Sandy loam
B-7	0-30	56.45	32.15	11.40	Sandy loam
	30-60	57.10	22.00	20.90	Sandy clay loam
	60-90	56.65	33.55	9.80	Sandy loam
B-8	0-30	55.45	33.45	11.10	Sandy loam
	30-60	55.10	23.55	21.35	Sandy clay loam
	60-90	56.85	33.55	9.60	Sandy loam
B-9	0-30	55.90	33.25	10.85	Sandy loam
	30-60	55.65	22.70	21.65	Sandy clay loam
	60-90	56.70	33.00	10.30	Sandy loam
B-10	0-30	55.60	33.60	10.80	Sandy loam
	30-60	54.50	23.65	21.85	Sandy clay loam
	60-90	56.15	33.60	10.25	Sandy loam
CD at 5%					
Blocks		NS	NS	NS	
Depth		0.50	0.47	0.47	

NS- Non significant

different blocks ranged from 9.60% to 21.65%. Average clay content was observed highest at 30-60 cm depth and lowest at the depth 0-30 cm, followed by 60-90 cm depth. This might be due to the movement or accumulation of clay from surface soil to sub surface along with infiltrating water (Amgain *et al.*, 2020). The soils of Botanical Garden vary from sandy loam to sandy clay loam.

4.6.2 Depthwise distribution of soil physical properties

The soil physical properties such as particle density, bulk density, porosity and maximum water holding capacity of different blocks at three depths were determined and presented in the Table 25.

4.6.2.1 Bulk density

Bulk density of soils in different blocks varied significantly as well as among three depths. Bulk density of soils at different depths among all the blocks ranged from 1.11 to 1.35 Mg m⁻³ (Table 25). The bulk density was observed highest at the depth 60-90 cm and lowest at the surface soils (0-30 cm). The surface soils have lower bulk density because of the presence of rich organic matter, where the moderate amount of clay content coupled with higher organic matter, humus and root exudation by the root system which may have helped in the formation of better soil aggregates there by improving the bulk density., but as depth increases the organic matter content in the soil also decreases gradually, which leads to increase in bulk density.

Tandel *et al.* (2009) also observed an increase in soil bulk density at all the soil depths under tree cover. Similar results were also reported by Pingale, (2009) and Ghimire, (2010) under different tree densities. Lower organic matter contents, less aggregation, fewer roots and fewer soil dwelling organisms leads to soil compaction because of the increased weight caused by the overlying layers (Brady and Weil, 2017).

4.6.2.2 Particle density

Particle density values of soil among the different blocks as well as between the three soil depths were not significantly different. Particle density values at different depths ranged from 2.07 to 2.82 Mg m⁻³ (Table 25). Particle density also increased with increasing

Table 25: Soil physical properties of different blocks in Mahatma Gandhi Botanical Garden at three depths.

Blocks	Soil depth (cm)	Bulk density (Mg m⁻³)	Particle density (Mg m⁻³)	Porosity (%)	MWHC (%)
B-1	0-30	1.11	2.07	46.38	35.08
	30-60	1.22	2.26	46.02	34.4
	60-90	1.28	2.37	45.99	33.6
B-2	0-30	1.20	2.24	46.43	36.1
	30-60	1.24	2.32	46.55	35.16
	60-90	1.34	2.82	44.63	33.48
B-3	0-30	1.22	2.32	47.41	36.72
	30-60	1.24	2.36	47.46	36.8
	60-90	1.28	2.37	45.99	34.24
B-4	0-30	1.19	2.26	47.35	36.45
	30-60	1.21	2.28	46.93	35.38
	60-90	1.26	2.34	46.15	34.94
B-5	0-30	1.21	2.28	46.93	35.54
	30-60	1.25	2.32	46.12	34.98
	60-90	1.31	2.41	45.64	34.4
B-6	0-30	1.23	2.34	47.44	35.78
	30-60	1.26	2.38	47.06	35.42
	60-90	1.28	2.36	45.76	34.92
B-7	0-30	1.20	2.29	47.60	36.34
	30-60	1.24	2.31	46.32	34.36
	60-90	1.29	2.40	46.25	33.94
B-8	0-30	1.29	2.21	41.63	30.6
	30-60	1.31	2.24	41.52	30.08
	60-90	1.35	2.28	40.79	29.9
B-9	0-30	1.16	2.20	47.27	36.46
	30-60	1.25	2.32	46.12	35.15
	60-90	1.31	2.44	46.31	34.88
B-10	0-30	1.19	2.24	46.88	34.96
	30-60	1.23	2.28	46.05	33.64
	60-90	1.27	2.32	45.26	32.82
CD at 5%					
Blocks		0.05	NS	0.76	0.95
Depth		0.03	NS	0.42	0.52

NS- Non significant

depth, surface soils had comparatively less particle density and gradually it increased in the second depth and highest values in 60-90 cm depth were recorded. This is mainly because of decrease in soil organic matter with increasing depth. Similar results were observed by Tandel *et al.* (2009).

4.6.2.3 Porosity

Porosity percentage was found highest in top soil (47.60%) of block-7 and lowest was found at the depth 60-90 cm in block-8 (40.79%). Porosity varied significantly depthwise as well as between the blocks (Table 25). The average porosity at the depths 0-30 cm, 30-60 cm and 60-90 cm was found 46.53%, 46.02% and 45.28% respectively. Porosity in the soil decreased with increasing soil depths, mainly due to decrease in soil organic matter at deeper layers of soil. The continuous addition of organic matter under perennial trees helps in maintaining the soil structure and reduces the soil crust formation thus increases the micro pores and macro pores in soil. The soil pore space is inversely related to soil bulk density. The results were in agreement with results of Uthappa, (2021).

4.6.2.4 Maximum water holding capacity

Maximum water holding capacity varied significantly between the blocks and between the three depths of soil in all the blocks (Table 25). Maximum water holding capacity in different blocks at three depths ranged from 29.90% to 36.80%. The highest maximum water holding capacity was observed in block-3 at the depth 30-60 cm and lowest in block-8 at 60-90 cm depth. The average percentage of maximum water holding capacity in soil at 0-30 cm, 30-60 cm and 60-90 cm was found to be 35.40%, 34.54% and 33.71%. It was observed that with increasing soil depth, the maximum water holding capacity of soil decreased gradually, mainly due to the availability of more organic matter at the surface due to litter fall than sub surface. The results were in agreement with results of Uthappa, (2021).

4.6.3 Depthwise changes in soil chemical properties

Variation of soil chemical properties in all the blocks at different depths were presented in the Table 26.

4.6.3.1 Soil pH

The values differed significantly between block and at different depths. The pH ranged from 4.46 at 0-30 cm soil depth of block-6 to 5.94 at 30-60 cm soil depth of block-7 (Table 26). The average pH values at depth 0-30 cm, 30-60 cm and 60-90 cm were 5.08, 5.26 and 5.60. Soil pH values were recorded lowest in the surface soil, as the depth increases the soil pH values also increased. This might be due to presence of more organic matter on the surface soil, where the microbial activity was greater compared to deeper layers. Microbial activity releases different organic acids, which ultimately decreases the pH value. These results were in agreement with findings of Rukshana *et al.* (2014). This might be also due to accumulation of exchangeable bases (calcium and magnesium) in the lower layers. Similar observations were reported by Bowman *et al.* (2008).

4.6.3.2 Electrical conductivity

Electrical conductivity values at different blocks and at all the three depths varied significantly. The EC values were found highest in surface soils (0-30 cm soil depth) and lowest at the 60-90 cm depth cm. EC values ranged from 0.02 dS m⁻¹ to 0.1 dS m⁻¹. The average EC values at depths 0-30 cm, 30-60 cm and 60-90 cm were 0.05 dS m⁻¹, 0.03 dS m⁻¹ and 0.03 dS m⁻¹ respectively. As the depth increases the electrical conductivity decreased, this may be because of the presence of organic matter on the surface soil, where the organic matter content decreases with increasing depth. Similar trends were reported by Newaj *et al.* (2007) and Akhtar *et al.* (2008). Ghimire, (2010) also reported that EC was higher at top layer and decreased with increasing depth.

4.6.3.3 Soil organic carbon

Soil organic carbon varied significantly between blocks and at different soil depths (Table 26). Soil organic carbon was found highest in surface soils (0-30 cm), where values ranged from 0.87% to 1.35% and lowest values at deeper layer (60-90 cm), where values ranged from 0.6-1.02%. The OC% was very decent at the depth 30-60 cm, values ranged from 0.75-1.2%. The average OC% at 0-30 cm, 30-60 cm and 60-90 cm were 1.10%, 0.96% and 0.81%.

Table 26: Soil pH, electrical conductivity and organic carbon of different blocks in Mahatma Gandhi Botanical Garden at three depths.

Blocks	Soil depth (cm)	pH	EC (dS m⁻¹)	Organic carbon (%)
B-1	0-30	4.92	0.06	0.87
	30-60	5.10	0.05	0.78
	60-90	5.68	0.04	0.69
B-2	0-30	5.12	0.04	1.35
	30-60	5.19	0.04	1.20
	60-90	5.47	0.03	1.02
B-3	0-30	5.77	0.04	1.26
	30-60	5.92	0.03	1.17
	60-90	5.99	0.03	0.93
B-4	0-30	5.30	0.08	0.87
	30-60	5.36	0.05	0.75
	60-90	5.45	0.04	0.60
B-5	0-30	5.63	0.05	1.20
	30-60	5.66	0.04	0.78
	60-90	5.83	0.03	0.63
B-6	0-30	4.46	0.03	1.08
	30-60	4.66	0.02	0.93
	60-90	5.10	0.02	0.75
B-7	0-30	4.86	0.03	1.14
	30-60	5.73	0.02	1.05
	60-90	5.94	0.02	0.93
B-8	0-30	5.29	0.10	1.05
	30-60	5.36	0.03	0.99
	60-90	6.03	0.03	0.84
B-9	0-30	4.60	0.03	0.96
	30-60	4.78	0.03	0.87
	60-90	4.87	0.02	0.75
B-10	0-30	4.55	0.03	1.17
	30-60	4.94	0.03	1.08
	60-90	5.89	0.02	0.93
CD at 5%				
Blocks		0.52	0.02	0.13
Depth		0.29	0.01	0.07

NS- Non significant

It was observed that with increasing depth soil OC% values decreased, this was mainly due to the decrease in organic matter in deeper layers. The presence of deciduous trees adds more amount of litter to the soil and results in higher organic carbon values at the surface soils. The results were due to the influence of standing trees, rate of litter fall, decomposition and dynamics of organic matter offered by roots at different depths. Similar variations in SOC with increasing soil depth have been reported by earlier studies of Singh and Sharma, 2012; Swamy and Puri, (2005); Chauhan *et al.* (2010) and Ghimire, (2010).

4.6.3.4 Available nitrogen

Soil nitrogen content at different depths in all the blocks varied significantly, but there was no significant difference among blocks. The available nitrogen in different blocks at all the three depths ranged from 100.35 to 238.34 kg ha⁻¹ (Table 27). The average available nitrogen value in depths 0-30 cm, 30-60 cm and 60-90 cm were 223.17 kg ha⁻¹, 211.99 kg ha⁻¹ and 190.67 kg ha⁻¹ respectively. Surface soils of all the blocks were found to be high in available nitrogen. The highest available nitrogen was found in surface soil of block-5, where trees belonging to Fabaceae are dominant. Trees belonging to Fabaceae family are leguminous and natural nitrogen fixers, hence symbiotic association with N-fixers increased nitrogen at the surface soil (Pandey *et al.*, 2020).

Nitrogen is the most important element measured in nutrient cycle as well as in determining the fertility of the soil. Significant differences were observed in nitrogen levels at different depths in all the blocks, but there was no significant difference observed among the blocks with respect to available nitrogen levels. Surface soils were found higher in nitrogen, which may attribute to the higher organic matter content as a result of litterfall and its accumulation on the top soil. These results were in agreement with the results of Ghimire, (2010) and Swamy *et al.* (2006). Duan *et al.* (2019) and Bhardwaj *et al.* (2001) also reported decreasing trend in available N content with increase in soil depth.

4.6.3.5 Available phosphorus

The phosphorus content in the soils at different depths in all the blocks varied significantly, but there was no evidence of significant difference of phosphorus values among the blocks (Table 27). The average available phosphorus values at 0-30 cm, 30-60

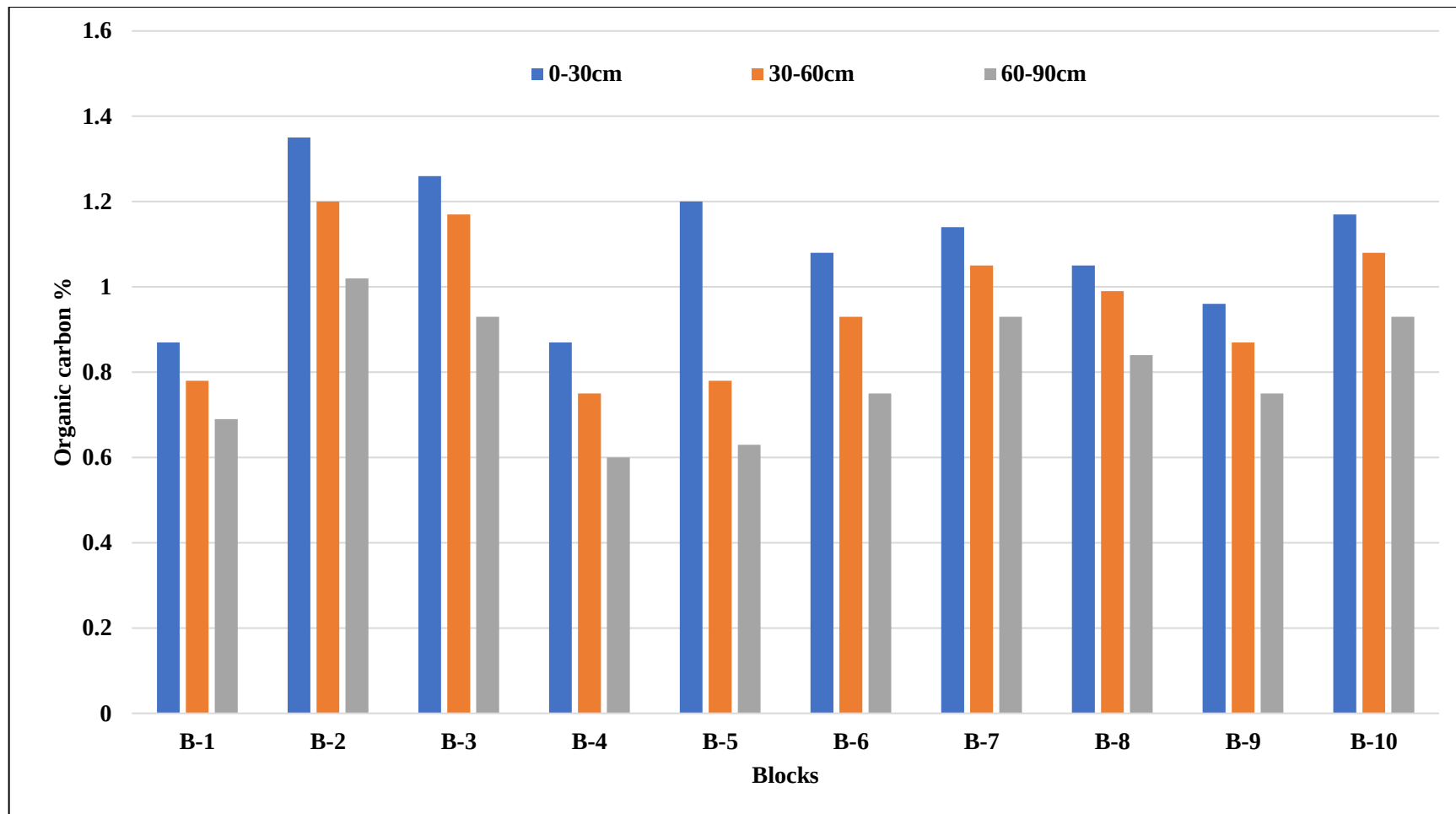


Fig. 8: Depthwise distribution of soil organic carbon.

Table 27: Soil available nitrogen, available phosphorus and available potassium of different blocks in Mahatma Gandhi Botanical Garden at three depths.

Blocks	Soil depth (cm)	Available N (kg ha⁻¹)	Available P₂O₅ (kg ha⁻¹)	Available K₂O (kg ha⁻¹)
B-1	0-30	225.79	74.59	91.39
	30-60	213.25	74.59	60.61
	60-90	200.70	72.31	59.00
B-2	0-30	225.69	80.85	79.03
	30-60	213.25	80.28	75.26
	60-90	200.70	76.30	63.30
B-3	0-30	224.79	88.25	87.23
	30-60	213.25	80.28	66.93
	60-90	213.25	74.02	48.38
B-4	0-30	225.79	76.87	105.10
	30-60	213.25	74.59	103.76
	60-90	200.70	74.59	89.91
B-5	0-30	238.34	92.24	188.70
	30-60	225.79	74.59	100.26
	60-90	188.16	74.02	83.33
B-6	0-30	225.79	78.01	101.07
	30-60	213.25	74.73	84.94
	60-90	100.35	74.59	71.50
B-7	0-30	213.25	79.14	81.72
	30-60	200.70	77.44	63.84
	60-90	200.70	72.88	56.72
B-8	0-30	213.25	76.87	111.96
	30-60	213.25	75.16	86.02
	60-90	200.70	74.02	78.36
B-9	0-30	213.25	79.71	100.93
	30-60	200.70	79.14	71.37
	60-90	200.70	71.17	63.84
B-10	0-30	225.79	82.56	84.13
	30-60	213.25	74.59	80.91
	60-90	200.70	73.45	64.51
CD at 5%				
Blocks		NS	NS	29.85
Depth		21.74	3.70	16.35

NS- Non significant

cm and 60-90 cm were 80.91 kg ha⁻¹, 76.59 kg ha⁻¹ and 73.74 kg ha⁻¹ respectively. The highest phosphorus value (92.24 kg ha⁻¹ in block-5) were found on the top soil and lowest at the depth 60-90 cm (71.17 kg ha⁻¹ in block-9). The highest phosphorus content at surface soil of block-5 is because of the fact that trees belonging to Fabaceae family are dominant there, where those trees grow vigorously and accumulate higher quantity of phosphorus from soil with their deeper root system and it is added back to surface soil in the form of litterfall (Misra, 2011). The values decreased with increase in depth in all the blocks this may be due to variation in clay and organic matter content of soil and due to soil reaction. The results were in agreement with the results of Duan *et al.* (2019); Lei *et al.* (2019); Swamy *et al.* (2006); Majumdar *et al.* (2004); and Ghimire, (2010).

4.6.3.6 Available potassium

Soil available potassium content varied significantly between the blocks as well as at all the three depths (Table 27). The available potassium content in soil among all the blocks ranged from 48.38 kg ha⁻¹ to 188.7 kg ha⁻¹. The highest values were found at the depth 0-30 cm and lowest at the depth 60-90 cm. The average soil potassium values at the depths 0-30 cm, 30-60 cm and 60-90 cm were 103.13 kg ha⁻¹, 79.39 kg ha⁻¹ and 67.89 kg ha⁻¹ respectively. Potassium content was found to be highest in surface soil of block-5, where the potassium was added to soil by trees in the form of litterfall. Trees of Fabaceae family have higher capacity to recycle nutrients *i.e.*, N, P and K to soil by litterfall (Misra, 2011), which was supported by higher microbial activity on the surface layer of soil for mineralization process.

The available potassium values decreased with increasing depth, mainly due to addition of potassium to the surface soil through litterfall and comparatively lesser quantity of potassium was observed at the deeper soil layers this may be because of mineral weathering. The results are similar with the results of Mishra and Swamy, (2007).

4.6.3.7 Exchangeable calcium

The exchangeable calcium values are presented in the Table 28. The exchangeable calcium values ranged between 2.6 to 4.8 c mol (p⁺) kg⁻¹. The calcium values varied significantly between the blocks but no significant differences were found between the

depths. The average values of exchangeable calcium at depths 0-30 cm, 30-60 cm and 60-90 cm were 3.81 c mol (p⁺) kg⁻¹, 3.47 c mol (p⁺) kg⁻¹ and 3.45 c mol (p⁺) kg⁻¹ respectively.

The calcium content generally decreased with increasing depth but it was observed that in block-5, block-6 and block-7 the values increased with increased depth. This may be due to accumulation of calcium in lower horizon due to leaching. The rest of the results were attributed due to the differential organic matter content and cycling of nutrients due to litterfall (Mishra *et al.*, 2003).

4.6.3.8 Exchangeable magnesium

The exchangeable magnesium content in soil varied significantly between the different depths but there was no significant difference between the blocks (Table 28). The highest magnesium content was observed in surface soil (2.9 c mol (p⁺) kg⁻¹ in block-1) and lowest in block-9 at the depth 60-90 cm. The average magnesium content at 0-30 cm, 30-60 cm and 60-90 cm were 1.78 c mol (p⁺) kg⁻¹, 1.57 c mol (p⁺) kg⁻¹ and 1.24 c mol (p⁺) kg⁻¹ respectively.

Generally, soil exchangeable magnesium content decreases with increasing depth but here in block-1 and block-10, it was increasing with increasing depth. This might be due to differential accumulation of organic matter and leaching of the bases.

Exchangeable calcium and magnesium contents were higher in sub surface horizon compared to surface horizons. This may be attributed to higher clay content and downward movement of bases to subsurface soil. These results were in agreement with the results of Mishra *et al.* (2003).

4.6.3.9 Available sulphur

The available sulphur values varied significantly between the depths but no significant different was found between the blocks (Table 28). Available sulphur values ranged from 39.48 mg kg⁻¹ to 123.05 mg kg⁻¹. The average sulphur content at 0-30 cm, 30-60 cm and 60-90 cm were 91.33 mg kg⁻¹, 68.83 mg kg⁻¹ and 54.94 mg kg⁻¹ respectively. The highest amount of available sulphur was found on the surface soil (0-30 cm), whereas

Table 28: Exchangeable calcium, exchangeable magnesium and available Sulphur of different blocks in Mahatma Gandhi Botanical Garden.

Blocks	Soil depth (cm)	Exchangeable calcium (c mol (p⁺) kg⁻¹)	Exchangeable magnesium (c mol (p⁺) kg⁻¹)	Available S (mg kg⁻¹)
B-1	0-30	4.4	2.9	85.54
	30-60	3.8	1.0	69.09
	60-90	3.7	1.5	50.01
B-2	0-30	4.3	1.7	123.05
	30-60	4.1	1.6	46.06
	60-90	4.0	1.3	39.48
B-3	0-30	3.4	1.8	76.33
	30-60	3.5	1.8	73.70
	60-90	2.6	1.3	70.41
B-4	0-30	4.8	2.3	103.31
	30-60	3.5	2.3	78.96
	60-90	3.6	1.6	69.75
B-5	0-30	2.9	1.7	101.99
	30-60	3.2	1.5	62.51
	60-90	3.3	1.0	48.69
B-6	0-30	2.6	1.5	84.22
	30-60	2.8	1.4	73.04
	60-90	3.5	1.0	63.17
B-7	0-30	3.9	1.4	83.57
	30-60	3.4	1.3	58.56
	60-90	3.8	1.3	53.30
B-8	0-30	4.6	2.2	66.46
	30-60	4.3	1.8	65.80
	60-90	4.3	1.7	59.88
B-9	0-30	3.9	1.3	101.33
	30-60	3.1	0.9	84.88
	60-90	2.7	0.6	61.19
B-10	0-30	3.3	1.0	87.51
	30-60	3.0	2.1	75.67
	60-90	3.0	1.1	33.56
CD at 5%				
Blocks		0.7	NS	NS
Depth		NS	0.4	17.34

NS- Non significant

lowest was found at the depth 60-90 cm. In all the blocks the sulphur content decreased with increasing depth, which signifies that sulphur content is dependent on organic matter. As the organic matter decreases with increasing soil depth, sulphur content also decreased with depth.

4.6.3.10 Micronutrients

The DTPA extractable micronutrients were presented in Table 29. Micronutrients are key nutrients, which are required to plants in smaller quantities but it is very essential to the plant growth and development.

4.6.3.10.1 Available iron

The iron content in soil at three depths varied significantly in all blocks and even significant difference of iron content between the blocks were also observed. The highest iron content was recorded at the surface soil of block-1 (24.5 mg kg⁻¹) and lowest at 60-90 cm of block-4 (9.35 mg kg⁻¹). The average iron content at depths 0-30 cm, 30-60 cm and 60-90 cm were 20.30 mg kg⁻¹, 13.20 mg kg⁻¹ and 10.55 mg kg⁻¹ respectively. The highest iron content was observed on the surface soils, this might be due to lower pH. The iron content decreased with increase in depth, this may be due to the increase in soil pH, which may be attributed due to leaching of bases down the soil layers. The lower content of iron may also be due to differential rate of nutrient uptake by the trees through their deeper roots. These results were similar to the findings of Jiang *et al.* (2009).

4.6.3.10.2 Available manganese

The available manganese content in the soil varied significantly both between blocks as well as among soil depths. The manganese content found highest at the soil depth 0-30 cm of block-1 (18.36 mg kg⁻¹) and lowest at the depth 60-90 cm of block-7 (12.17 mg kg⁻¹). The average manganese content at the depth 0-30 cm, 30-60 cm and 60-90 cm were 17.02 mg kg⁻¹, 15.09 mg kg⁻¹ and 13.82 mg kg⁻¹. The available manganese content decreased with increasing depth, this may be because of differential uptake of nutrients by trees through their deeper roots and along with that increasing pH also favours the decrease in manganese content. These results were similar to the findings of Jiang *et al.* (2009).

Table 29: Distribution of DTPA extractable micronutrients in different blocks of Mahatma Gandhi Botanical Garden.

Blocks	Soil depth (cm)	Fe (mg kg⁻¹)	Mn (mg kg⁻¹)	Zn (mg kg⁻¹)	Cu (mg kg⁻¹)
B-1	0-30	24.50	18.36	1.46	2.38
	30-60	15.50	14.22	1.26	0.96
	60-90	11.25	15.18	0.80	0.78
B-2	0-30	16.98	15.86	1.06	0.94
	30-60	11.72	14.37	0.84	0.92
	60-90	9.35	13.80	0.62	0.90
B-3	0-30	22.20	18.15	1.04	0.96
	30-60	10.82	15.43	0.84	0.90
	60-90	9.94	14.38	0.58	0.90
B-4	0-30	16.88	15.47	1.02	1.40
	30-60	10.48	14.76	0.82	0.96
	60-90	9.35	13.53	0.56	0.86
B-5	0-30	20.50	17.83	1.46	0.96
	30-60	15.40	15.45	0.70	0.92
	60-90	11.30	13.61	0.64	0.94
B-6	0-30	21.24	17.71	2.02	2.32
	30-60	12.30	15.37	1.42	1.98
	60-90	10.24	14.29	0.60	0.84
B-7	0-30	17.86	16.09	1.26	1.26
	30-60	12.38	14.85	0.80	1.08
	60-90	10.42	12.17	0.66	0.90
B-8	0-30	20.80	16.28	1.24	0.96
	30-60	13.26	15.03	0.76	0.56
	60-90	10.58	13.15	0.64	0.92
B-9	0-30	24.50	18.24	1.20	1.66
	30-60	15.54	16.48	0.62	0.92
	60-90	13.20	14.67	0.42	0.46
B-10	0-30	17.50	16.18	1.24	1.12
	30-60	14.56	14.92	0.80	0.94
	60-90	9.84	13.45	0.64	0.84
CD at 5%					
Blocks		1.20	1.30	0.34	NS
Depth		0.70	0.71	NS	NS

NS- Non significant

4.6.3.10.3 Available zinc

The available zinc content in soil was found to be significant between the blocks but not significant between the three depths. The zinc content at different depths among all the blocks varied from 0.42 mg kg⁻¹ to 2.02 mg kg⁻¹. The highest zinc content found at the surface soil (0-30 cm) of block-6 (2.02 mg kg⁻¹) and lowest at 60-90 cm depth soil of block-9 (0.42 mg kg⁻¹). The average content of zinc found at the depths 0-30 cm, 30-60 cm and 60-90 cm were 1.30 mg kg⁻¹, 0.89 mg kg⁻¹ and 0.62 mg kg⁻¹ respectively.

Surface soils found to have higher available zinc content, this may be attributed to recycling of nutrients and high organic carbon content at the surface but as depth increases the available zinc also decreased, this may be due to decrease in organic carbon as depth increases. The decrease in available zinc with successive increase in soil depth is shown in earlier studies (Jiang *et al.*, 2009). The higher amount of Zn at surface layer might also be due to release of zinc from the mineralization of litter in the top layer.

4.6.3.10.4 Available copper

Available copper content in soil found no significant difference both between blocks as well as between three depths. Available copper content varied from 0.46 mg kg⁻¹ to 2.38 mg kg⁻¹. The highest values were recorded at the surface soils of block-1 and lowest at 60-90 cm depth soil of block-9. The average copper content at the depths 0-30 cm, 30-60 cm and 60-90 cm were 1.40 mg kg⁻¹, 1.01 mg kg⁻¹ and 0.83 mg kg⁻¹ respectively. There was a slight decrease in copper content with increasing depth was observed, which may be attributed to decrease in organic carbon content over the deeper soil depths. Similar results were observed by Jiang *et al.* (2009).

4.6.4 Depthwise distribution of soil biological properties

The microbial population is very important in converting soil nutrients into available form. The microbial population (bacteria, fungi and actinomycetes) was measured at three different depths (0-30 cm, 30-60 cm and 60-90 cm) in all the ten blocks and presented in the Table 30.

Table 30: Soil microbial population in different blocks of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Blocks	Soil depth (cm)	No. of colony forming units g ⁻¹ of soil		
		Bacteria	Fungi	Actinomycetes
		1x10 ⁻⁵	1x10 ⁻³	1x10 ⁻³
Block-1	0-30	10.6	8.4	6.8
	30-60	5.8	6.4	4.0
	60-90	2.6	3.0	2.2
Block-2	0-30	11.2	9.6	6.2
	30-60	8.4	6.6	4.6
	60-90	4.8	3.2	2.8
Block-3	0-30	9.2	7.8	6.0
	30-60	6.2	5.4	4.2
	60-90	3.8	2.2	2.4
Block-4	0-30	8.8	7.0	6.4
	30-60	6.4	5.2	4.2
	60-90	3.4	3.2	2.6
Block-5	0-30	9.6	7.6	5.8
	30-60	6.6	5.4	3.6
	60-90	4.0	2.8	2.2
Block-6	0-30	9.4	8.2	6.6
	30-60	7.0	6.0	4.8
	60-90	4.2	3.0	3.6
Block-7	0-30	8.6	8.8	5.6
	30-60	5.8	6.8	3.8
	60-90	2.6	4.0	2.4
Block-8	0-30	7.2	8.6	5.2
	30-60	5.4	7.2	4.2
	60-90	2.4	3.8	2.8
Block-9	0-30	12.2	10.2	5.8
	30-60	8.4	7.8	3.6
	60-90	3.2	3.6	2.6
Block-10	0-30	11.8	8.6	6.4
	30-60	8.2	7.6	4.6
	60-90	5.2	3.0	2.4
CD at 5%				
Blocks		1.43	1.01	0.70
Depth		0.80	0.56	0.40

NS- Non significant

4.6.4.1 Bacterial population

Bacterial population varied significantly between the blocks as well as between the three different depths. The bacterial population was found highest in the block-9 (12.2 cfu g⁻¹) followed by block-10 (11.8 cfu g⁻¹) and block-2 (11.2 cfu g⁻¹), all these values recorded at the depth 0-30 cm. The lowest values were recorded at the depth 60-90 cm of block-8 (2.4 cfu g⁻¹), followed by block-7 (2.6 cfu g⁻¹) and block-1 (2.6 cfu g⁻¹). The average bacterial population at 0-30 cm, 30-60 cm and 60-90 cm were 9.86 cfu g⁻¹, 6.82 cfu g⁻¹ and 3.62 cfu g⁻¹ respectively.

The bacterial population were observed more at the surface soil and it decreased gradually with increasing depth, this may be due to the reduction in soil organic matter with increasing soil depth. Because the bacterial population mainly feed on the organic matter as their energy source. Decrease in aeration, increase in soil compaction and decrease in soil fertility may also influenced the decrease in bacterial population. These results were in agreement with the results of Bhattarai *et al.* (2015).

4.6.4.2 Fungal population

Fungal population showed significant variation between the blocks and also between the three depths of soil in Mahatma Gandhi Botanical Garden, GKVK. Fungi population was found to be highest at surface soil (0-30 cm) of block-9 and lowest at the deepest soil layer (60-90 cm) of block-3 (2.2 cfu g⁻¹). The Fungal population at the depth 0-30 cm ranged from 7-10.2 cfu g⁻¹, at the depth 30-60 cm ranged from 5.2 to 7.8 cfu g⁻¹ and at the depth 60-90 cm ranged from 2.2 to 4 cfu g⁻¹. It is found that the fungal population decreased with increasing soil depth. This may be due to decrease of soil nutrients and organic matter in deeper layers, and also due to increase in compaction, which decreases the aeration in the soil. Generally, fungi population was affected by the disturbance of the soil when compared with bacteria and actinomycetes. Since there was very least or no tillage in the botanical garden might have influenced the higher fungal population at the surface soils in all the blocks. These results were in agreement with the results of Bhattarai *et al.* (2015).

4.6.4.3 Actinomycetes population

The actinomycetes population varied significantly between the blocks as well as between the three depths. The actinomycetes population in botanical garden at three depths in all the blocks varied from 2.2 to 6.8 cfu g⁻¹. The highest population of actinomycetes was found in block-1 (6.8 cfu g⁻¹) at the depth of 0-30 cm and lowest was found in block-2 (2.2 cfu g⁻¹) and block-5 (2.2 cfu g⁻¹) at the depth 60-90 cm. The average fungal population at 0-30 cm, 30-60 cm and 60-90 cm were 6.08 cfu g⁻¹, 4.16 cfu g⁻¹ and 2.60 cfu g⁻¹ respectively.

Actinomycetes are ten times larger microbes than bacteria but their biomass in soil is very less due to their less number. These microbes were much tolerant to the tillage and dominates the tilled soils, but in botanical garden there was very less soil disturbance which might have created competition among bacteria and fungi, hence the population of actinomycetes found in garden soil was comparatively less. The actinomycetes population found to be decreased with increasing soil depth, it may be due to increasing soil compaction, which results in poor soil aeration and even organic matter and soil nutrients will decrease with increasing soil depth. These results are in agreement with results of Bhattarai *et al.* (2015).

4.6.4.4 Dehydrogenase activity

The dehydrogenase activity in soil found to be significantly between blocks as well as between the three depths in all the blocks. The dehydrogenase activity in soil was ranged from 22.15 to 75.63 µg TPF g⁻¹ soil 24h⁻¹ (Table 31). The highest activity was observed in block-2 at the depth 0-30 cm (75.63 µg TPF g⁻¹ soil 24h⁻¹) and lowest was observed in block-1 at the depth 60-90 cm (22.15 µg TPF g⁻¹ soil 24h⁻¹). The average dehydrogenase activity among all the blocks at 0-30 cm, 30-60 cm and 60-90 cm were 63.31 µg TPF g⁻¹ soil 24h⁻¹, 55.51 µg TPF g⁻¹ soil 24h⁻¹ and 44.82 µg TPF g⁻¹ soil 24h⁻¹.

Soil Dehydrogenase activity reflects the total range of oxidative activity of soil microflora and, consequently it may be a good indicator of microbiological activity in the soil (Skujins, 1973). The dehydrogenase activity found to decline with increase in soil

Table 31: Soil microbial activity at three different depths in different blocks of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Blocks	Soil depth (cm)	Dehydrogenase Activity	Urease activity	Phosphatase activity
		$\mu\text{g TPF g}^{-1} \text{ soil } 24\text{h}^{-1}$	$\mu\text{g NH}^+ \text{-N g}^{-1} \text{ of soil h}^{-1}$	$\mu\text{g of PNP g}^{-1} \text{ of soil h}^{-1}$
B-1	0-30	50.69	58.37	49.61
	30-60	41.52	55.06	48.67
	60-90	22.15	51.82	43.11
B-2	0-30	75.63	55.80	52.75
	30-60	69.81	52.47	49.78
	60-90	54.36	51.62	51.37
B-3	0-30	71.41	57.92	56.47
	30-60	66.30	54.97	51.38
	60-90	52.70	53.41	47.76
B-4	0-30	49.30	58.16	49.66
	30-60	42.50	54.68	47.26
	60-90	34.51	51.35	46.29
B-5	0-30	68.39	60.98	57.75
	30-60	44.52	57.43	46.70
	60-90	36.58	46.40	45.34
B-6	0-30	62.71	52.58	50.98
	30-60	54.89	49.61	47.41
	60-90	44.27	24.74	45.38
B-7	0-30	67.29	54.69	48.15
	30-60	61.98	51.34	44.34
	60-90	54.91	49.16	47.12
B-8	0-30	61.99	53.39	46.77
	30-60	58.45	51.46	45.73
	60-90	49.59	45.67	45.04
B-9	0-30	56.67	55.93	48.50
	30-60	51.36	51.92	48.15
	60-90	44.26	46.34	43.30
B-10	0-30	69.05	57.92	51.22
	30-60	63.73	54.70	46.26
	60-90	54.88	51.48	45.55
CD at 5%				
Blocks		8.12	8.30	4.40
Depth		4.45	4.53	2.40

NS- Non significant

depth and the maximum dehydrogenase activity were recorded in the surface horizon (0–30 cm). The major reason for increased DHA in the surface soil compared to the deeper soil depths was attributed to the greater availability of organic carbon, nutrients and stimulated microbial activity in the surface soil. DHA in soil depends on the content of soluble organic carbon (Casida, 1977; Zaman *et al.*, 2002) and the increased organic matter in the surface soil horizon enhanced the soil enzyme activities. Furczak and Joniec, (2007) showed that stimulation of DHA was accompanied by an increase in the number of the microbial groups and improvement in other living conditions (aeration and moisture). Significant correlations were observed between soil organic matter and enzyme activities (Bergstrom *et al.*, 1998; Roldan *et al.*, 2005).

4.6.4.5 Urease activity

The Urease activity was found be significantly different between the blocks and between the three depths of soil. The urease activity ranged from 24.74 $\mu\text{g NH}^+ \text{-N g}^{-1} \text{ 24h}^{-1}$ to 60.98 $\mu\text{g NH}^+ \text{-N g}^{-1} \text{ 24h}^{-1}$ (Table 31). The highest urease activity was observed at the surface soil (0-30 cm) of block-5 (60.98 $\mu\text{g NH}^+ \text{-N g}^{-1} \text{ 24h}^{-1}$) and lowest was found in block-6 at the depth 60-90 cm (24.74 $\mu\text{g NH}^+ \text{-N g}^{-1} \text{ 24h}^{-1}$). The average urease activity at three soil depths 0-30 cm, 30-60 cm and 60-90 cm were 56.57 $\mu\text{g NH}^+ \text{-N g}^{-1} \text{ 24h}^{-1}$, 53.36 $\mu\text{g NH}^+ \text{-N g}^{-1} \text{ 24h}^{-1}$ and 47.20 $\mu\text{g NH}^+ \text{-N g}^{-1} \text{ 24h}^{-1}$ respectively.

The soil urease activity was found to be decreased with increasing soil depth. This may be due to the availability of organic matter (microbial biomass increases) on the surface soil due to litterfall. Urease activity was dependent on soil pH, with increasing soil pH, the urease activity decreases. Since, here the pH is increasing with increasing depth, the urease activity decreased gradually across the soil profile. The results are in agreement with the results of Zhang *et al.* (2014).

4.6.4.6 Phosphatase activity

The phosphatase activity was found be significantly different between the blocks and between the three depths of soil. The phosphatase activity ranged from 43.11 $\mu\text{g of PNP g}^{-1} \text{ 24h}^{-1}$ to 57.75 $\mu\text{g of PNP g}^{-1} \text{ 24h}^{-1}$ (Table 31). The highest urease activity was observed at the surface soil (0-30 cm) of block-5 (57.75 $\mu\text{g of PNP g}^{-1} \text{ 24h}^{-1}$) and lowest

was found in block-1 ($43.11 \mu\text{g of PNP g}^{-1} 24\text{h}^{-1}$) at the depth 60-90 cm. The average phosphatase activity at three soil depths 0-30 cm, 30-60 cm and 60-90 cm were $51.19 \mu\text{g of PNP g}^{-1} 24\text{h}^{-1}$, $47.57 \mu\text{g of PNP g}^{-1} 24\text{h}^{-1}$ and $46.03 \mu\text{g of PNP g}^{-1} 24\text{h}^{-1}$ respectively.

Phosphatase enzymes are produced by bacteria, fungi and plant roots and serve to cleave a phosphate group from its substrates, transforming complex and sometime unavailable forms of organic P into assimilable phosphate. Thus, phosphatase production depends on a combination of P demand from plants and microbes, available organic P substrate and P limitation of the soil. Hence, the phosphatase activity between the blocks was observed significant difference, where different trees require phosphorus in different quantities. The phosphatase activity variation between the depths was mainly due to gradual decrease in microbial biomass over the deeper layers of the soil profile (0-30 cm depth to 60-90 cm depth). The presented results are in agreement with results of Wan and Chen, (2004).

4.7 Economic valuation of carbon sequestered by different tree species in the garden

Due to increased human activities like urbanization, conversion of forest into farmlands, industrialization, extensive use of automobiles and release of greenhouse gases is polluting our environment. Forests act as second most important carbon sink after soil. Hence growing diversified trees in urban areas plays an important role in carbon sequestration from the atmosphere. But there was no proper economic quantification of ecosystem services provided by botanical garden. Hence to fulfil this need, the economic valuation of trees with respect to CO₂ sequestration in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru was calculated and presented in the Table 32 and Table 33.

Albizia lebbeck was found to sequester highest quantity (Table 32) of CO₂ among 186 tree species in botanical garden, which produces about Rs. 12691.34 through carbon sale in the global market. *Albizia lebbeck* followed by *Millettia pinnata*, *Azadirachta indica*, *Syzygium operculatum* and so on, where these top four tree species produce an income about Rs. 38269.68. Lowest carbon value was found in *Ficus racemosa*, *Tecoma stans*, and *Tabebuia aurea*, this might be due to their less tree density in botanical garden.

Table 32: Economic valuation of carbon in different tree species of Mahatma Gandhi Botanical Garden, GKV, Bengaluru.

Sl. No.	Tree species	Tree density	CO ₂ sequestration (Mg)	Carbon value (Rs.)
1	<i>Albizia lebbbeck</i>	110	431.68	12691.34
2	<i>Millettia pinnata</i>	249	354.38	10418.63
3	<i>Azadirachta indica</i>	258	318.31	9358.42
4	<i>Syzygium operculatum</i>	85	197.32	5801.29
5	<i>Eucalyptus citriodora</i>	50	131.53	3867.03
6	<i>Leucaena leucocephala</i>	46	128.88	3789.17
7	<i>Hardwickia binata</i>	54	128.17	3768.24
8	<i>Delonix regia</i>	58	111.97	3291.87
9	<i>Albizia amara</i>	35	105.89	3113.05
10	<i>Grevillea robusta</i>	97	100.08	2942.22
11	<i>Acacia auriculiformis</i>	42	99.24	2917.53
12	<i>Albizia odoratissima</i>	35	98.90	2907.74
13	<i>Tamarindus indica</i>	28	91.14	2679.59
14	<i>Ailanthus excelsa</i>	11	87.88	2583.67
15	<i>Anacardium occidentale</i>	69	87.76	2580.23
16	<i>Eucalyptus tereticornis</i>	19	82.41	2422.81
17	<i>Diospyros melanoxylon</i>	15	64.08	1884.01
18	<i>Roystonea regia</i>	42	52.76	1551.03
19	<i>Eucalyptus globulus</i>	36	52.53	1544.35
20	<i>Melia dubia</i>	13	42.84	1259.59
21	<i>Syzygium cumini</i>	4	39.29	1155.22
22	<i>Sterculia balanghas</i>	11	37.15	1092.06
23	<i>Butea monosperma</i>	29	35.47	1042.82
24	<i>Cassia fistula</i>	81	31.23	918.22
25	<i>Senna siamea</i>	41	29.61	870.62
26	<i>Khaya senegalensis</i>	3	28.15	827.71
27	<i>Caesalpinia coriaria</i>	8	27.23	800.68
28	<i>Peltophorum pterocarpum</i>	1	25.35	745.24
29	<i>Samanea saman</i>	6	24.76	728.02
30	<i>Diospyros montana</i>	5	17.71	520.60
31	<i>Casuarina equisetifolia</i>	9	16.37	481.19
32	<i>Ficus virens</i>	4	16.08	472.67
33	<i>Ficus religiosa</i>	3	15.88	466.79
34	<i>Schleichera oleosa</i>	5	15.30	449.93
35	<i>Ficus drupacea</i>	2	14.15	415.89
36	<i>Polyalthia longifolia</i>	110	14.13	415.31
37	<i>Toona ciliata</i>	6	13.33	392.01
38	<i>Tabebuia rosea</i>	18	12.12	356.35
39	<i>Pterocarpus santalinus</i>	4	12.09	355.43

Sl. No.	Tree species	Tree density	CO ₂ sequestration (Mg)	Carbon value (Rs.)
40	<i>Ficus microcarpa</i>	4	11.19	329.12
41	<i>Gliricidia sepium</i>	14	10.63	312.54
42	<i>Erythroxylum monogynum</i>	23	10.38	305.29
43	<i>Santalum album</i>	19	10.14	298.03
44	<i>Sterculia urens</i>	5	9.47	278.55
45	<i>Tectona grandis</i>	37	8.86	260.49
46	<i>Simarouba glauca</i>	20	8.81	258.97
47	<i>Swietenia macrophylla</i>	1	8.42	247.65
48	<i>Swietenia mahagoni</i>	4	8.38	246.33
49	<i>Khaya grandifoliola</i>	3	8.05	236.65
50	<i>Araucaria cookii</i>	5	7.58	222.83
51	<i>Acrocarpus fraxinifolius</i>	3	6.77	199.03
52	<i>Olea dioica</i>	4	6.05	177.89
53	<i>Artocarpus heterophyllus</i>	4	6.04	177.44
54	<i>Millingtonia hortensis</i>	2	5.91	173.70
55	<i>Amoora lawii</i>	12	5.71	167.80
56	<i>Madhuca indica</i>	4	5.70	167.60
57	<i>Lagerstroemia lanceolata</i>	3	5.67	166.59
58	<i>Mangifera indica</i>	9	5.65	166.00
59	<i>Manilkara hexandra</i>	3	5.54	162.82
60	<i>Sapindus laurifolius</i>	4	5.13	150.76
61	<i>Holoptelea integrifolia</i>	1	5.07	148.95
62	<i>Ligustrum perrottettii</i>	3	5.03	147.81
63	<i>Celtis tetrandra</i>	3	4.92	144.55
64	<i>Mallotus philippensis</i>	6	4.91	144.36
65	<i>Limonia acidissima</i>	2	4.78	140.45
66	<i>Ziziphus xylopyrus</i>	6	4.68	137.62
67	<i>Plumeria alba</i>	5	4.57	134.37
68	<i>Chukrasia tabularis</i>	2	4.29	126.15
69	<i>Spondias pinnata</i>	6	4.18	122.96
70	<i>Vitex altissima</i>	1	4.07	119.69
71	<i>Wrightia tinctoria</i>	2	4.03	118.45
72	<i>Bridelia retusa</i>	6	3.70	108.64
73	<i>Ixora brachiata</i>	10	3.67	107.83
74	<i>Ficus benghalensis</i>	3	3.60	105.75
75	<i>Terminalia tomentosa</i>	5	3.54	104.14
76	<i>Canthium parviflorum</i>	8	3.35	98.47
77	<i>Ficus elastica</i>	1	3.33	97.98
78	<i>Bauhinia purpurea</i>	5	3.25	95.50
79	<i>Agathis robusta</i>	3	3.25	95.42
80	<i>Xylia xylocarpa</i>	2	3.03	89.13
81	<i>Ailanthus malabarica</i>	1	2.78	81.78
82	<i>Zizipus rugosa</i>	1	2.76	81.06

Sl. No.	Tree species	Tree density	CO ₂ sequestration (Mg)	Carbon value (Rs.)
83	<i>Jacaranda mimosifolia</i>	1	2.61	76.74
84	<i>Sterculia foetida</i>	3	2.46	72.27
85	<i>Pinus roxburghii</i>	4	2.42	71.12
86	<i>Diospyros buxifolia</i>	1	2.40	70.53
87	<i>Phoenix dactylifera</i>	4	2.33	68.41
88	<i>Ficus krishnae</i>	1	2.20	64.69
89	<i>Careya arborea</i>	2	2.17	63.89
90	<i>Colvillea racemosa</i>	5	2.14	63.02
91	<i>Podocarpus macrophyllus</i>	2	2.04	60.07
92	<i>Caesalpinia platyloba</i>	1	2.02	59.39
93	<i>Vepris bilocularis</i>	2	2.00	58.66
94	<i>Mitragyna parvifolia</i>	2	1.96	57.62
95	<i>Combretum erythrophyllum</i>	1	1.95	57.44
96	<i>Terminalia catappa</i>	6	1.83	53.90
97	<i>Artocarpus lacucha</i>	3	1.78	52.35
98	<i>Cassine paniculata</i>	2	1.66	48.66
99	<i>Wrightia tomentosa</i>	1	1.64	48.26
100	<i>Terminalia arjuna</i>	2	1.59	46.81
101	<i>Aegle marmelos</i>	4	1.59	46.75
102	<i>Hibiscus tiliaceus</i>	2	1.58	46.48
103	<i>Callistemon viminalis</i>	3	1.57	46.06
104	<i>Semecarpus anacardium</i>	2	1.47	43.26
105	<i>Celtis wightii</i>	2	1.30	38.19
106	<i>Reutealis trisperma</i>	3	1.25	36.76
107	<i>Streblus asper</i>	3	1.18	34.63
108	<i>Alangium lamarckii</i>	1	1.17	34.49
109	<i>Pterocarpus marsupium</i>	2	1.01	29.66
110	<i>Mesua ferrea</i>	2	1.00	29.47
111	<i>Kingiodendron pinnatum</i>	3	0.99	29.12
112	<i>Milicia excelsa</i>	1	0.98	28.80
113	<i>Gmelina arborea</i>	1	0.98	28.68
114	<i>Chrysophyllum cainito</i>	1	0.95	27.89
115	<i>Oroxylum indicum</i>	1	0.94	27.71
116	<i>Anthocephalus cadamba</i>	2	0.93	27.25
117	<i>Elaeis guineensis</i>	1	0.92	27.14
118	<i>Hopea parviflora</i>	4	0.89	26.26
119	<i>Ficus tsjahela</i>	1	0.89	26.11
120	<i>Terminalia bellirica</i>	1	0.86	25.21
121	<i>Citharexylum quadrangulare</i>	1	0.85	25.13
122	<i>Alstonia scholaris</i>	2	0.83	24.41
123	<i>Dolichandrone atrovirens</i>	3	0.83	24.31
124	<i>Ficus hispida</i>	1	0.80	23.52
125	<i>Cedrus deodara</i>	6	0.80	23.49

Sl. No.	Tree species	Tree density	CO ₂ sequestration (Mg)	Carbon value (Rs.)
126	<i>Anamirta cocculus</i>	1	0.78	22.85
127	<i>Saraca asoca</i>	2	0.78	22.80
128	<i>Pterospermum rubiginosum</i>	1	0.76	22.27
129	<i>Broussonetia papyrifera</i>	1	0.74	21.85
130	<i>Adonidia merrillii</i>	1	0.73	21.59
131	<i>Adina cordifolia</i>	1	0.71	20.91
132	<i>Gmelina asiatica</i>	3	0.68	20.03
133	<i>Dalbergia latifolia</i>	2	0.67	19.82
134	<i>Croton oblongifolius</i>	1	0.61	17.98
135	<i>Cassia spectabilis</i>	2	0.61	17.94
136	<i>Madhuca longifolia</i>	1	0.60	17.77
137	<i>Couroupita guianensis</i>	1	0.58	17.16
138	<i>Tabebuia impetiginosa</i>	2	0.58	16.93
139	<i>Podocarpus chinensis</i>	2	0.57	16.84
140	<i>Suregada angustifolia</i>	1	0.55	16.17
141	<i>Thespesia populnea</i>	1	0.54	15.76
142	<i>Ficus amplissima</i>	1	0.53	15.63
143	<i>Securinega leucopyrus</i>	1	0.52	15.16
144	<i>Schefflera actinophylla</i>	1	0.51	15.14
145	<i>Manihot glaziovii</i>	1	0.51	14.99
146	<i>Moringa oleifera</i>	3	0.51	14.85
147	<i>Enterolobium contortisiliquum</i>	1	0.48	14.21
148	<i>Pterospermum diversifolium</i>	1	0.47	13.79
149	<i>Phoenix sylvestris</i>	1	0.45	13.26
150	<i>Averrhoa carambola</i>	1	0.43	12.75
151	<i>Schotia brachypetala</i>	1	0.42	12.48
152	<i>Crescentia cujete</i>	2	0.41	12.19
153	<i>Cocos nucifera</i>	1	0.41	11.92
154	<i>Acacia ferruginea</i>	2	0.38	11.22
155	<i>Terminalia mantaly</i>	1	0.37	10.81
156	<i>Dimocarpus longan</i>	4	0.37	10.75
157	<i>Clausena dentata</i>	1	0.36	10.63
158	<i>Araucaria cunninghamii</i>	1	0.35	10.22
159	<i>Ficus benjamina</i>	1	0.34	10.10
160	<i>Hamelia patens</i>	2	0.34	9.91
161	<i>Ficus lyrata</i>	1	0.34	9.87
162	<i>Diospyros sylvatica</i>	1	0.33	9.73
163	<i>Zanthoxylum rhetsa</i>	1	0.32	9.29
164	<i>Cupressus torulosa</i>	1	0.32	9.26
165	<i>Mimusops elengi</i>	1	0.28	8.32
166	<i>Lagerstroemia speciosa</i>	2	0.27	7.96
167	<i>Antiaris toxicaria</i>	1	0.27	7.94
168	<i>Guazuma ulmifolia</i>	1	0.27	7.90

Sl. No.	Tree species	Tree density	CO ₂ sequestration (Mg)	Carbon value (Rs.)
169	<i>Commiphora wightii</i>	1	0.25	7.46
170	<i>Gardenia latifolia</i>	1	0.21	6.13
171	<i>Psidium guajava</i>	1	0.21	6.12
172	<i>Persea macrantha</i>	1	0.18	5.22
173	<i>Sterulia guttata</i>	1	0.17	5.12
174	<i>Clusia rosea</i>	1	0.16	4.81
175	<i>Callistemon sp.</i>	1	0.15	4.55
176	<i>Barringtonia asiatica</i>	1	0.13	3.84
177	<i>Cupressus sempervirens</i>	1	0.12	3.60
178	<i>Elaeocarpus tuberculatus</i>	1	0.09	2.77
179	<i>Pterocarpus dalbergioides</i>	1	0.09	2.60
180	<i>Barringtonia acutangula</i>	1	0.08	2.44
181	<i>Ficus neriifolia</i>	1	0.08	2.42
182	<i>Thuja occidentalis</i>	1	0.08	2.39
183	<i>Litsea coriacea</i>	1	0.07	2.08
184	<i>Tabebuia aurea</i>	1	0.06	1.81
185	<i>Tecoma stans</i>	1	0.06	1.79
186	<i>Ficus racemosa</i>	1	0.05	1.51
Grand Total		2140	3527.07	103695.93

Table 33: Economic evaluation of total carbon pool in different blocks of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Blocks	Tree biomass carbon	SOC	Total Carbon pool	CO ₂ sequestration	Carbon value
	(Mg ha ⁻¹)	(Mg ha ⁻¹)	(Mg ha ⁻¹)	(Mg ha ⁻¹)	(Rs ha ⁻¹)
Block-1	40	28	68	251	7376
Block-2	45	45	89	328	9646
Block-3	47	42	89	327	9616
Block-4	26	27	53	194	5705
Block-5	39	33	72	264	7757
Block-6	56	35	91	334	9811
Block-7	30	39	68	251	7368
Block-8	37	38	75	275	8084
Block-9	38	32	70	256	7530
Block-10	11	39	50	184	5407
Total	370	36	405	1487	43725

SOC= Soil organic carbon

Mg ha⁻¹= Mg ha⁻¹

The 186 tree species present in botanical garden sequester about 3527.07 Mg of CO₂ from the atmosphere and has a carbon value about Rs. 103695.93.

Economic quantification of CO₂ sequestered by trees in different blocks of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru was calculated and presented in the Table 33. Block-6 (9811 Rs ha⁻¹), block-2 (9646 Rs ha⁻¹) and block-3 (9616 Rs ha⁻¹) were the top three blocks producing highest carbon value. Block-10 (5407 Rs ha⁻¹) and block-4 (5705 Rs ha⁻¹) was found to have least carbon value among ten blocks of botanical garden. The ten blocks of garden had total carbon pool, total CO₂ sequestration and carbon value about 405 Mg ha⁻¹, 1487 Mg ha⁻¹ and 43725 Rs ha⁻¹ respectively. These results were in agreement with results of Uthappa, (2021).

4.8 Nutrient turnover in Mahatma Gandhi Botanical Garden, GKVK.

Nutrient, turn over in botanical garden was calculated by taking uncultivated barren soil as control. The soil properties of uncultivated barren soil were presented in the Table 34. The nutrient content in all the blocks were calculated and compared with the soil properties of uncultivated barren soil to find out the nutrient turnover (Table 35) in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

The soil pH and bulk density of undisturbed soil increased with increased soil depth (Table 32). Soil pH ranged between 5.25 to 5.95 and bulk density ranged from 1.45 to 1.50 Mg m⁻³. There was no significant variation in organic carbon in all the three depths, this may be due to absence of trees and lack of addition of organic matter through litterfall. Electrical conductivity was found much less compared to botanical garden soil, it may be due to lack of organic matter on the surface soil and absence of fine clay particles in the sub surface soil (Verma *et al.*, 2001). Nitrogen content decreased from 15.07 kg ha⁻¹ to 7.6 kg ha⁻¹ with increasing depth, the low nitrogen content on the surface soil may due to volatilization of nitrogen in the form of ammonia on the surface (due to increasing pH) and leaching of nitrogen in the form of nitrate deep into the soil profile (Swamy *et al.*, 2006). Even due to the lack of plants there is no nitrogen fixation in barren soil, hence turnover rate of nitrogen was more in botanical garden.

Phosphorus and potassium content decreased from 0-30 cm to 30-60 cm depth but increased later with increasing depth, this may be due to variation in weathering of parent material. Calcium and magnesium decreased from 2.1 to 2.8 c mol (p⁺) kg⁻¹ and 1.1 to 1.75 c mol (p⁺) kg⁻¹ respectively. It was found that with increasing depth calcium and magnesium increased in quantity, this may be due to differential leaching and accumulation at the deeper layers of the soil profile. Micronutrients were very less in quantity, those elements increased from 0-30 cm to 30-60 cm depth, but decreased in quantity beyond the depth of 60 cm. This may be due to accumulation of micronutrients through leaching at the middle depth from the surface.

Nutrient turnover of different nutrients along with soil organic carbon was calculated in comparison with soil of uncultivated barren soil and presented in the Table 35. Soil organic carbon turnover was found to be highest in surface soil of block-2 (39900 kg ha⁻¹), which is due to greater accumulation of litterfall by deciduous trees in block-2 and lowest was found at the depth 60-90 cm of block-4 (18180 kg ha⁻¹). The organic carbon turnover in botanical garden varied significantly both between the blocks as well as between the three depths. It was observed that the soil organic carbon turnover decreased with increasing soil depth, this might be due to the decrease in organic matter content over the deeper layers of soil profile (Singh and Sharma, 2012). Organic matter varied significantly between the blocks, hence the soil organic carbon also varied between the different blocks of the garden.

Nitrogen and phosphorus turnover in botanical garden varied significantly between three soil depths, but there was no significant difference between the blocks (Table 35). Highest nitrogen turnover was observed in surface soil of block-5 (223.27 kg ha⁻¹) and lowest was found at the soil depth 60-90 cm of block-6 (92.75 kg ha⁻¹). Highest phosphorus turnover was found at the soil depth 0-30 cm of block-5 (91.89 kg ha⁻¹) and lowest was found at the soil depth 60-90 cm of block-9 (65.67 kg ha⁻¹). Greater quantity of nitrogen and phosphorus turnover was found at the soil depth 0-30 cm and it decreased with increasing soil depth (Duan *et al.*, 2019). This might be due to decrease of available nitrogen and phosphorus content in soil with increasing soil depth.

Table 34: Physical and chemical properties of uncultivated barren soil.

Soil depth (cm)	pH	BD	EC	Organic carbon	N	P ₂ O ₅	K ₂ O	Ca	Mg	S	Fe	Mn	Zn	Cu
		Mg m ⁻³	dSm ⁻¹	%	kg ha ⁻¹		c mol (p ⁺) kg ⁻¹		mg kg ⁻¹					
0-30	5.25	1.45	0.02	0.20	15.07	0.35	75.40	2.10	1.10	5.00	28.50	18.96	1.20	1.26
30-60	5.50	1.46	0.02	0.15	11.40	0.50	18.70	2.30	1.50	10.50	23.50	17.88	0.62	1.08
60-90	5.95	1.50	0.01	0.10	7.60	5.50	40.00	2.80	1.75	5.00	11.25	18.30	0.42	0.90
Total	5.57	1.47	0.02	0.15	11.36	2.12	44.70	2.40	1.45	6.83	21.08	18.38	0.75	1.08

OC- Organic carbon (%)

The highest potassium turnover was found at the depth 0-30 cm of block-5 (113.3 kg ha⁻¹) and lowest was found at the depth 60-90 cm of block-3 (8.38 kg ha⁻¹). Potassium turnover varied significantly between three soil depths as well as between ten blocks of the garden. Highest potassium turnover was found in block-5 (238.19 kg ha⁻¹) and lowest potassium turnover was found in block-7 (68.18 kg ha⁻¹). The variation in potassium turnover between three soil depths as well as between blocks might be due to differential uptake of potassium in the soil by trees (Mishra and Swamy, 2007).

Calcium turnover was varied significantly between the three soil depths as well as between the ten blocks of the garden. Highest turnover of calcium was found at the soil depth 0-30 cm of block-4 (1209.6 kg ha⁻¹) and lowest was found at the soil depth 60-90 cm of block-3 (-89.6 kg ha⁻¹). The negative turnover value indicates that the rate of addition of nutrient through litterfall was less than the uptake of nutrient by the trees and also non movement of calcium to lower layers (Mishra *et al.*, 2003). Highest calcium turnover was found in the block-8 (2688 kg ha⁻¹) and lowest was found in the block-6 (761.6 kg ha⁻¹).

Magnesium turnover was varied significantly between the three depths but there was no significant difference observed between the blocks. The highest magnesium turnover was found at the depth 0-30 cm of block-1 (483.84 kg ha⁻¹) and lowest was found at the depth 60-90 cm of block-9 (-309.12 kg ha⁻¹). The highest magnesium turnover was found in block-4 (497.28 kg ha⁻¹) and lowest was found in block-9 (-416.64 kg ha⁻¹). The magnesium turnover was found to be decreased with increasing depth, this might be due to decrease in magnesium content over the depths as well as the addition of magnesium might be less than the uptake by trees, where tree roots were spread deeper into the soil profile (Mishra *et al.*, 2003).

The sulphur turnover varied significantly between the depths but not between the blocks. Highest sulphur turnover was found at the depth 0-30 cm of block 2 (264.43 kg ha⁻¹) and lowest was found at the depth 60-90 cm of the same block (77.24 kg ha⁻¹). The average turnover at three depths 0-30 cm, 30-60 cm and 60-90 cm was 193.38 kg ha⁻¹, 130.65 kg ha⁻¹ and 111.88 kg ha⁻¹ respectively. It was found that the sulphur turnover decreased with increasing soil depth. This might be due to decrease in sulphur content with increasing depth (Uthappa, 2021).

Table 35: Nutrient turnover in ten blocks of Mahatma Gandhi Botanical Garden at three different depths.

Block	Soil Depth	OC	N	P	K	Ca	Mg	S
	(cm)	kg ha ⁻¹						
B-1	0-30	20271	210.72	74.24	15.99	1030.40	483.84	180.41
	30-60	21978	201.85	74.09	41.91	672.00	-134.40	131.24
	60-90	21996	193.10	66.81	19.00	403.20	-67.20	100.82
B-2	0-30	39900	210.62	80.50	3.63	985.60	161.28	264.43
	30-60	38070	201.85	79.78	56.56	806.40	26.88	79.65
	60-90	36504	193.10	70.80	23.30	537.60	-120.96	77.24
B-3	0-30	37416	209.72	87.90	11.83	582.40	188.16	159.78
	30-60	36954	201.85	79.78	48.23	537.60	80.64	141.57
	60-90	31212	205.65	68.52	8.38	-89.60	-120.96	146.52
B-4	0-30	22359	210.72	76.52	29.70	1209.60	322.56	220.21
	30-60	20655	201.85	74.09	85.06	537.60	215.04	153.35
	60-90	18180	193.10	69.09	49.91	358.40	-40.32	145.04
B-5	0-30	34860	223.27	91.89	113.30	358.40	161.28	217.26
	30-60	22680	214.39	74.09	81.56	403.20	15.26	116.50
	60-90	20259	180.56	68.52	43.33	224.00	-201.60	97.87
B-6	0-30	31152	210.72	77.66	25.67	224.00	107.52	177.45
	30-60	28584	201.85	74.23	66.24	224.00	-26.88	140.09
	60-90	24300	92.75	69.09	31.50	313.60	-201.60	130.30

Block	Soil Depth	OC	N	P	K	Ca	Mg	S
	(cm)	kg ha ⁻¹						
B-7	0-30	32340	198.18	78.79	6.32	806.40	80.64	176.00
	30-60	32490	189.30	76.94	45.14	492.80	-53.76	107.65
	60-90	31491	193.10	67.38	16.72	448.00	-120.96	108.19
B-8	0-30	31935	198.18	76.52	36.56	1120.00	295.68	137.67
	30-60	32337	201.85	74.66	67.32	896.00	80.64	123.87
	60-90	29520	193.10	68.52	38.36	672.00	-13.44	122.93
B-9	0-30	24708	198.18	79.36	25.53	806.40	53.76	215.78
	30-60	26055	189.30	78.64	52.67	358.40	-161.28	166.61
	60-90	24975	193.10	65.67	23.84	-44.80	-309.12	125.87
B-10	0-30	33069	210.72	82.21	8.73	537.60	-26.88	184.82
	30-60	33282	201.85	74.09	62.21	313.60	161.28	145.98
	60-90	30933	193.10	67.95	24.51	89.60	-174.72	63.97
CD at 5%								
Blocks		5167	NS	NS	29.85	339.12	NS	NS
Depth		2830	21.74	3.66	16.35	185.75	111.28	34.39

NS- Non significant

The negative values of nutrient turnover indicates that the nutrient content of uncultivated barren soil was more than that of botanical garden. This might be mainly due to the fact that the nutrients present in garden was continuously up taken by plants, where the addition of nutrients was less than that of uptake. But in uncultivated barren soil did not have any plants to uptake the nutrients, which was added to soil by weathering of parent material. Hence this might be the potential reason for negative turnover of few nutrients in botanical garden in comparison with uncultivated barren soil.

4.9 Economic valuation of nutrient turnover of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

The economic valuation of nutrients turnover of Mahatma Gandhi Botanical Garden was worked out by using the market price of different fertilizers price at global market and presented in table 36.

Nitrogen, phosphorus, potassium turnovers were $591.76 \text{ kg ha}^{-1}$, $224.83 \text{ kg ha}^{-1}$ and $116.30 \text{ kg ha}^{-1}$ respectively, where these accounts about $7604.15 \text{ Rs ha}^{-1}$, $11522.69 \text{ Rs ha}^{-1}$ and $2636.54 \text{ Rs ha}^{-1}$ respectively. Calcium turnover was found to be highest among all the nutrients *i.e.*, $1581.44 \text{ kg ha}^{-1}$, which accounts for about $282097.27 \text{ Rs ha}^{-1}$. Monetary value of magnesium and sulphur turnover in garden was found to be $12512.22 \text{ Rs ha}^{-1}$ and $14528.83 \text{ Rs ha}^{-1}$ respectively. Overall, the monetary service provided by the garden with respect to soil nutrients was $330901.7 \text{ Rs ha}^{-1}$. Aulia *et al.* (2020) quantified the economic value of ecosystem services generated in oil palm which was around $\text{USD } 6520 \text{ ha}^{-1} \text{ year}^{-1}$.

Botanical Gardens play an important role in conservation of rare and endemic plant species as well as helps in maintaining urban green patches with diversified plants and trees. Apart from nearly quantifiable entities like CO_2 sequestration from the atmosphere and increasing soil fertility, there are many intangible benefits from botanical garden like improving soil physical and biological properties, improving enzymatic activity, aesthetic beauty, conservation of germplasm and also used for educational purposes like research and to gain knowledge of diversified trees and plants. These services from botanical gardens are not derived in economic valuation due to lack of appropriate market value.

Ultimately, the services provided by botanical gardens can be quantified but their economic valuation methods must be standardized to know the monetary value of both tangible and intangible services provided by botanical gardens. Similarly radial influence of different tree species on soil physical, chemical and biological properties along with soil fauna diversity can be investigated in future.

Table 36: Economic valuation of nutrient turnover of Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Nutrients	Turnover (kg ha⁻¹)	Market price (Rs kg⁻¹)	Value of turnover (Rs ha⁻¹)
N	591.76	12.85	7604.15
P	224.83	51.25	11522.69
K	116.30	22.67	2636.54
Ca	1581.44	178.38	282097.27
Mg	66.04	189.47	12512.22
S	435.91	33.33	14528.83
Total monetary service (Rs)			330901.70

Practical utility of the work

- *Albizia lebbeck*, *Millettia pinnata*, *Azadirachta indica*, *Syzygium operculatum* and *Ailanthus excelsa* were found to be having greater potential to sequester large quantity of CO₂ from Fabaceae atmosphere, hence can be planted in urban parks and botanical gardens to reduce the effect of carbon emission in urban areas.
- Trees belonging to family have higher carbon sequestering capacity, hence can be planted in urban areas to reduce atmospheric carbon.
- Economic valuation of ecosystem services inferences that the value of nature is more precious than our greed to exploit the services of nature, hence it creates an awareness among the people for sustainable use of natural resources and protect our mother Earth.

V SUMMARY

The detailed research activity was carried out in Mahatma Gandhi botanical Garden, GKVK, Bengaluru, to find out the diversity and carbon stock of trees, which are having girth at breast height ≥ 30 cm. The Botanical Garden has, a total area about 26 ha (65 acres), where trees were planted systematically based on their families in ten blocks by following Bentham and Hooker's System. The height and girth at breast height were measured for all the tree species in different blocks. The height was measured using Ravi's altimeter and girth at breast height was measured using standard measuring tape. The carbon stock of different trees present in different blocks were calculated after calculating volume of trees. Composite soil samples were taken at three different depths (0-30 cm, 30-60 cm and 60-90 cm) in all the blocks. Those samples were analyzed for physical (bulk density, particle density and maximum water holding capacity), chemical (pH, electrical conductivity, organic carbon, major nutrients, secondary nutrients and micronutrients) and biological properties (Bacteria, fungi and actinomycetes population as well as urease, dehydrogenase and phosphatase activity). The results of these analysis are summarized as follows:

- The botanical garden found to have about 186 tree species (girth at breast height ≥ 30 cm) belonging to 48 families. There were 2140 trees, which were distributed systematically in different blocks of the garden.
- Garden contains about 12 naturally grown tree species and 174 planted tree species, where naturally grown trees were present all over the garden but planted tree species were restricted to a particular block. Naturally grown tree species were dominated by *Millettia pinnata* and *Albizia lebbeck*, whereas planted tree species were dominated by *Azadirachta indica* and *Polyalthia longifolia*.
- Garden contains about 100 native tree species and 86 exotic tree species, where native group was dominated by *Azadirachta indica* and *Millettia pinnata* and the exotic tree species were dominated by *Albizia lebbeck* and *Grevillea robusta*.

- Shannon-Weiner diversity index was estimated for all the ten blocks, which revealed that block-1 has highest tree diversity with 83 tree species followed by block-9 and block-3. Lowest diversity was found in block-2 and block-7. The entire botanical garden has an index value of 5.52.
- Simpson's diversity index showed that the tree species in block-8 and block-9 were diversified as well as distributed evenly all over the respective blocks, but both tree diversity and their distribution found to be low in block-2 and block-7. The Simpson's index of botanical garden was found to be higher than any other blocks in the garden.
- Importance Value Index was found to be highest for *Millettia pinnata*, *Azadirachta indica* and *Albizia lebbeck*. This indicates that these tree species dominate in botanical garden. Whereas *Psidium guajava* and *Pterocarpus dalbergioides* were rarely found tree species in the garden.
- *Azadirachta indica*, *Millettia pinnata* and *Albizia lebbeck* were more abundant tree species in botanical garden, which comprise around 29% of total trees in the garden.
- The research revealed that almost 68% of total tree population in botanical garden have the girth size ranged from 30 cm to 90 cm. It was observed that the tree density decreased with increasing girth size.
- Almost 48% of total tree population has a height ranged from 6 m to 12 m. Lower tree population falls under the height class 24 m to 27 m. It was observed that at lower heights (1 m to 6 m) the tree population was moderate but maximum tree population was found under moderate height (6 m to 15 m). Later the tree population decreased with increasing height.
- The aboveground biomass was found to be highest in block-6 and lowest for block-10. The below ground biomass was highest in block-6 and lowest in block-10. The total tree biomass was found to be highest in block-6 and lowest for block-10. Here it was observed that above ground biomass and below ground biomass are directly proportional to each other.

- It was found that *Albizia lebbeck*, *Millettia pinnata* and *Azadirachta indica* contributes more to the total tree biomass carbon in the garden, because of their high carbon accumulation potential and large tree density in the garden.
- *Millettia pinnata* was found to have highest basal area in the garden and it was followed by *Azadirachta indica* and *Albizia lebbeck*, because of the fact that these tree species were more in numbers in the garden.
- It was observed that the exotic tree species accumulated more biomass carbon than native tree species and planted tree species produced more biomass carbon than naturally grown tree species.
- Results revealed that *Albizia lebbeck*, *Millettia pinnata* and *Azadirachta indica* were more efficient on CO₂ sequestration from the atmosphere.
- Fabaceae, Myrtaceae and Meliaceae are the three major families in botanical garden, which contains around 64% of total tree population and produces about 76.88% of total biomass carbon.
- Soil texture in all the blocks of botanical garden at the soil depth 0-30 cm and 60-90 cm was found to be sandy loam, but at the middle depth (30-60 cm) it was loamy soil. This may be due to deposition of finer clay particles at the sub soil.
- Soil bulk density and particle density increased with increasing soil depth, which may be due to increase in soil compaction. Maximum water holding capacity of the soil decreased with decreasing porosity along the soil profile.
- Soil acidity decreased with increase in soil depth, whereas electrical conductivity and organic carbon content decreased with increasing depth. Available nitrogen, available phosphorus, available potassium, available sulphur and micronutrients found to be decreased with increase in soil depth.
- Exchangeable calcium and exchangeable magnesium found to be increased at the middle depth and then decreased later, which may be due to leaching of bases along with infiltrating water.

- Decrease in soil organic matter with increasing soil depth led to decrease in bacteria, fungi and actinomycetes population along the soil profile, which in turn decreased the dehydrogenase, phosphatase and urease activity with increasing depth.
- Highest carbon economic value was found in *Albizia lebbeck* followed by *Millettia pinnata*, *Azadirachta indica*, *Syzygium operculatum* and lowest carbon value was found in *Ficus racemosa*, *Tecoma stans*, and *Tabebuia aurea*,
- Highest carbon economic value was found in block-2 followed by block-3 and block-6 and lowest was found in block-4 followed by block-1.
- The nutrient turnover in botanical garden was estimated by taking soil of uncultivated barren land, where nutrient turnover was greater in the garden due to continuous addition of organic matter, more microbial and enzyme activity. Nutrients are added to the soil in greater amounts in botanical garden due to litter fall. Primary and secondary soil nutrients turnover was found to be greater than micronutrients turnover.
- After finding out the nutrient turnover, its economic valuation was carried out to know the monetary value of nutrients, where calcium was found to have highest monetary value and lowest was potassium.

After summarizing the results of the research, it was clear that botanical garden has a diversified tree species, which includes both native and exotic tree species. The diversity of trees in botanical garden was found to be greater than the diversity in natural forests, mainly due to continuous planting of different native, exotic, rare, endemic and endangered tree species in botanical garden for conservation purpose.

Exotic trees are efficient in accumulating more amount of carbon in their tissues, where CO₂ sequestration was found to be highest for exotic trees. This might be due to their greater capacity to adopt to the surrounding environmental conditions, faster growth rate, effective nutrients up taking capacity, age of trees and greater tree density.

Due to continuous addition of organic matter through litter fall, the surface soil of the garden was found to be rich in soil organic carbon and other soil nutrients. Even the microbial and enzyme activity was highest at the surface soil of the garden. But as the depth of soil increases, the organic matter decreases in turn decreases the microbial and enzymatic activity. When enzymatic and microbial activity decreases with depth even the availability of soil nutrients also decreased simultaneously. Hence, it can be concluded that the soil fertility decreased with increasing soil depth. But there was no significant variation among soil properties between the blocks, since all the blocks contain tree species belonging to different families, it is difficult to find out the influence of tree species on soil properties. Hence, influence of tree density has more effect on soil fertility than tree diversity.

From this it can be concluded that tree species belonging to Fabaceae, Myrtaceae and Meliaceae are more efficient in carbon sequestration due to their vigorous growth rate, tolerance to drought conditions and efficient in nutrient up take from the soil. These trees can be planted in urban parks, botanical gardens and as avenue trees along the roads, which effectively sequester CO₂ from atmosphere. Apart from tangible services, botanical garden also provides intangible services, which adds economic valuation to the botanical garden services.

Future line of work

- Vigorous growth of trees belonging to Fabaceae family could be investigated.
- Radial influence canopy of spread on soil physical, chemical and biological properties.
- Standardization of economic valuation methods for intangible services provided by botanical gardens.

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Appendix I: Volume, above ground biomass, below ground biomass, total biomass, total biomass carbon and CO₂ sequestered by different tree species in Botanical Garden.

Sl. No.	Tree species	V (m ³)	AGB (t)	BGB (t)	Total Biomass (t)	Total Carbon (t)	Total CO ₂ (t)
1	<i>Albizia lebbek</i>	282.88	186.70	48.54	235.25	117.62	431.68
2	<i>Millettia pinnata</i>	184.66	153.27	39.85	193.12	96.56	354.38
3	<i>Azadirachta indica</i>	264.76	137.67	35.79	173.47	86.73	318.31
4	<i>Syzygium operculatum</i>	112.29	85.34	22.19	107.53	53.77	197.32
5	<i>Eucalyptus citriodora</i>	88.89	56.89	14.79	71.68	35.84	131.53
6	<i>Leucaena leucocephala</i>	87.10	55.74	14.49	70.24	35.12	128.88
7	<i>Hardwickia binata</i>	75.94	55.44	14.41	69.85	34.92	128.17
8	<i>Delonix regia</i>	59.06	48.43	12.59	61.02	30.51	111.97
9	<i>Albizia amara</i>	65.42	45.80	11.91	57.70	28.85	105.89
10	<i>Grevillea robusta</i>	80.15	43.28	11.25	54.54	27.27	100.08
11	<i>Acacia auriculiformis</i>	66.03	42.92	11.16	54.08	27.04	99.24
12	<i>Albizia odoratissima</i>	56.28	42.78	11.12	53.90	26.95	98.90
13	<i>Tamarindus indica</i>	52.56	39.42	10.25	49.67	24.83	91.14
14	<i>Ailanthus excelsa</i>	79.18	38.01	9.88	47.89	23.95	87.88
15	<i>Anacardium occidentale</i>	90.38	37.96	9.87	47.83	23.91	87.76
16	<i>Eucalyptus tereticornis</i>	54.00	35.64	9.27	44.91	22.45	82.41
17	<i>Diospyros melanoxylon</i>	40.76	27.72	7.21	34.92	17.46	64.08
18	<i>Roystonea regia</i>	43.88	22.82	5.93	28.75	14.38	52.76
19	<i>Eucalyptus globulus</i>	40.07	22.72	5.91	28.63	14.31	52.53
20	<i>Melia dubia</i>	46.32	18.53	4.82	23.35	11.67	42.84
21	<i>Syzygium cumini</i>	24.28	16.99	4.42	21.41	10.71	39.29
22	<i>Sterculia balanphas</i>	29.21	16.07	4.18	20.24	10.12	37.15
23	<i>Butea monosperma</i>	31.96	15.34	3.99	19.33	9.66	35.47
24	<i>Cassia fistula</i>	19.03	13.51	3.51	17.02	8.51	31.23
25	<i>Senna siamea</i>	21.35	12.81	3.33	16.14	8.07	29.61
26	<i>Khaya senegalensis</i>	20.29	12.18	3.17	15.34	7.67	28.15
27	<i>Caesalpinia coriaria</i>	11.22	11.78	3.06	14.84	7.42	27.23
28	<i>Peltophorum pterocarpum</i>	17.68	10.96	2.85	13.81	6.91	25.35
29	<i>Samanea saman</i>	23.28	10.71	2.78	13.49	6.75	24.76
30	<i>Diospyros montana</i>	9.01	7.66	1.99	9.65	4.82	17.71
31	<i>Casuarina equisetifolia</i>	8.74	7.08	1.84	8.92	4.46	16.37
32	<i>Ficus virens</i>	17.83	6.95	1.81	8.76	4.38	16.08
33	<i>Ficus religiosa</i>	17.61	6.87	1.79	8.65	4.33	15.88
34	<i>Schleichera oleosa</i>	6.89	6.62	1.72	8.34	4.17	15.30
35	<i>Ficus drupacea</i>	15.69	6.12	1.59	7.71	3.85	14.15
36	<i>Polyalthia longifolia</i>	11.98	6.11	1.59	7.70	3.85	14.13
37	<i>Toona ciliata</i>	10.49	5.77	1.50	7.27	3.63	13.33
38	<i>Tabebuia rosea</i>	9.71	5.24	1.36	6.61	3.30	12.12
39	<i>Pterocarpus santalinus</i>	6.79	5.23	1.36	6.59	3.29	12.09

Sl. No.	Tree species	V (m ³)	AGB (t)	BGB (t)	Total Biomass (t)	Total Carbon (t)	Total CO ₂ (t)
40	<i>Ficus microcarpa</i>	12.41	4.84	1.26	6.10	3.05	11.19
41	<i>Gliricidia sepium</i>	6.86	4.60	1.20	5.79	2.90	10.63
42	<i>Erythroxylum monogynum</i>	8.98	4.49	1.17	5.66	2.83	10.38
43	<i>Santalum album</i>	4.87	4.38	1.14	5.52	2.76	10.14
44	<i>Sterculia urens</i>	6.12	4.10	1.07	5.16	2.58	9.47
45	<i>Tectona grandis</i>	6.97	3.83	1.00	4.83	2.41	8.86
46	<i>Simarouba glauca</i>	10.30	3.81	0.99	4.80	2.40	8.81
47	<i>Swietenia macrophylla</i>	6.64	3.64	0.95	4.59	2.30	8.42
48	<i>Swietenia mahagoni</i>	7.40	3.62	0.94	4.57	2.28	8.38
49	<i>Khaya grandifoliola</i>	5.44	3.48	0.91	4.39	2.19	8.05
50	<i>Araucaria cookii</i>	7.62	3.28	0.85	4.13	2.07	7.58
51	<i>Acrocarpus fraxinifolius</i>	4.18	2.93	0.76	3.69	1.84	6.77
52	<i>Olea dioica</i>	3.04	2.62	0.68	3.30	1.65	6.05
53	<i>Artocarpus heterophyllus</i>	4.35	2.61	0.68	3.29	1.64	6.04
54	<i>Millingtonia hortensis</i>	4.26	2.56	0.66	3.22	1.61	5.91
55	<i>Amoora lawii</i>	4.11	2.47	0.64	3.11	1.56	5.71
56	<i>Madhuca indica</i>	3.33	2.47	0.64	3.11	1.55	5.70
57	<i>Lagerstroemia lanceolata</i>	4.46	2.45	0.64	3.09	1.54	5.67
58	<i>Mangifera indica</i>	4.14	2.44	0.63	3.08	1.54	5.65
59	<i>Manilkara hexandra</i>	2.89	2.40	0.62	3.02	1.51	5.54
60	<i>Sapindus laurifolius</i>	3.82	2.22	0.58	2.79	1.40	5.13
61	<i>Holoptelea integrifolia</i>	4.25	2.19	0.57	2.76	1.38	5.07
62	<i>Ligustrum perrottettii</i>	4.83	2.17	0.57	2.74	1.37	5.03
63	<i>Celtis tetrandra</i>	3.60	2.13	0.55	2.68	1.34	4.92
64	<i>Mallotus philippensis</i>	3.32	2.12	0.55	2.68	1.34	4.91
65	<i>Limonia acidissima</i>	2.46	2.07	0.54	2.60	1.30	4.78
66	<i>Ziziphus xylopyrus</i>	2.38	2.02	0.53	2.55	1.28	4.68
67	<i>Plumeria alba</i>	3.41	1.98	0.51	2.49	1.25	4.57
68	<i>Chukrasia tabularis</i>	3.26	1.86	0.48	2.34	1.17	4.29
69	<i>Spondias pinnata</i>	4.52	1.81	0.47	2.28	1.14	4.18
70	<i>Vitex altissima</i>	2.71	1.76	0.46	2.22	1.11	4.07
71	<i>Wrightia tinctoria</i>	2.32	1.74	0.45	2.20	1.10	4.03
72	<i>Bridelia retusa</i>	3.20	1.60	0.42	2.01	1.01	3.70
73	<i>Ixora brachiata</i>	1.57	1.59	0.41	2.00	1.00	3.67
74	<i>Ficus benghalensis</i>	3.99	1.56	0.40	1.96	0.98	3.60
75	<i>Terminalia tomentosa</i>	1.99	1.53	0.40	1.93	0.97	3.54
76	<i>Canthium parviflorum</i>	3.45	1.45	0.38	1.83	0.91	3.35
77	<i>Ficus elastica</i>	3.70	1.44	0.37	1.82	0.91	3.33
78	<i>Bauhinia purpurea</i>	2.10	1.40	0.37	1.77	0.89	3.25
79	<i>Agathis robusta</i>	3.19	1.40	0.36	1.77	0.88	3.25
80	<i>Xylocarpus xylocarpa</i>	1.62	1.31	0.34	1.65	0.83	3.03
81	<i>Ailanthus malabarica</i>	2.77	1.20	0.31	1.52	0.76	2.78

Sl. No.	Tree species	V (m ³)	AGB (t)	BGB (t)	Total Biomass (t)	Total Carbon (t)	Total CO ₂ (t)
82	<i>Zizipus rugosa</i>	1.57	1.19	0.31	1.50	0.75	2.76
83	<i>Jacaranda mimosifolia</i>	2.05	1.13	0.29	1.42	0.71	2.61
84	<i>Sterculia foetida</i>	2.26	1.06	0.28	1.34	0.67	2.46
85	<i>Pinus roxburghii</i>	2.27	1.05	0.27	1.32	0.66	2.42
86	<i>Diospyros buxifolia</i>	1.48	1.04	0.27	1.31	0.65	2.40
87	<i>Phoenix dactylifera</i>	1.86	1.01	0.26	1.27	0.63	2.33
88	<i>Ficus krishnae</i>	2.44	0.95	0.25	1.20	0.60	2.20
89	<i>Careya arborea</i>	1.95	0.94	0.24	1.18	0.59	2.17
90	<i>Colvillea racemosa</i>	2.26	0.93	0.24	1.17	0.58	2.14
91	<i>Podocarpus macrophyllus</i>	2.06	0.88	0.23	1.11	0.56	2.04
92	<i>Caesalpinia platyloba</i>	0.83	0.87	0.23	1.10	0.55	2.02
93	<i>Vepris bilocularis</i>	1.24	0.86	0.22	1.09	0.54	2.00
94	<i>Mitragyna parviflora</i>	1.51	0.85	0.22	1.07	0.53	1.96
95	<i>Combretum erythrophyllum</i>	0.94	0.85	0.22	1.06	0.53	1.95
96	<i>Terminalia catappa</i>	1.52	0.79	0.21	1.00	0.50	1.83
97	<i>Artocarpus lacucha</i>	1.45	0.77	0.20	0.97	0.49	1.78
98	<i>Cassine paniculata</i>	1.38	0.72	0.19	0.90	0.45	1.66
99	<i>Wrightia tomentosa</i>	0.95	0.71	0.18	0.89	0.45	1.64
100	<i>Terminalia arjuna</i>	1.01	0.69	0.18	0.87	0.43	1.59
101	<i>Aegle marmelos</i>	0.92	0.69	0.18	0.87	0.43	1.59
102	<i>Hibiscus tiliaceus</i>	1.20	0.68	0.18	0.86	0.43	1.58
103	<i>Callistemon viminalis</i>	1.04	0.68	0.18	0.85	0.43	1.57
104	<i>Semecarpus anacardium</i>	0.88	0.64	0.17	0.80	0.40	1.47
105	<i>Celtis wightii</i>	0.95	0.56	0.15	0.71	0.35	1.30
106	<i>Reutealis trisperma</i>	1.26	0.54	0.14	0.68	0.34	1.25
107	<i>Streblus asper</i>	0.96	0.51	0.13	0.64	0.32	1.18
108	<i>Alangium lamarckii</i>	0.78	0.51	0.13	0.64	0.32	1.17
109	<i>Pterocarpus marsupium</i>	0.65	0.44	0.11	0.55	0.27	1.01
110	<i>Mesua ferrea</i>	0.51	0.43	0.11	0.55	0.27	1.00
111	<i>Kingiodendron pinnatum</i>	0.89	0.43	0.11	0.54	0.27	0.99
112	<i>Milicia excelsa</i>	0.77	0.42	0.11	0.53	0.27	0.98
113	<i>Gmelina arborea</i>	1.03	0.42	0.11	0.53	0.27	0.98
114	<i>Chrysophyllum cainito</i>	0.73	0.41	0.11	0.52	0.26	0.95
115	<i>Oroxylon indicum</i>	1.27	0.41	0.11	0.51	0.26	0.94
116	<i>Anthocephalus cadamba</i>	1.21	0.40	0.10	0.51	0.25	0.93
117	<i>Elaeis guineensis</i>	1.00	0.40	0.10	0.50	0.25	0.92
118	<i>Hopea parviflora</i>	0.60	0.39	0.10	0.49	0.24	0.89
119	<i>Ficus tsjahela</i>	0.98	0.38	0.10	0.48	0.24	0.89
120	<i>Terminalia bellirica</i>	0.52	0.37	0.10	0.47	0.23	0.86
121	<i>Citharexylum quadrangulare</i>	0.52	0.37	0.10	0.47	0.23	0.85
122	<i>Alstonia scholaris</i>	1.00	0.36	0.09	0.45	0.23	0.83
123	<i>Dolichandrone atrovirens</i>	0.69	0.36	0.09	0.45	0.23	0.83

Sl. No.	Tree species	V (m ³)	AGB (t)	BGB (t)	Total Biomass (t)	Total Carbon (t)	Total CO ₂ (t)
124	<i>Ficus hispida</i>	0.89	0.35	0.09	0.44	0.22	0.80
125	<i>Cedrus deodara</i>	0.62	0.35	0.09	0.44	0.22	0.80
126	<i>Anamirta cocculus</i>	0.61	0.34	0.09	0.42	0.21	0.78
127	<i>Saraca asoca</i>	0.52	0.34	0.09	0.42	0.21	0.78
128	<i>Pterospermum rubiginosum</i>	0.47	0.33	0.09	0.41	0.21	0.76
129	<i>Broussonetia papyrifera</i>	0.71	0.32	0.08	0.41	0.20	0.74
130	<i>Adonidia merrillii</i>	0.61	0.32	0.08	0.40	0.20	0.73
131	<i>Adina cordifolia</i>	0.52	0.31	0.08	0.39	0.19	0.71
132	<i>Gmelina asiatica</i>	0.65	0.29	0.08	0.37	0.19	0.68
133	<i>Dalbergia latifolia</i>	0.39	0.29	0.08	0.37	0.18	0.67
134	<i>Croton oblongifolius</i>	0.41	0.26	0.07	0.33	0.17	0.61
135	<i>Cassia spectabilis</i>	0.55	0.26	0.07	0.33	0.17	0.61
136	<i>Madhuca longifolia</i>	0.35	0.26	0.07	0.33	0.16	0.60
137	<i>Couroupita guianensis</i>	0.56	0.25	0.07	0.32	0.16	0.58
138	<i>Tabebuia impetiginosa</i>	0.49	0.25	0.06	0.31	0.16	0.58
139	<i>Podocarpus chinensis</i>	0.58	0.25	0.06	0.31	0.16	0.57
140	<i>Suregada angustifolia</i>	0.48	0.24	0.06	0.30	0.15	0.55
141	<i>Thespesia populnea</i>	0.45	0.23	0.06	0.29	0.15	0.54
142	<i>Ficus amplissima</i>	0.59	0.23	0.06	0.29	0.14	0.53
143	<i>Securinega leucopyrus</i>	0.28	0.22	0.06	0.28	0.14	0.52
144	<i>Schefflera actinophylla</i>	0.56	0.22	0.06	0.28	0.14	0.51
145	<i>Manihot glaziovii</i>	0.34	0.22	0.06	0.28	0.14	0.51
146	<i>Moringa oleifera</i>	0.44	0.22	0.06	0.28	0.14	0.51
147	<i>Enterolobium contortisiliquum</i>	0.60	0.21	0.05	0.26	0.13	0.48
148	<i>Pterospermum diversifolium</i>	0.29	0.20	0.05	0.26	0.13	0.47
149	<i>Phoenix sylvestris</i>	0.36	0.20	0.05	0.25	0.12	0.45
150	<i>Averrhoa carambola</i>	0.34	0.19	0.05	0.24	0.12	0.43
151	<i>Schotia brachypetala</i>	0.24	0.18	0.05	0.23	0.12	0.42
152	<i>Crescentia cujete</i>	0.36	0.18	0.05	0.23	0.11	0.41
153	<i>Cocos nucifera</i>	0.35	0.18	0.05	0.22	0.11	0.41
154	<i>Acacia ferruginea</i>	0.25	0.17	0.04	0.21	0.10	0.38
155	<i>Terminalia mantaly</i>	0.27	0.16	0.04	0.20	0.10	0.37
156	<i>Dimocarpus longan</i>	0.24	0.16	0.04	0.20	0.10	0.37
157	<i>Clausena dentata</i>	0.18	0.16	0.04	0.20	0.10	0.36
158	<i>Araucaria cunninghamii</i>	0.35	0.15	0.04	0.19	0.09	0.35
159	<i>Ficus benjamina</i>	0.23	0.15	0.04	0.19	0.09	0.34
160	<i>Hamelia patens</i>	0.27	0.15	0.04	0.18	0.09	0.34
161	<i>Ficus lyrata</i>	0.37	0.15	0.04	0.18	0.09	0.34
162	<i>Diospyros sylvatica</i>	0.20	0.14	0.04	0.18	0.09	0.33
163	<i>Zanthoxylum rhetsa</i>	0.41	0.14	0.04	0.17	0.09	0.32
164	<i>Cupressus torulosa</i>	0.31	0.14	0.04	0.17	0.09	0.32

Sl. No.	Tree species	V (m ³)	AGB (t)	BGB (t)	Total Biomass (t)	Total Carbon (t)	Total CO ₂ (t)
165	<i>Mimusops elengi</i>	0.17	0.12	0.03	0.15	0.08	0.28
166	<i>Lagerstroemia speciosa</i>	0.22	0.12	0.03	0.15	0.07	0.27
167	<i>Antiaris toxicaria</i>	0.31	0.12	0.03	0.15	0.07	0.27
168	<i>Guazuma ulmifolia</i>	0.22	0.12	0.03	0.15	0.07	0.27
169	<i>Commiphora wightii</i>	0.24	0.11	0.03	0.14	0.07	0.25
170	<i>Gardenia latifolia</i>	0.14	0.09	0.02	0.11	0.06	0.21
171	<i>Psidium guajava</i>	0.09	0.09	0.02	0.11	0.06	0.21
172	<i>Persea macrantha</i>	0.15	0.08	0.02	0.10	0.05	0.18
173	<i>Sterulia guttata</i>	0.14	0.08	0.02	0.09	0.05	0.17
174	<i>Clusia rosea</i>	0.08	0.07	0.02	0.09	0.04	0.16
175	<i>Callistemon sp.</i>	0.10	0.07	0.02	0.08	0.04	0.15
176	<i>Barringtonia asiatica</i>	0.12	0.06	0.01	0.07	0.04	0.13
177	<i>Cupressus sempervirens</i>	0.12	0.05	0.01	0.07	0.03	0.12
178	<i>Elaeocarpus tuberculatus</i>	0.10	0.04	0.01	0.05	0.03	0.09
179	<i>Pterocarpus dalbergioides</i>	0.07	0.04	0.01	0.05	0.02	0.09
180	<i>Barringtonia acutangula</i>	0.07	0.04	0.01	0.05	0.02	0.08
181	<i>Ficus neriifolia</i>	0.09	0.04	0.01	0.04	0.02	0.08
182	<i>Thuja occidentalis</i>	0.10	0.04	0.01	0.04	0.02	0.08
183	<i>Litsea coriacea</i>	0.08	0.03	0.01	0.04	0.02	0.07
184	<i>Tabebuia aurea</i>	0.05	0.03	0.01	0.03	0.02	0.06
185	<i>Tecoma stans</i>	0.05	0.03	0.01	0.03	0.02	0.06
186	<i>Ficus racemosa</i>	0.06	0.02	0.01	0.03	0.01	0.05
Grand Total		2442.33	1525.48	396.63	1922.11	961.06	3527.07

V- Volume

AGB- Above ground biomass

BGB- Below ground biomass

t- tonnes

Appendix II: Family wise distribution of tree species in Mahatma Gandhi Botanical Garden, GKVK, Bengaluru.

Sl. No.	Family and tree species	Tree density	Total Carbon (Tonnes)	Sum of Total CO ₂ sequestration (Tonnes)
1	Fabaceae	873	482.09	1769.27
	<i>Acacia auriculiformis</i>	42	27.04	99.24
	<i>Acacia ferruginea</i>	2	0.10	0.38
	<i>Acrocarpus fraxinifolius</i>	3	1.84	6.77
	<i>Albizia amara</i>	35	28.85	105.89
	<i>Albizia lebbeck</i>	110	117.62	431.68
	<i>Albizia odoratissima</i>	35	26.95	98.90
	<i>Bauhinia purpurea</i>	5	0.89	3.25
	<i>Butea monosperma</i>	29	9.66	35.47
	<i>Caesalpinia coriaria</i>	8	7.42	27.23
	<i>Caesalpinia platyloba</i>	1	0.55	2.02
	<i>Cassia fistula</i>	81	8.51	31.23
	<i>Cassia spectabilis</i>	2	0.17	0.61
	<i>Colvillea racemosa</i>	5	0.58	2.14
	<i>Dalbergia latifolia</i>	2	0.18	0.67
	<i>Delonix regia</i>	58	30.51	111.97
	<i>Enterolobium contortisiliquum</i>	1	0.13	0.48
	<i>Gliricidia sepium</i>	14	2.90	10.63
	<i>Hardwickia binata</i>	54	34.92	128.17
	<i>Kingiodendron pinnatum</i>	3	0.27	0.99
	<i>Leucaena leucocephala</i>	46	35.12	128.88
	<i>Millettia pinnata</i>	249	96.56	354.38
	<i>Peltophorum pterocarpum</i>	1	6.91	25.35
	<i>Pterocarpus dalbergioides</i>	1	0.02	0.09
	<i>Pterocarpus marsupium</i>	2	0.27	1.01
	<i>Pterocarpus santalinus</i>	4	3.29	12.09
	<i>Samanea saman</i>	6	6.75	24.76
	<i>Saraca asoca</i>	2	0.21	0.78
	<i>Schotia brachypetala</i>	1	0.12	0.42
	<i>Senna siamea</i>	41	8.07	29.61
	<i>Tamarindus indica</i>	28	24.83	91.14
	<i>Xylia xylocarpa</i>	2	0.83	3.03
2	Myrtaceae	199	137.61	505.01
	<i>Callistemon sp.</i>	1	0.04	0.15
	<i>Callistemon viminalis</i>	3	0.43	1.57
	<i>Eucalyptus citriodora</i>	50	35.84	131.53
	<i>Eucalyptus globulus</i>	36	14.31	52.53
	<i>Eucalyptus tereticornis</i>	19	22.45	82.41

Sl. No.	Family and tree species	Tree density	Total Carbon (Tonnes)	Sum of Total CO ₂ sequestration (Tonnes)
	<i>Psidium guajava</i>	1	0.06	0.21
	<i>Syzygium cumini</i>	4	10.71	39.29
	<i>Syzygium operculatum</i>	85	53.77	197.32
3	Meliaceae	302	119.21	437.49
	<i>Amoora lawii</i>	12	1.56	5.71
	<i>Azadirachta indica</i>	258	86.73	318.31
	<i>Chukrasia tabularis</i>	2	1.17	4.29
	<i>Khaya grandifoliola</i>	3	2.19	8.05
	<i>Khaya senegalensis</i>	3	7.67	28.15
	<i>Melia dubia</i>	13	11.67	42.84
	<i>Swietenia macrophylla</i>	1	2.30	8.42
	<i>Swietenia mahagoni</i>	4	2.28	8.38
	<i>Toona ciliata</i>	6	3.63	13.33
4	Proteaceae	97	27.27	100.08
	<i>Grevillea robusta</i>	97	27.27	100.08
5	Simaroubaceae	32	27.10	99.47
	<i>Ailanthus excelsa</i>	11	23.95	87.88
	<i>Ailanthus malabarica</i>	1	0.76	2.78
	<i>Simarouba glauca</i>	20	2.40	8.81
6	Anacardiaceae	86	26.99	99.06
	<i>Anacardium occidentale</i>	69	23.91	87.76
	<i>Mangifera indica</i>	9	1.54	5.65
	<i>Semecarpus anacardium</i>	2	0.40	1.47
	<i>Spondias pinnata</i>	6	1.14	4.18
7	Ebenaceae	22	23.03	84.52
	<i>Diospyros buxifolia</i>	1	0.65	2.40
	<i>Diospyros melanoxylon</i>	15	17.46	64.08
	<i>Diospyros montana</i>	5	4.82	17.71
	<i>Diospyros sylvatica</i>	1	0.09	0.33
8	Moraceae	38	21.92	80.44
	<i>Antiaris toxicaria</i>	1	0.07	0.27
	<i>Artocarpus heterophyllus</i>	4	1.64	6.04
	<i>Artocarpus lacucha</i>	3	0.49	1.78
	<i>Broussonetia papyrifera</i>	1	0.20	0.74
	<i>Ficus amplissima</i>	1	0.14	0.53
	<i>Ficus benghalensis</i>	3	0.98	3.60
	<i>Ficus benjamina</i>	1	0.09	0.34
	<i>Ficus drupacea</i>	2	3.85	14.15
	<i>Ficus elastica</i>	1	0.91	3.33
	<i>Ficus hispida</i>	1	0.22	0.80
	<i>Ficus krishnae</i>	1	0.60	2.20
	<i>Ficus lyrata</i>	1	0.09	0.34

Sl. No.	Family and tree species	Tree density	Total Carbon (Tonnes)	Sum of Total CO ₂ sequestration (Tonnes)
	<i>Ficus microcarpa</i>	4	3.05	11.19
	<i>Ficus neriifolia</i>	1	0.02	0.08
	<i>Ficus racemosa</i>	1	0.01	0.05
	<i>Ficus religiosa</i>	3	4.33	15.88
	<i>Ficus tsjahela</i>	1	0.24	0.89
	<i>Ficus virens</i>	4	4.38	16.08
	<i>Milicia excelsa</i>	1	0.27	0.98
	<i>Streblus asper</i>	3	0.32	1.18
9	Arecaceae	50	15.69	57.60
	<i>Adonidia merrillii</i>	1	0.20	0.73
	<i>Cocos nucifera</i>	1	0.11	0.41
	<i>Elaeis guineensis</i>	1	0.25	0.92
	<i>Phoenix dactylifera</i>	4	0.63	2.33
	<i>Phoenix sylvestris</i>	1	0.12	0.45
	<i>Roystonea regia</i>	42	14.38	52.76
10	Malvaceae	25	14.20	52.11
	<i>Guazuma ulmifolia</i>	1	0.07	0.27
	<i>Hibiscus tiliaceus</i>	2	0.43	1.58
	<i>Pterospermum diversifolium</i>	1	0.13	0.47
	<i>Sterculia balanghas</i>	11	10.12	37.15
	<i>Sterculia foetida</i>	3	0.67	2.46
	<i>Sterculia urens</i>	5	2.58	9.47
	<i>Sterculia guttata</i>	1	0.05	0.17
	<i>Thespesia populnea</i>	1	0.15	0.54
11	Bignoniaceae	31	6.41	23.52
	<i>Crescentia cujete</i>	2	0.11	0.41
	<i>Dolichandrone atrovirens</i>	3	0.23	0.83
	<i>Jacaranda mimosifolia</i>	1	0.71	2.61
	<i>Millingtonia hortensis</i>	2	1.61	5.91
	<i>Oroxylum indicum</i>	1	0.26	0.94
	<i>Tabebuia aurea</i>	1	0.02	0.06
	<i>Tabebuia impetiginosa</i>	2	0.16	0.58
	<i>Tabebuia rosea</i>	18	3.30	12.12
	<i>Tecoma stans</i>	1	0.02	0.06
12	Sapindaceae	13	5.67	20.80
	<i>Dimocarpus longan</i>	4	0.10	0.37
	<i>Sapindus laurifolius</i>	4	1.40	5.13
	<i>Schleichera oleosa</i>	5	4.17	15.30
13	Casuarinaceae	9	4.46	16.37
	<i>Casuarina equisetifolia</i>	9	4.46	16.37
14	Lamiaceae	42	3.97	14.59
	<i>Gmelina arborea</i>	1	0.27	0.98

Sl. No.	Family and tree species	Tree density	Total Carbon (Tonnes)	Sum of Total CO ₂ sequestration (Tonnes)
	<i>Gmelina asiatica</i>	3	0.19	0.68
	<i>Tectona grandis</i>	37	2.41	8.86
	<i>Vitex altissima</i>	1	1.11	4.07
15	Annonaceae	110	3.85	14.13
	<i>Polyalthia longifolia</i>	110	3.85	14.13
16	Sapotaceae	10	3.56	13.07
	<i>Chrysophyllum cainito</i>	1	0.26	0.95
	<i>Madhuca indica</i>	4	1.55	5.70
	<i>Madhuca longifolia</i>	1	0.16	0.60
	<i>Manilkara hexandra</i>	3	1.51	5.54
	<i>Mimusops elengi</i>	1	0.08	0.28
17	Araucariaceae	9	3.04	11.17
	<i>Agathis robusta</i>	3	0.88	3.25
	<i>Araucaria cookii</i>	5	2.07	7.58
	<i>Araucaria cunninghamii</i>	1	0.09	0.35
18	Rubiaceae	26	3.04	11.16
	<i>Adina cordifolia</i>	1	0.19	0.71
	<i>Anthocephalus cadamba</i>	2	0.25	0.93
	<i>Canthium parviflorum</i>	8	0.91	3.35
	<i>Gardenia latifolia</i>	1	0.06	0.21
	<i>Hamelia patens</i>	2	0.09	0.34
	<i>Ixora brachiata</i>	10	1.00	3.67
	<i>Mitragyna parvifolia</i>	2	0.53	1.96
19	Oleaceae	7	3.02	11.08
	<i>Ligustrum perrottettii</i>	3	1.37	5.03
	<i>Olea dioica</i>	4	1.65	6.05
20	Erythroxylaceae	23	2.83	10.38
	<i>Erythroxylum monogynum</i>	23	2.83	10.38
21	Santalaceae	19	2.76	10.14
	<i>Santalum album</i>	19	2.76	10.14
22	Combretaceae	16	2.76	10.15
	<i>Combretum erythrophyllum</i>	1	0.53	1.95
	<i>Terminalia arjuna</i>	2	0.43	1.59
	<i>Terminalia bellirica</i>	1	0.23	0.86
	<i>Terminalia catappa</i>	5	0.35	1.27
	<i>Terminalia mantaly</i>	1	0.10	0.37
	<i>Terminalia tomentosa</i>	5	0.97	3.54
	<i>Terminalia catappa</i>	1	0.15	0.56
23	Rutaceae	10	2.46	9.04
	<i>Aegle marmelos</i>	4	0.43	1.59
	<i>Clausena dentata</i>	1	0.10	0.36
	<i>Limonia acidissima</i>	2	1.30	4.78

Sl. No.	Family and tree species	Tree density	Total Carbon (Tonnes)	Sum of Total CO ₂ sequestration (Tonnes)
	<i>Vepris bilocularis</i>	2	0.54	2.00
	<i>Zanthoxylum rhetsa</i>	1	0.09	0.32
24	Euphorbiaceae	13	2.27	8.35
	<i>Croton oblongifolius</i>	1	0.17	0.61
	<i>Mallotus philippensis</i>	6	1.34	4.91
	<i>Manihot glaziovii</i>	1	0.14	0.51
	<i>Reutealis trisperma</i>	3	0.34	1.25
	<i>Securinea leucopyrus</i>	1	0.14	0.52
	<i>Suregada angustifolia</i>	1	0.15	0.55
25	Rhamnaceae	7	2.03	7.44
	<i>Ziziphus xylopyrus</i>	6	1.28	4.68
	<i>Zizipus rugosa</i>	1	0.75	2.76
26	Cannabaceae	5	1.69	6.22
	<i>Celtis tetrandra</i>	3	1.34	4.92
	<i>Celtis wightii</i>	2	0.35	1.30
27	Apocyanaceae	4	1.63	5.99
	<i>Alstonia scholaris</i>	1	0.09	0.32
	<i>Wrightia tinctoria</i>	2	1.10	4.03
	<i>Wrightia tomentosa</i>	1	0.45	1.64
28	Lythraceae	5	1.62	5.94
	<i>Lagerstroemia lanceolata</i>	3	1.54	5.67
	<i>Lagerstroemia speciosa</i>	2	0.07	0.27
29	Apocynaceae	6	1.38	5.08
	<i>Alstonia scholaris</i>	1	0.14	0.51
	<i>Plumeria alba</i>	5	1.25	4.57
30	Ulmaceae	1	1.38	5.07
	<i>Holoptelea integrifolia</i>	1	1.38	5.07
31	Phyllanthaceae	6	1.01	3.70
	<i>Bridelia retusa</i>	6	1.01	3.70
32	Pinaceae	10	0.88	3.22
	<i>Cedrus deodara</i>	6	0.22	0.80
	<i>Pinus roxburghii</i>	4	0.66	2.42
33	Lecythidaceae	5	0.81	2.97
	<i>Barringtonia acutangula</i>	1	0.02	0.08
	<i>Barringtonia asiatica</i>	1	0.04	0.13
	<i>Careya arborea</i>	2	0.59	2.17
	<i>Couropita guianensis</i>	1	0.16	0.58
34	Podocarpaceae	4	0.71	2.62
	<i>Podocarpus chinensis</i>	2	0.16	0.57
	<i>Podocarpus macrophyllus</i>	2	0.56	2.04
35	Celastraceae	2	0.45	1.66
	<i>Cassine paniculata</i>	2	0.45	1.66

Sl. No.	Family and tree species	Tree density	Total Carbon (Tonnes)	Sum of Total CO ₂ sequestration (Tonnes)
36	Cornaceae	1	0.32	1.17
	<i>Alangium lamarckii</i>	1	0.32	1.17
37	Calophyllaceae	2	0.27	1.00
	<i>Mesua ferrea</i>	2	0.27	1.00
38	Dipterocarpaceae	4	0.24	0.89
	<i>Hopea parviflora</i>	4	0.24	0.89
39	Verbenaceae	1	0.23	0.85
	<i>Citharexylum quadrangulare</i>	1	0.23	0.85
40	Menispermaceae	1	0.21	0.78
	<i>Anamirta cocculus</i>	1	0.21	0.78
41	Sterculiaceae	1	0.21	0.76
	<i>Pterospermum rubiginosum</i>	1	0.21	0.76
42	Cupressaceae	3	0.14	0.52
	<i>Cupressus sempervirens</i>	1	0.03	0.12
	<i>Cupressus torulosa</i>	1	0.09	0.32
	<i>Thuja occidentalis</i>	1	0.02	0.08
43	Araliaceae	1	0.14	0.51
	<i>Schefflera actinophylla</i>	1	0.14	0.51
44	Moringaceae	3	0.14	0.51
	<i>Moringa oleifera</i>	3	0.14	0.51
45	Oxalidaceae	1	0.12	0.43
	<i>Averrhoa carambola</i>	1	0.12	0.43
46	Burseraceae	1	0.07	0.25
	<i>Commiphora wightii</i>	1	0.07	0.25
47	Lauraceae	2	0.07	0.25
	<i>Litsea coriacea</i>	1	0.02	0.07
	<i>Persea macrantha</i>	1	0.05	0.18
48	Clusiaceae	1	0.04	0.16
	<i>Clusia rosea</i>	1	0.04	0.16
49	Elaeocarpaceae	1	0.03	0.09
	<i>Elaeocarpus tuberculatus</i>	1	0.03	0.09
Grand Total		2140	961.06	3527.07

Appendix III: Naturally grown tree species and planted tree species with total biomass carbon and total CO₂ sequestration.

Sl. No.	Tree species	Tree density	Total biomass Carbon (t)	Total CO ₂ sequestration (t)
A	Naturally grown tree species	659	418.20	1534.78
1	<i>Acacia auriculiformis</i>	42	27.04	99.24
2	<i>Acacia ferruginea</i>	2	0.10	0.38
3	<i>Albizia amara</i>	35	28.85	105.89
4	<i>Albizia lebbbeck</i>	110	117.62	431.68
5	<i>Albizia odoratissima</i>	35	26.95	98.90
6	<i>Erythroxylum monogynum</i>	23	2.83	10.38
7	<i>Eucalyptus citriodora</i>	50	35.84	131.53
8	<i>Eucalyptus globulus</i>	36	14.31	52.53
9	<i>Eucalyptus tereticornis</i>	19	22.45	82.41
10	<i>Hardwickia binata</i>	54	34.92	128.17
11	<i>Millettia pinnata</i>	249	96.56	354.38
12	<i>Syzygium cumini</i>	4	10.71	39.29
B	Planted tree species	1481	542.86	1992.29
1	<i>Acrocarpus fraxinifolius</i>	3	1.84	6.77
2	<i>Adina cordifolia</i>	1	0.19	0.71
3	<i>Adonidia merrillii</i>	1	0.20	0.73
4	<i>Aegle marmelos</i>	4	0.43	1.59
5	<i>Agathis robusta</i>	3	0.88	3.25
6	<i>Ailanthus excelsa</i>	11	23.95	87.88
7	<i>Ailanthus malabarica</i>	1	0.76	2.78
8	<i>Alangium lamarckii</i>	1	0.32	1.17
9	<i>Alstonia scholaris</i>	2	0.23	0.83
10	<i>Amoora lawii</i>	12	1.56	5.71
11	<i>Anacardium occidentale</i>	69	23.91	87.76
12	<i>Anamirta cocculus</i>	1	0.21	0.78
13	<i>Anthocephalus cadamba</i>	2	0.25	0.93
14	<i>Antiaris toxicaria</i>	1	0.07	0.27
15	<i>Araucaria cookii</i>	5	2.07	7.58
16	<i>Araucaria cunninghamii</i>	1	0.09	0.35
17	<i>Artocarpus heterophyllus</i>	4	1.64	6.04
18	<i>Artocarpus lacucha</i>	3	0.49	1.78
19	<i>Averrhoa carambola</i>	1	0.12	0.43
20	<i>Azadirachta indica</i>	258	86.73	318.31
21	<i>Barringtonia acutangula</i>	1	0.02	0.08
22	<i>Barringtonia asiatica</i>	1	0.04	0.13
23	<i>Bauhinia purpurea</i>	5	0.89	3.25
24	<i>Bridelia retusa</i>	6	1.01	3.70
25	<i>Broussonetia papyrifera</i>	1	0.20	0.74

Sl. No.	Tree species	Tree density	Total biomass Carbon (t)	Total CO ₂ sequestration (t)
26	<i>Butea monosperma</i>	29	9.66	35.47
27	<i>Caesalpinia coriaria</i>	8	7.42	27.23
28	<i>Caesalpinia platyloba</i>	1	0.55	2.02
29	<i>Callistemon sp.</i>	1	0.04	0.15
30	<i>Callistemon viminalis</i>	3	0.43	1.57
31	<i>Canthium parviflorum</i>	8	0.91	3.35
32	<i>Careya arborea</i>	2	0.59	2.17
33	<i>Cassia fistula</i>	81	8.51	31.23
34	<i>Cassia spectabilis</i>	2	0.17	0.61
35	<i>Cassine paniculata</i>	2	0.45	1.66
36	<i>Casuarina equisetifolia</i>	9	4.46	16.37
37	<i>Cedrus deodara</i>	6	0.22	0.80
38	<i>Celtis tetrandra</i>	3	1.34	4.92
39	<i>Celtis wightii</i>	2	0.35	1.30
40	<i>Chrysophyllum cainito</i>	1	0.26	0.95
41	<i>Chukrasia tabularis</i>	2	1.17	4.29
42	<i>Citharexylum quadrangulare</i>	1	0.23	0.85
43	<i>Clausena dentata</i>	1	0.10	0.36
44	<i>Clusia rosea</i>	1	0.04	0.16
45	<i>Cocos nucifera</i>	1	0.11	0.41
46	<i>Colvillea racemosa</i>	5	0.58	2.14
47	<i>Combretum erythrophyllum</i>	1	0.53	1.95
48	<i>Commiphora wightii</i>	1	0.07	0.25
49	<i>Couroupita guianensis</i>	1	0.16	0.58
50	<i>Crescentia cujete</i>	2	0.11	0.41
51	<i>Croton oblongifolius</i>	1	0.17	0.61
52	<i>Cupressus sempervirens</i>	1	0.03	0.12
53	<i>Cupressus torulosa</i>	1	0.09	0.32
54	<i>Dalbergia latifolia</i>	2	0.18	0.67
55	<i>Delonix regia</i>	58	30.51	111.97
56	<i>Dimocarpus longan</i>	4	0.10	0.37
57	<i>Diospyros buxifolia</i>	1	0.65	2.40
58	<i>Diospyros melanoxylon</i>	15	17.46	64.08
59	<i>Diospyros montana</i>	5	4.82	17.71
60	<i>Diospyros sylvatica</i>	1	0.09	0.33
61	<i>Dolichandrone atrovirens</i>	3	0.23	0.83
62	<i>Elaeis guineensis</i>	1	0.25	0.92
63	<i>Elaeocarpus tuberculatus</i>	1	0.03	0.09
64	<i>Enterolobium contortisiliquum</i>	1	0.13	0.48
65	<i>Ficus amplissima</i>	1	0.14	0.53
66	<i>Ficus benghalensis</i>	3	0.98	3.60

Sl. No.	Tree species	Tree density	Total biomass Carbon (t)	Total CO ₂ sequestration (t)
67	<i>Ficus benamina</i>	1	0.09	0.34
68	<i>Ficus drupacea</i>	2	3.85	14.15
69	<i>Ficus elastica</i>	1	0.91	3.33
70	<i>Ficus hispida</i>	1	0.22	0.80
71	<i>Ficus krishnae</i>	1	0.60	2.20
72	<i>Ficus lyrata</i>	1	0.09	0.34
73	<i>Ficus microcarpa</i>	4	3.05	11.19
74	<i>Ficus neriifolia</i>	1	0.02	0.08
75	<i>Ficus racemosa</i>	1	0.01	0.05
76	<i>Ficus religiosa</i>	3	4.33	15.88
77	<i>Ficus tsjahela</i>	1	0.24	0.89
78	<i>Ficus virens</i>	4	4.38	16.08
79	<i>Gardenia latifolia</i>	1	0.06	0.21
80	<i>Gliricidia sepium</i>	14	2.90	10.63
81	<i>Gmelina arborea</i>	1	0.27	0.98
82	<i>Gmelina asiatica</i>	3	0.19	0.68
83	<i>Grevillea robusta</i>	97	27.27	100.08
84	<i>Guazuma ulmifolia</i>	1	0.07	0.27
85	<i>Hamelia patens</i>	2	0.09	0.34
86	<i>Hibiscus tiliaceus</i>	2	0.43	1.58
87	<i>Holoptelea integrifolia</i>	1	1.38	5.07
88	<i>Hopea parviflora</i>	4	0.24	0.89
89	<i>Ixora brachiata</i>	10	1.00	3.67
90	<i>Jacaranda mimosifolia</i>	1	0.71	2.61
91	<i>Khaya grandifoliola</i>	3	2.19	8.05
92	<i>Khaya senegalensis</i>	3	7.67	28.15
93	<i>Kingiodendron pinnatum</i>	3	0.27	0.99
94	<i>Lagerstroemia lanceolata</i>	3	1.54	5.67
95	<i>Lagerstroemia speciosa</i>	2	0.07	0.27
96	<i>Leucaena leucocephala</i>	46	35.12	128.88
97	<i>Ligustrum perrottettii</i>	3	1.37	5.03
98	<i>Limonia acidissima</i>	2	1.30	4.78
99	<i>Litsea coriacea</i>	1	0.02	0.07
100	<i>Madhuca indica</i>	4	1.55	5.70
101	<i>Madhuca longifolia</i>	1	0.16	0.60
102	<i>Mallotus philippensis</i>	6	1.34	4.91
103	<i>Mangifera indica</i>	9	1.54	5.65
104	<i>Manihot glaziovii</i>	1	0.14	0.51
105	<i>Manilkara hexandra</i>	3	1.51	5.54
106	<i>Melia dubia</i>	13	11.67	42.84
107	<i>Mesua ferrea</i>	2	0.27	1.00

Sl. No.	Tree species	Tree density	Total biomass Carbon (t)	Total CO ₂ sequestration (t)
108	<i>Milicia excelsa</i>	1	0.27	0.98
109	<i>Millingtonia hortensis</i>	2	1.61	5.91
110	<i>Mimusops elengi</i>	1	0.08	0.28
111	<i>Mitragyna parvifolia</i>	2	0.53	1.96
112	<i>Moringa oleifera</i>	3	0.14	0.51
113	<i>Olea dioica</i>	4	1.65	6.05
114	<i>Peltophorum pterocarpum</i>	1	6.91	25.35
115	<i>Persea macrantha</i>	1	0.05	0.18
116	<i>Phoenix dactylifera</i>	4	0.63	2.33
117	<i>Phoenix sylvestris</i>	1	0.12	0.45
118	<i>Pinus roxburghii</i>	4	0.66	2.42
119	<i>Plumeria alba</i>	5	1.25	4.57
120	<i>Podocarpus chinensis</i>	2	0.16	0.57
121	<i>Podocarpus macrophyllus</i>	2	0.56	2.04
122	<i>Polyalthia longifolia</i>	110	3.85	14.13
123	<i>Psidium guajava</i>	1	0.06	0.21
124	<i>Pterocarpus dalbergioides</i>	1	0.02	0.09
125	<i>Pterocarpus marsupium</i>	2	0.27	1.01
126	<i>Pterocarpus santalinus</i>	4	3.29	12.09
127	<i>Pterospermum diversifolium</i>	1	0.13	0.47
128	<i>Pterospermum rubiginosum</i>	1	0.21	0.76
129	<i>Reutealis trisperma</i>	3	0.34	1.25
130	<i>Roystonea regia</i>	42	14.38	52.76
131	<i>Samanea saman</i>	6	6.75	24.76
132	<i>Santalum album</i>	19	2.76	10.14
133	<i>Sapindus laurifolius</i>	4	1.40	5.13
134	<i>Saraca asoca</i>	2	0.21	0.78
135	<i>Schefflera actinophylla</i>	1	0.14	0.51
136	<i>Schleichera oleosa</i>	5	4.17	15.30
137	<i>Schotia brachypetala</i>	1	0.12	0.42
138	<i>Securinega leucopyrus</i>	1	0.14	0.52
139	<i>Semecarpus anacardium</i>	2	0.40	1.47
140	<i>Senna siamea</i>	41	8.07	29.61
141	<i>Simarouba glauca</i>	20	2.40	8.81
142	<i>Spondias pinnata</i>	6	1.14	4.18
143	<i>Sterculia balanghas</i>	11	10.12	37.15
144	<i>Sterculia foetida</i>	3	0.67	2.46
145	<i>Sterculia urens</i>	5	2.58	9.47
146	<i>Sterulia guttata</i>	1	0.05	0.17
147	<i>Streblus asper</i>	3	0.32	1.18
148	<i>Suregada angustifolia</i>	1	0.15	0.55

Sl. No.	Tree species	Tree density	Total biomass Carbon (t)	Total CO ₂ sequestration (t)
149	<i>Swietenia macrophylla</i>	1	2.30	8.42
150	<i>Swietenia mahagoni</i>	4	2.28	8.38
151	<i>Syzygium operculatum</i>	85	53.77	197.32
152	<i>Tabebuia aurea</i>	1	0.02	0.06
153	<i>Tabebuia impetiginosa</i>	2	0.16	0.58
154	<i>Tabebuia rosea</i>	18	3.30	12.12
155	<i>Tamarindus indica</i>	28	24.83	91.14
156	<i>Tecoma stans</i>	1	0.02	0.06
157	<i>Tectona grandis</i>	37	2.41	8.86
158	<i>Terminalia arjuna</i>	2	0.43	1.59
159	<i>Terminalia bellirica</i>	1	0.23	0.86
160	<i>Terminalia catappa</i>	6	0.50	1.83
161	<i>Terminalia mantaly</i>	1	0.10	0.37
162	<i>Terminalia tomentosa</i>	5	0.97	3.54
163	<i>Thespesia populnea</i>	1	0.15	0.54
164	<i>Thuja occidentalis</i>	1	0.02	0.08
165	<i>Toona ciliata</i>	6	3.63	13.33
166	<i>Vepris bilocularis</i>	2	0.54	2.00
167	<i>Vitex altissima</i>	1	1.11	4.07
168	<i>Wrightia tinctoria</i>	2	1.10	4.03
169	<i>Wrightia tomentosa</i>	1	0.45	1.64
170	<i>Xylia xylocarpa</i>	2	0.83	3.03
171	<i>Zanthoxylum rhetsa</i>	1	0.09	0.32
172	<i>Ziziphus xylopyrus</i>	6	1.28	4.68
173	<i>Zizipus rugosa</i>	1	0.75	2.76
174	<i>Oroxylum indicum</i>	1	0.26	0.94
Grand Total		2140	961.06	3527.07

t- tonnes

Appendix IV: Exotic tree species and native tree species with total biomass carbon and total CO₂ sequestration.

Sl. No.	Tree species	Tree density	Total biomass Carbon (tonnes)	Total CO ₂ sequestration (tonnes)
A	Exotic tree species	902	509.81	1871.00
1	<i>Acacia auriculiformis</i>	42	27.04	99.24
2	<i>Adonidia merrillii</i>	1	0.20	0.73
3	<i>Agathis robusta</i>	3	0.88	3.25
4	<i>Ailanthus malabarica</i>	1	0.76	2.78
5	<i>Albizia amara</i>	35	28.85	105.89
6	<i>Albizia lebbeck</i>	110	117.62	431.68
7	<i>Anacardium occidentale</i>	69	23.91	87.76
8	<i>Anthocephalus cadamba</i>	2	0.25	0.93
9	<i>Antiaris toxicaria</i>	1	0.07	0.27
10	<i>Araucaria cookii</i>	5	2.07	7.58
11	<i>Araucaria cunninghamii</i>	1	0.09	0.35
12	<i>Averrhoa carambola</i>	1	0.12	0.43
13	<i>Barringtonia acutangula</i>	1	0.02	0.08
14	<i>Barringtonia asiatica</i>	1	0.04	0.13
15	<i>Broussonetia papyrifera</i>	1	0.20	0.74
16	<i>Caesalpinia coriaria</i>	8	7.42	27.23
17	<i>Caesalpinia platyloba</i>	1	0.55	2.02
18	<i>Callistemon sp.</i>	1	0.04	0.15
19	<i>Callistemon viminalis</i>	3	0.43	1.57
20	<i>Canthium parviflorum</i>	8	0.91	3.35
21	<i>Cassia spectabilis</i>	2	0.17	0.61
22	<i>Cassine paniculata</i>	2	0.45	1.66
23	<i>Casuarina equisetifolia</i>	9	4.46	16.37
24	<i>Celtis tetrandra</i>	3	1.34	4.92
25	<i>Celtis wightii</i>	2	0.35	1.30
26	<i>Chrysophyllum cainito</i>	1	0.26	0.95
27	<i>Citharexylum quadrangulare</i>	1	0.23	0.85
28	<i>Clausena dentata</i>	1	0.10	0.36
29	<i>Clusia rosea</i>	1	0.04	0.16
30	<i>Colvillea racemosa</i>	5	0.58	2.14
31	<i>Combretum erythrophyllum</i>	1	0.53	1.95
32	<i>Couroupita guianensis</i>	1	0.16	0.58
33	<i>Crescentia cujete</i>	2	0.11	0.41
34	<i>Croton oblongifolius</i>	1	0.17	0.61
35	<i>Cupressus sempervirens</i>	1	0.03	0.12
36	<i>Delonix regia</i>	58	30.51	111.97

Sl. No.	Tree species	Tree density	Total biomass Carbon (tonnes)	Total CO ₂ sequestration (tonnes)
37	<i>Dimocarpus longan</i>	4	0.10	0.37
38	<i>Elaeis guineensis</i>	1	0.25	0.92
39	<i>Enterolobium contortisiliquum</i>	1	0.13	0.48
40	<i>Eucalyptus citriodora</i>	50	35.84	131.53
41	<i>Eucalyptus globulus</i>	36	14.31	52.53
42	<i>Eucalyptus tereticornis</i>	19	22.45	82.41
43	<i>Ficus lyrata</i>	1	0.09	0.34
44	<i>Ficus microcarpa</i>	4	3.05	11.19
45	<i>Gliricidia sepium</i>	14	2.90	10.63
46	<i>Grevillea robusta</i>	97	27.27	100.08
47	<i>Guazuma ulmifolia</i>	1	0.07	0.27
48	<i>Hamelia patens</i>	2	0.09	0.34
49	<i>Hibiscus tiliaceus</i>	2	0.43	1.58
50	<i>Holoptelea integrifolia</i>	1	1.38	5.07
51	<i>Jacaranda mimosifolia</i>	1	0.71	2.61
52	<i>Khaya grandifoliola</i>	3	2.19	8.05
53	<i>Khaya senegalensis</i>	3	7.67	28.15
54	<i>Leucaena leucocephala</i>	46	35.12	128.88
55	<i>Manihot glaziovii</i>	1	0.14	0.51
56	<i>Milicia excelsa</i>	1	0.27	0.98
57	<i>Millingtonia hortensis</i>	2	1.61	5.91
58	<i>Peltophorum pterocarpum</i>	1	6.91	25.35
59	<i>Phoenix dactylifera</i>	4	0.63	2.33
60	<i>Phoenix sylvestris</i>	1	0.12	0.45
61	<i>Plumeria alba</i>	5	1.25	4.57
62	<i>Podocarpus chinensis</i>	2	0.16	0.57
63	<i>Podocarpus macrophyllus</i>	2	0.56	2.04
64	<i>Psidium guajava</i>	1	0.06	0.21
65	<i>Reutealis trisperma</i>	3	0.34	1.25
66	<i>Roystonea regia</i>	42	14.38	52.76
67	<i>Samanea saman</i>	6	6.75	24.76
68	<i>Schefflera actinophylla</i>	1	0.14	0.51
69	<i>Schotia brachypetala</i>	1	0.12	0.42
70	<i>Securinega leucopyrus</i>	1	0.14	0.52
71	<i>Simarouba glauca</i>	20	2.40	8.81
72	<i>Spondias pinnata</i>	6	1.14	4.18
73	<i>Streblus asper</i>	3	0.32	1.18
74	<i>Swietenia macrophylla</i>	1	2.30	8.42
75	<i>Swietenia mahagoni</i>	4	2.28	8.38
76	<i>Syzygium operculatum</i>	85	53.77	197.32
77	<i>Tabebuia aurea</i>	1	0.02	0.06

Sl. No.	Tree species	Tree density	Total biomass Carbon (tonnes)	Total CO ₂ sequestration (tonnes)
78	<i>Tabebuia impetiginosa</i>	2	0.16	0.58
79	<i>Tabebuia rosea</i>	18	3.30	12.12
80	<i>Tecoma stans</i>	1	0.02	0.06
81	<i>Terminalia mantaly</i>	1	0.10	0.37
82	<i>Thespesia populnea</i>	1	0.15	0.54
83	<i>Thuja occidentalis</i>	1	0.02	0.08
84	<i>Toona ciliata</i>	6	3.63	13.33
85	<i>Vepris bilocularis</i>	2	0.54	2.00
86	<i>Xylia xylocarpa</i>	2	0.83	3.03
B	Native tree species	1238	451.25	1656.08
1	<i>Acacia ferruginea</i>	2	0.10	0.38
2	<i>Acrocarpus fraxinifolius</i>	3	1.84	6.77
3	<i>Adina cordifolia</i>	1	0.19	0.71
4	<i>Aegle marmelos</i>	4	0.43	1.59
5	<i>Ailanthus excelsa</i>	11	23.95	87.88
6	<i>Alangium lamarckii</i>	1	0.32	1.17
7	<i>Albizia odoratissima</i>	35	26.95	98.90
8	<i>Alstonia scholaris</i>	2	0.23	0.83
9	<i>Amoora lawii</i>	12	1.56	5.71
10	<i>Anamirta cocculus</i>	1	0.21	0.78
11	<i>Artocarpus heterophyllus</i>	4	1.64	6.04
12	<i>Artocarpus lacucha</i>	3	0.49	1.78
13	<i>Azadirachta indica</i>	258	86.73	318.31
14	<i>Bauhinia purpurea</i>	5	0.89	3.25
15	<i>Bridelia retusa</i>	6	1.01	3.70
16	<i>Butea monosperma</i>	29	9.66	35.47
17	<i>Careya arborea</i>	2	0.59	2.17
18	<i>Cassia fistula</i>	81	8.51	31.23
19	<i>Cedrus deodara</i>	6	0.22	0.80
20	<i>Chukrasia tabularis</i>	2	1.17	4.29
21	<i>Cocos nucifera</i>	1	0.11	0.41
22	<i>Commiphora wightii</i>	1	0.07	0.25
23	<i>Cupressus torulosa</i>	1	0.09	0.32
24	<i>Dalbergia latifolia</i>	2	0.18	0.67
25	<i>Diospyros buxifolia</i>	1	0.65	2.40
26	<i>Diospyros melanoxylon</i>	15	17.46	64.08
27	<i>Diospyros montana</i>	5	4.82	17.71
28	<i>Diospyros sylvatica</i>	1	0.09	0.33
29	<i>Dolichandrone atrovirens</i>	3	0.23	0.83
30	<i>Elaeocarpus tuberculatus</i>	1	0.03	0.09
31	<i>Erythroxylum monogynum</i>	23	2.83	10.38

Sl. No.	Tree species	Tree density	Total biomass Carbon (tonnes)	Total CO ₂ sequestration (tonnes)
32	<i>Ficus amplissima</i>	1	0.14	0.53
33	<i>Ficus benghalensis</i>	3	0.98	3.60
34	<i>Ficus benjamina</i>	1	0.09	0.34
35	<i>Ficus drupacea</i>	2	3.85	14.15
36	<i>Ficus elastica</i>	1	0.91	3.33
37	<i>Ficus hispida</i>	1	0.22	0.80
38	<i>Ficus krishnae</i>	1	0.60	2.20
39	<i>Ficus neriifolia</i>	1	0.02	0.08
40	<i>Ficus racemosa</i>	1	0.01	0.05
41	<i>Ficus religiosa</i>	3	4.33	15.88
42	<i>Ficus tsjahela</i>	1	0.24	0.89
43	<i>Ficus virens</i>	4	4.38	16.08
44	<i>Gardenia latifolia</i>	1	0.06	0.21
45	<i>Gmelina arborea</i>	1	0.27	0.98
46	<i>Gmelina asiatica</i>	3	0.19	0.68
47	<i>Hardwickia binata</i>	54	34.92	128.17
48	<i>Hopea parviflora</i>	4	0.24	0.89
49	<i>Ixora brachiata</i>	10	1.00	3.67
50	<i>Kingiodendron pinnatum</i>	3	0.27	0.99
51	<i>Lagerstroemia lanceolata</i>	3	1.54	5.67
52	<i>Lagerstroemia speciosa</i>	2	0.07	0.27
53	<i>Ligustrum perrottettii</i>	3	1.37	5.03
54	<i>Limonia acidissima</i>	2	1.30	4.78
55	<i>Litsea coriacea</i>	1	0.02	0.07
56	<i>Madhuca indica</i>	4	1.55	5.70
57	<i>Madhuca longifolia</i>	1	0.16	0.60
58	<i>Mallotus philippensis</i>	6	1.34	4.91
59	<i>Mangifera indica</i>	9	1.54	5.65
60	<i>Manilkara hexandra</i>	3	1.51	5.54
61	<i>Melia dubia</i>	13	11.67	42.84
62	<i>Mesua ferrea</i>	2	0.27	1.00
63	<i>Millettia pinnata</i>	249	96.56	354.38
64	<i>Mimusops elengi</i>	1	0.08	0.28
65	<i>Mitragyna parvifolia</i>	2	0.53	1.96
66	<i>Moringa oleifera</i>	3	0.14	0.51
67	<i>Olea dioica</i>	4	1.65	6.05
68	<i>Persea macrantha</i>	1	0.05	0.18
69	<i>Pinus roxburghii</i>	4	0.66	2.42
70	<i>Polyalthia longifolia</i>	110	3.85	14.13
71	<i>Pterocarpus dalbergioides</i>	1	0.02	0.09
72	<i>Pterocarpus marsupium</i>	2	0.27	1.01

Sl. No.	Tree species	Tree density	Total biomass Carbon (tonnes)	Total CO ₂ sequestration (tonnes)
73	<i>Pterocarpus santalinus</i>	4	3.29	12.09
74	<i>Pterospermum diversifolium</i>	1	0.13	0.47
75	<i>Pterospermum rubiginosum</i>	1	0.21	0.76
76	<i>Santalum album</i>	19	2.76	10.14
77	<i>Sapindus laurifolius</i>	4	1.40	5.13
78	<i>Saraca asoca</i>	2	0.21	0.78
79	<i>Schleichera oleosa</i>	5	4.17	15.30
80	<i>Semecarpus anacardium</i>	2	0.40	1.47
81	<i>Senna siamea</i>	41	8.07	29.61
82	<i>Sterculia balanghas</i>	11	10.12	37.15
83	<i>Sterculia foetida</i>	3	0.67	2.46
84	<i>Sterculia urens</i>	5	2.58	9.47
85	<i>Sterulia guttata</i>	1	0.05	0.17
86	<i>Suregada angustifolia</i>	1	0.15	0.55
87	<i>Syzygium cumini</i>	4	10.71	39.29
88	<i>Tamarindus indica</i>	28	24.83	91.14
89	<i>Tectona grandis</i>	37	2.41	8.86
90	<i>Terminalia arjuna</i>	2	0.43	1.59
91	<i>Terminalia bellirica</i>	1	0.23	0.86
92	<i>Terminalia catappa</i>	6	0.50	1.83
93	<i>Terminalia tomentosa</i>	5	0.97	3.54
94	<i>Vitex altissima</i>	1	1.11	4.07
95	<i>Wrightia tinctoria</i>	2	1.10	4.03
96	<i>Wrightia tomentosa</i>	1	0.45	1.64
97	<i>Zanthoxylum rhetsa</i>	1	0.09	0.32
98	<i>Ziziphus xylopyrus</i>	6	1.28	4.68
99	<i>Zizipus rugosa</i>	1	0.75	2.76
100	<i>Oroxylum indicum</i>	1	0.26	0.94
Grand Total		2140	961.06	3527.07

Appendix V: Complete enumeration data of Mahatma Gandhi Botanical Garden, GKV, Bengaluru.

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
Block-1									
1	<i>Roystonea regia</i>	0.13	1.68	874.16	227.28	1101.44	550.72	2.02	59.42
2	<i>Roystonea regia</i>	0.09	1.18	614.55	159.78	774.33	387.17	1.42	41.77
3	<i>Roystonea regia</i>	0.08	0.80	417.29	108.49	525.78	262.89	0.96	28.37
4	<i>Roystonea regia</i>	0.04	0.50	260.75	67.79	328.54	164.27	0.60	17.72
5	<i>Roystonea regia</i>	0.04	0.52	268.14	69.72	337.86	168.93	0.62	18.23
6	<i>Roystonea regia</i>	0.06	0.63	328.87	85.51	414.38	207.19	0.76	22.36
7	<i>Roystonea regia</i>	0.16	2.03	1057.73	275.01	1332.74	666.37	2.45	71.90
8	<i>Roystonea regia</i>	0.11	1.52	791.08	205.68	996.76	498.38	1.83	53.77
9	<i>Roystonea regia</i>	0.13	1.83	952.58	247.67	1200.25	600.13	2.20	64.75
10	<i>Roystonea regia</i>	0.07	0.88	457.05	118.83	575.88	287.94	1.06	31.07
11	<i>Roystonea regia</i>	0.14	1.73	901.26	234.33	1135.59	567.80	2.08	61.26
12	<i>Roystonea regia</i>	0.11	1.39	720.22	187.26	907.48	453.74	1.67	48.96
13	<i>Roystonea regia</i>	0.10	1.20	622.89	161.95	784.84	392.42	1.44	42.34
14	<i>Roystonea regia</i>	0.12	1.53	795.33	206.79	1002.11	501.06	1.84	54.06
15	<i>Roystonea regia</i>	0.10	1.12	581.22	151.12	732.34	366.17	1.34	39.51
16	<i>Roystonea regia</i>	0.12	1.37	711.22	184.92	896.14	448.07	1.64	48.35
17	<i>Roystonea regia</i>	0.13	1.52	788.34	204.97	993.31	496.66	1.82	53.59
18	<i>Roystonea regia</i>	0.11	1.32	684.07	177.86	861.93	430.96	1.58	46.50
19	<i>Roystonea regia</i>	0.07	0.71	367.75	95.62	463.37	231.69	0.85	25.00
20	<i>Millettia pinnata</i>	0.16	1.32	1097.97	285.47	1383.44	691.72	2.54	74.64
21	<i>Polyalthia longifolia</i>	0.01	0.04	17.90	4.65	22.55	11.28	0.04	1.22
22	<i>Polyalthia longifolia</i>	0.02	0.06	29.23	7.60	36.83	18.42	0.07	1.99
23	<i>Polyalthia longifolia</i>	0.02	0.06	30.88	8.03	38.91	19.46	0.07	2.10
24	<i>Polyalthia longifolia</i>	0.03	0.07	34.13	8.87	43.01	21.50	0.08	2.32
25	<i>Polyalthia longifolia</i>	0.03	0.08	42.96	11.17	54.13	27.06	0.10	2.92
26	<i>Polyalthia longifolia</i>	0.02	0.06	31.84	8.28	40.12	20.06	0.07	2.16
27	<i>Polyalthia longifolia</i>	0.03	0.07	33.71	8.76	42.47	21.24	0.08	2.29
28	<i>Polyalthia longifolia</i>	0.04	0.10	50.33	13.09	63.41	31.71	0.12	3.42
29	<i>Polyalthia longifolia</i>	0.04	0.10	52.80	13.73	66.53	33.26	0.12	3.59

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
30	<i>Polyalthia longifolia</i>	0.03	0.08	41.27	10.73	52.01	26.00	0.10	2.81
31	<i>Polyalthia longifolia</i>	0.03	0.10	49.09	12.76	61.86	30.93	0.11	3.34
32	<i>Polyalthia longifolia</i>	0.04	0.11	55.41	14.41	69.82	34.91	0.13	3.77
33	<i>Polyalthia longifolia</i>	0.04	0.10	52.60	13.68	66.27	33.14	0.12	3.58
34	<i>Polyalthia longifolia</i>	0.04	0.11	57.07	14.84	71.91	35.96	0.13	3.88
35	<i>Polyalthia longifolia</i>	0.03	0.08	42.87	11.15	54.01	27.01	0.10	2.91
36	<i>Polyalthia longifolia</i>	0.01	0.02	9.44	2.45	11.89	5.95	0.02	0.64
37	<i>Polyalthia longifolia</i>	0.01	0.03	14.65	3.81	18.46	9.23	0.03	1.00
38	<i>Polyalthia longifolia</i>	0.02	0.05	27.97	7.27	35.24	17.62	0.06	1.90
39	<i>Polyalthia longifolia</i>	0.05	0.16	82.27	21.39	103.66	51.83	0.19	5.59
40	<i>Polyalthia longifolia</i>	0.05	0.13	67.74	17.61	85.35	42.67	0.16	4.60
41	<i>Polyalthia longifolia</i>	0.01	0.02	11.39	2.96	14.35	7.17	0.03	0.77
42	<i>Polyalthia longifolia</i>	0.02	0.04	22.89	5.95	28.84	14.42	0.05	1.56
43	<i>Polyalthia longifolia</i>	0.02	0.05	23.38	6.08	29.45	14.73	0.05	1.59
44	<i>Polyalthia longifolia</i>	0.01	0.03	13.15	3.42	16.57	8.28	0.03	0.89
45	<i>Polyalthia longifolia</i>	0.02	0.06	30.69	7.98	38.67	19.34	0.07	2.09
46	<i>Polyalthia longifolia</i>	0.01	0.03	14.65	3.81	18.46	9.23	0.03	1.00
47	<i>Polyalthia longifolia</i>	0.02	0.04	20.55	5.34	25.89	12.94	0.05	1.40
48	<i>Polyalthia longifolia</i>	0.02	0.04	21.47	5.58	27.05	13.53	0.05	1.46
49	<i>Polyalthia longifolia</i>	0.02	0.04	21.01	5.46	26.47	13.23	0.05	1.43
50	<i>Polyalthia longifolia</i>	0.03	0.06	32.55	8.46	41.01	20.51	0.08	2.21
51	<i>Polyalthia longifolia</i>	0.02	0.06	28.50	7.41	35.91	17.96	0.07	1.94
52	<i>Polyalthia longifolia</i>	0.01	0.02	9.75	2.54	12.29	6.14	0.02	0.66
53	<i>Polyalthia longifolia</i>	0.02	0.05	27.04	7.03	34.07	17.03	0.06	1.84
54	<i>Polyalthia longifolia</i>	0.02	0.04	22.89	5.95	28.84	14.42	0.05	1.56
55	<i>Polyalthia longifolia</i>	0.02	0.06	30.69	7.98	38.67	19.34	0.07	2.09
56	<i>Polyalthia longifolia</i>	0.01	0.03	13.52	3.51	17.03	8.52	0.03	0.92
57	<i>Polyalthia longifolia</i>	0.01	0.04	18.33	4.76	23.09	11.55	0.04	1.25
58	<i>Polyalthia longifolia</i>	0.02	0.06	30.69	7.98	38.67	19.34	0.07	2.09
59	<i>Polyalthia longifolia</i>	0.03	0.10	51.44	13.37	64.82	32.41	0.12	3.50
60	<i>Polyalthia longifolia</i>	0.06	0.17	85.91	22.34	108.25	54.12	0.20	5.84
61	<i>Polyalthia longifolia</i>	0.02	0.06	29.59	7.69	37.28	18.64	0.07	2.01
62	<i>Polyalthia longifolia</i>	0.02	0.04	22.41	5.83	28.24	14.12	0.05	1.52

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
63	<i>Polyalthia longifolia</i>	0.02	0.05	26.39	6.86	33.25	16.63	0.06	1.79
64	<i>Polyalthia longifolia</i>	0.02	0.06	30.69	7.98	38.67	19.34	0.07	2.09
65	<i>Polyalthia longifolia</i>	0.03	0.07	35.92	9.34	45.26	22.63	0.08	2.44
66	<i>Polyalthia longifolia</i>	0.01	0.03	17.06	4.43	21.49	10.75	0.04	1.16
67	<i>Polyalthia longifolia</i>	0.02	0.04	19.64	5.11	24.75	12.38	0.05	1.34
68	<i>Polyalthia longifolia</i>	0.02	0.04	19.19	4.99	24.18	12.09	0.04	1.30
69	<i>Polyalthia longifolia</i>	0.03	0.07	34.93	9.08	44.01	22.00	0.08	2.37
70	<i>Polyalthia longifolia</i>	0.03	0.07	35.98	9.35	45.33	22.67	0.08	2.45
71	<i>Polyalthia longifolia</i>	0.02	0.06	28.50	7.41	35.91	17.96	0.07	1.94
72	<i>Polyalthia longifolia</i>	0.03	0.06	32.96	8.57	41.54	20.77	0.08	2.24
73	<i>Terminalia catappa</i>	0.07	0.47	242.75	63.11	305.86	152.93	0.56	16.50
74	<i>Schefflera actinophylla</i>	0.05	0.56	222.71	57.90	280.61	140.31	0.51	15.14
75	<i>Anacardium occidentale</i>	0.25	2.28	955.62	248.46	1204.08	602.04	2.21	64.96
76	<i>Millettia pinnata</i>	0.12	1.16	960.69	249.78	1210.46	605.23	2.22	65.30
77	<i>Toona ciliata</i>	0.22	4.13	2271.72	590.65	2862.36	1431.18	5.25	154.42
78	<i>Anacardium occidentale</i>	0.15	1.29	541.02	140.67	681.69	340.85	1.25	36.78
79	<i>Elaeocarpus tuberculatus</i>	0.01	0.10	40.74	10.59	51.34	25.67	0.09	2.77
80	<i>Moringa oleifera</i>	0.02	0.16	77.92	20.26	98.18	49.09	0.18	5.30
81	<i>Citharexylum quadrangulare</i>	0.07	0.52	369.65	96.11	465.75	232.88	0.85	25.13
82	<i>Callistemon sp.</i>	0.01	0.10	66.95	17.41	84.35	42.18	0.15	4.55
83	<i>Couroupita guianensis</i>	0.06	0.56	252.42	65.63	318.06	159.03	0.58	17.16
84	<i>Vepris bilocularis</i>	0.01	0.04	20.17	5.24	25.41	12.71	0.05	1.37
85	<i>Litsea coriacea</i>	0.01	0.08	30.56	7.95	38.50	19.25	0.07	2.08
86	<i>Millettia pinnata</i>	0.07	0.59	491.25	127.72	618.97	309.49	1.14	33.39
87	<i>Millettia pinnata</i>	0.07	0.65	536.49	139.49	675.97	337.99	1.24	36.47
88	<i>Millettia pinnata</i>	0.12	1.30	1077.32	280.10	1357.42	678.71	2.49	73.23
89	<i>Millettia pinnata</i>	0.10	1.01	840.89	218.63	1059.52	529.76	1.94	57.16
90	<i>Araucaria cookii</i>	0.12	2.19	942.21	244.98	1187.19	593.60	2.18	64.05
91	<i>Colvillea racemosa</i>	0.02	0.10	41.34	10.75	52.09	26.05	0.10	2.81
92	<i>Pterocarpus dalbergioides</i>	0.01	0.07	38.30	9.96	48.26	24.13	0.09	2.60
93	<i>Lagerstroemia speciosa</i>	0.01	0.08	42.63	11.08	53.72	26.86	0.10	2.90
94	<i>Syzygium cumini</i>	0.92	18.86	13200.79	3432.20	16632.99	8316.50	30.52	897.33
95	<i>Syzygium cumini</i>	0.10	1.81	1266.88	329.39	1596.27	798.14	2.93	86.12

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
96	<i>Anacardium occidentale</i>	0.22	1.52	636.95	165.61	802.56	401.28	1.47	43.30
97	<i>Millettia pinnata</i>	0.04	0.27	226.55	58.90	285.45	142.73	0.52	15.40
98	<i>Kingiodendron pinnatum</i>	0.01	0.04	21.51	5.59	27.11	13.55	0.05	1.46
99	<i>Cassia fistula</i>	0.01	0.04	27.15	7.06	34.21	17.10	0.06	1.85
100	<i>Persea macrantha</i>	0.02	0.15	76.83	19.97	96.80	48.40	0.18	5.22
101	<i>Schleichera oleosa</i>	0.04	0.45	430.48	111.93	542.41	271.20	1.00	29.26
102	<i>Millettia pinnata</i>	0.20	1.70	1412.19	367.17	1779.36	889.68	3.27	95.99
103	<i>Olea dioica</i>	0.02	0.13	108.09	28.10	136.19	68.09	0.25	7.35
104	<i>Hopea parviflora</i>	0.01	0.05	33.90	8.81	42.71	21.36	0.08	2.30
105	<i>Pterospermum diversifolium</i>	0.03	0.29	202.91	52.76	255.66	127.83	0.47	13.79
106	<i>Senna siamea</i>	0.13	1.84	1103.56	286.93	1390.49	695.25	2.55	75.02
107	<i>Lagerstroemia speciosa</i>	0.02	0.14	74.53	19.38	93.91	46.96	0.17	5.07
108	<i>Millettia pinnata</i>	0.02	0.24	198.15	51.52	249.67	124.83	0.46	13.47
109	<i>Millettia pinnata</i>	0.01	0.10	84.54	21.98	106.52	53.26	0.20	5.75
110	<i>Tabebuia aurea</i>	0.01	0.05	26.69	6.94	33.63	16.81	0.06	1.81
111	<i>Cedrus deodara</i>	0.01	0.05	28.96	7.53	36.49	18.24	0.07	1.97
112	<i>Barringtonia asiatica</i>	0.01	0.12	56.50	14.69	71.19	35.60	0.13	3.84
113	<i>Agathis robusta</i>	0.04	0.64	281.35	73.15	354.49	177.25	0.65	19.12
114	<i>Hamelia patens</i>	0.01	0.04	24.43	6.35	30.78	15.39	0.06	1.66
115	<i>Hamelia patens</i>	0.04	0.22	121.43	31.57	153.00	76.50	0.28	8.25
116	<i>Moringa oleifera</i>	0.01	0.03	17.21	4.47	21.68	10.84	0.04	1.17
117	<i>Polyalthia longifolia</i>	0.03	0.31	157.59	40.97	198.56	99.28	0.36	10.71
118	<i>Polyalthia longifolia</i>	0.01	0.17	86.30	22.44	108.73	54.37	0.20	5.87
119	<i>Polyalthia longifolia</i>	0.01	0.16	80.38	20.90	101.28	50.64	0.19	5.46
120	<i>Polyalthia longifolia</i>	0.03	0.35	178.39	46.38	224.77	112.39	0.41	12.13
121	<i>Polyalthia longifolia</i>	0.02	0.24	121.97	31.71	153.68	76.84	0.28	8.29
122	<i>Polyalthia longifolia</i>	0.03	0.42	212.74	55.31	268.05	134.03	0.49	14.46
123	<i>Polyalthia longifolia</i>	0.03	0.32	165.23	42.96	208.19	104.10	0.38	11.23
124	<i>Grevillea robusta</i>	0.12	2.30	1242.15	322.96	1565.11	782.56	2.87	84.44
125	<i>Grevillea robusta</i>	0.02	0.29	155.99	40.56	196.54	98.27	0.36	10.60
126	<i>Grevillea robusta</i>	0.04	0.53	284.26	73.91	358.17	179.08	0.66	19.32
127	<i>Grevillea robusta</i>	0.05	0.65	352.94	91.77	444.71	222.36	0.82	23.99
128	<i>Polyalthia longifolia</i>	0.04	0.60	308.19	80.13	388.32	194.16	0.71	20.95

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
129	<i>Grevillea robusta</i>	0.08	1.11	598.42	155.59	754.01	377.00	1.38	40.68
130	<i>Polyalthia longifolia</i>	0.02	0.04	22.41	5.83	28.24	14.12	0.05	1.52
131	<i>Polyalthia longifolia</i>	0.02	0.05	24.36	6.33	30.69	15.35	0.06	1.66
132	<i>Polyalthia longifolia</i>	0.02	0.05	25.37	6.59	31.96	15.98	0.06	1.72
133	<i>Tecoma stans</i>	0.01	0.05	26.38	6.86	33.24	16.62	0.06	1.79
134	<i>Polyalthia longifolia</i>	0.02	0.08	42.97	11.17	54.14	27.07	0.10	2.92
135	<i>Polyalthia longifolia</i>	0.02	0.04	20.55	5.34	25.89	12.94	0.05	1.40
136	<i>Polyalthia longifolia</i>	0.02	0.05	23.38	6.08	29.45	14.73	0.05	1.59
137	<i>Polyalthia longifolia</i>	0.02	0.06	29.59	7.69	37.28	18.64	0.07	2.01
138	<i>Polyalthia longifolia</i>	0.01	0.02	10.39	2.70	13.09	6.55	0.02	0.71
139	<i>Polyalthia longifolia</i>	0.02	0.04	20.55	5.34	25.89	12.94	0.05	1.40
140	<i>Polyalthia longifolia</i>	0.02	0.05	25.37	6.59	31.96	15.98	0.06	1.72
141	<i>Polyalthia longifolia</i>	0.01	0.03	14.65	3.81	18.46	9.23	0.03	1.00
142	<i>Polyalthia longifolia</i>	0.03	0.07	36.53	9.50	46.02	23.01	0.08	2.48
143	<i>Polyalthia longifolia</i>	0.02	0.05	24.66	6.41	31.07	15.53	0.06	1.68
144	<i>Grevillea robusta</i>	0.06	0.93	504.70	131.22	635.93	317.96	1.17	34.31
145	<i>Grevillea robusta</i>	0.06	0.89	482.52	125.46	607.98	303.99	1.12	32.80
146	<i>Grevillea robusta</i>	0.18	3.40	1836.72	477.55	2314.27	1157.13	4.25	124.85
147	<i>Millettia pinnata</i>	0.02	0.16	132.10	34.35	166.44	83.22	0.31	8.98
148	<i>Grevillea robusta</i>	0.15	2.68	1448.85	376.70	1825.55	912.77	3.35	98.49
149	<i>Grevillea robusta</i>	0.12	1.31	705.01	183.30	888.31	444.15	1.63	47.92
150	<i>Grevillea robusta</i>	0.11	2.12	1144.77	297.64	1442.41	721.20	2.65	77.82
151	<i>Grevillea robusta</i>	0.10	1.69	909.93	236.58	1146.51	573.26	2.10	61.85
152	<i>Grevillea robusta</i>	0.12	2.23	1202.72	312.71	1515.43	757.72	2.78	81.76
153	<i>Grevillea robusta</i>	0.12	2.30	1242.15	322.96	1565.11	782.56	2.87	84.44
154	<i>Polyalthia longifolia</i>	0.02	0.05	25.37	6.59	31.96	15.98	0.06	1.72
155	<i>Polyalthia longifolia</i>	0.02	0.05	23.38	6.08	29.45	14.73	0.05	1.59
156	<i>Polyalthia longifolia</i>	0.01	0.03	13.15	3.42	16.57	8.28	0.03	0.89
157	<i>Grevillea robusta</i>	0.15	3.11	1677.63	436.18	2113.81	1056.91	3.88	114.04
158	<i>Grevillea robusta</i>	0.14	2.77	1497.48	389.35	1886.83	943.41	3.46	101.79
159	<i>Grevillea robusta</i>	0.14	2.93	1581.78	411.26	1993.05	996.52	3.66	107.52
160	<i>Grevillea robusta</i>	0.13	2.58	1394.43	362.55	1756.99	878.49	3.22	94.79
161	<i>Grevillea robusta</i>	0.12	2.30	1242.15	322.96	1565.11	782.56	2.87	84.44

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
162	<i>Grevillea robusta</i>	0.10	1.30	701.94	182.51	884.45	442.23	1.62	47.72
163	<i>Grevillea robusta</i>	0.34	7.40	3997.14	1039.26	5036.39	2518.20	9.24	271.71
164	<i>Polyalthia longifolia</i>	0.01	0.03	17.58	4.57	22.15	11.08	0.04	1.20
165	<i>Polyalthia longifolia</i>	0.02	0.05	24.66	6.41	31.07	15.53	0.06	1.68
166	<i>Polyalthia longifolia</i>	0.01	0.02	12.47	3.24	15.71	7.85	0.03	0.85
167	<i>Polyalthia longifolia</i>	0.01	0.02	11.70	3.04	14.74	7.37	0.03	0.80
168	<i>Polyalthia longifolia</i>	0.01	0.03	14.91	3.88	18.79	9.40	0.03	1.01
169	<i>Polyalthia longifolia</i>	0.01	0.02	12.47	3.24	15.71	7.85	0.03	0.85
170	<i>Polyalthia longifolia</i>	0.01	0.03	15.47	4.02	19.49	9.75	0.04	1.05
171	<i>Samanea saman</i>	0.35	5.79	2663.61	692.54	3356.15	1678.07	6.16	181.06
172	<i>Samanea saman</i>	0.20	3.36	1546.22	402.02	1948.24	974.12	3.58	105.11
173	<i>Samanea saman</i>	0.20	3.36	1546.22	402.02	1948.24	974.12	3.58	105.11
174	<i>Samanea saman</i>	0.24	4.14	1905.78	495.50	2401.28	1200.64	4.41	129.55
175	<i>Samanea saman</i>	0.24	4.12	1895.15	492.74	2387.89	1193.94	4.38	128.82
176	<i>Gliricidia sepium</i>	0.12	1.53	1026.48	266.89	1293.37	646.68	2.37	69.78
177	<i>Gliricidia sepium</i>	0.02	0.23	153.11	39.81	192.92	96.46	0.35	10.41
178	<i>Samanea saman</i>	0.18	2.51	1153.08	299.80	1452.88	726.44	2.67	78.38
179	<i>Ficus religiosa</i>	0.39	6.93	2703.79	702.98	3406.77	1703.39	6.25	183.79
180	<i>Millettia pinnata</i>	0.33	4.09	3396.59	883.11	4279.70	2139.85	7.85	230.89
181	<i>Sterculia foetida</i>	0.07	0.81	379.88	98.77	478.65	239.32	0.88	25.82
182	<i>Amoora lawii</i>	0.05	0.45	272.31	70.80	343.11	171.56	0.63	18.51
183	<i>Mallotus philippensis</i>	0.04	0.37	237.08	61.64	298.72	149.36	0.55	16.12
184	<i>Acacia auriculiformis</i>	0.48	8.83	5738.50	1492.01	7230.51	3615.26	13.27	390.08
185	<i>Acacia auriculiformis</i>	0.05	0.90	582.19	151.37	733.56	366.78	1.35	39.57
186	<i>Gmelina arborea</i>	0.11	1.03	421.97	109.71	531.68	265.84	0.98	28.68
187	<i>Grevillea robusta</i>	0.05	0.99	535.95	139.35	675.30	337.65	1.24	36.43
188	<i>Grevillea robusta</i>	0.10	1.95	1051.13	273.29	1324.42	662.21	2.43	71.45
189	<i>Mallotus philippensis</i>	0.01	0.06	35.53	9.24	44.77	22.39	0.08	2.42
190	<i>Cedrus deodara</i>	0.01	0.08	45.04	11.71	56.76	28.38	0.10	3.06
191	<i>Santalum album</i>	0.01	0.06	54.60	14.19	68.79	34.40	0.13	3.71
192	<i>Santalum album</i>	0.01	0.09	78.44	20.39	98.83	49.42	0.18	5.33
193	<i>Cassia fistula</i>	0.04	0.34	242.45	63.04	305.49	152.74	0.56	16.48
194	<i>Santalum album</i>	0.01	0.07	61.41	15.97	77.38	38.69	0.14	4.17

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
195	<i>Grevillea robusta</i>	0.01	0.25	134.07	34.86	168.93	84.47	0.31	9.11
196	<i>Alangium lamarckii</i>	0.08	0.78	507.32	131.90	639.23	319.61	1.17	34.49
197	<i>Cassia fistula</i>	0.01	0.13	88.80	23.09	111.89	55.94	0.21	6.04
198	<i>Grevillea robusta</i>	0.07	0.98	527.38	137.12	664.50	332.25	1.22	35.85
199	<i>Mesua ferrea</i>	0.04	0.39	331.44	86.17	417.61	208.81	0.77	22.53
200	<i>Cedrus deodara</i>	0.01	0.14	80.59	20.95	101.54	50.77	0.19	5.48
201	<i>Bauhinia purpurea</i>	0.01	0.07	47.99	12.48	60.46	30.23	0.11	3.26
202	<i>Dalbergia latifolia</i>	0.03	0.27	200.77	52.20	252.98	126.49	0.46	13.65
203	<i>Dalbergia latifolia</i>	0.01	0.12	90.78	23.60	114.38	57.19	0.21	6.17
204	<i>Celtis tetrandra</i>	0.10	1.16	681.72	177.25	858.97	429.49	1.58	46.34
205	<i>Senna siamea</i>	0.01	0.12	72.39	18.82	91.22	45.61	0.17	4.92
206	<i>Grevillea robusta</i>	0.06	1.27	683.31	177.66	860.97	430.49	1.58	46.45
207	<i>Syzygium cumini</i>	0.18	2.42	1692.02	439.92	2131.94	1065.97	3.91	115.02
208	<i>Cedrus deodara</i>	0.01	0.10	58.24	15.14	73.38	36.69	0.13	3.96
209	<i>Albizia lebbeck</i>	0.09	1.62	1071.23	278.52	1349.75	674.88	2.48	72.82
210	<i>Cedrus deodara</i>	0.02	0.16	90.59	23.55	114.14	57.07	0.21	6.16
211	<i>Cedrus deodara</i>	0.01	0.08	42.11	10.95	53.06	26.53	0.10	2.86
212	<i>Crescentia cujete</i>	0.01	0.06	31.60	8.22	39.82	19.91	0.07	2.15
213	<i>Colvillea racemosa</i>	0.08	1.27	519.21	134.99	654.20	327.10	1.20	35.29
214	<i>Mimusops elengi</i>	0.02	0.17	122.34	31.81	154.15	77.07	0.28	8.32
215	<i>Colvillea racemosa</i>	0.05	0.41	168.73	43.87	212.59	106.30	0.39	11.47
216	<i>Adina cordifolia</i>	0.04	0.52	307.68	80.00	387.68	193.84	0.71	20.91
217	<i>Antiaris toxicaria</i>	0.02	0.31	116.76	30.36	147.12	73.56	0.27	7.94
218	<i>Sapindus laurifolius</i>	0.07	0.65	374.89	97.47	472.37	236.18	0.87	25.48
219	<i>Terminalia mantaly</i>	0.02	0.27	159.02	41.34	200.36	100.18	0.37	10.81
220	<i>Grevillea robusta</i>	0.07	1.47	795.03	206.71	1001.74	500.87	1.84	54.04
221	<i>Eucalyptus globulus</i>	0.26	6.06	3435.47	893.22	4328.69	2164.35	7.94	233.53
222	<i>Clausena dentata</i>	0.04	0.18	156.43	40.67	197.10	98.55	0.36	10.63
223	<i>Anamirta cocculus</i>	0.08	0.61	336.14	87.40	423.53	211.77	0.78	22.85
224	<i>Syzygium cumini</i>	0.11	1.19	834.87	217.07	1051.93	525.97	1.93	56.75
225	<i>Cassia fistula</i>	0.31	4.50	3194.58	830.59	4025.18	2012.59	7.39	217.15
226	<i>Diospyros sylvatica</i>	0.02	0.20	143.09	37.20	180.30	90.15	0.33	9.73
227	<i>Vitex altissima</i>	0.26	2.71	1760.73	457.79	2218.52	1109.26	4.07	119.69

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
228	<i>Spondias pinnata</i>	0.14	1.77	706.81	183.77	890.58	445.29	1.63	48.05
229	<i>Alstonia scholaris</i>	0.05	0.38	137.51	35.75	173.26	86.63	0.32	9.35
230	<i>Terminalia arjuna</i>	0.04	0.24	162.64	42.29	204.93	102.46	0.38	11.06
231	<i>Terminalia arjuna</i>	0.06	0.77	525.98	136.75	662.73	331.36	1.22	35.75
232	<i>Melia dubia</i>	0.53	10.77	4309.93	1120.58	5430.51	2715.26	9.96	292.97
233	<i>Pterocarpus marsupium</i>	0.04	0.25	169.81	44.15	213.97	106.98	0.39	11.54
234	<i>Securinega leucopyrus</i>	0.03	0.28	223.00	57.98	280.98	140.49	0.52	15.16
235	<i>Terminalia bellirica</i>	0.04	0.52	370.91	96.44	467.35	233.67	0.86	25.21
236	<i>Anthocephalus cadamba</i>	0.04	0.42	138.21	35.93	174.14	87.07	0.32	9.39
237	<i>Anthocephalus cadamba</i>	0.08	0.80	262.61	68.28	330.88	165.44	0.61	17.85
238	<i>Madhuca longifolia</i>	0.05	0.35	261.38	67.96	329.34	164.67	0.60	17.77
239	<i>Ficus racemosa</i>	0.02	0.06	22.25	5.78	28.03	14.02	0.05	1.51
240	<i>Ficus religiosa</i>	0.03	0.20	78.67	20.46	99.13	49.56	0.18	5.35
241	<i>Aegle marmelos</i>	0.03	0.26	193.37	50.28	243.65	121.83	0.45	13.14
242	<i>Anacardium occidentale</i>	0.13	1.22	512.12	133.15	645.27	322.63	1.18	34.81
243	<i>Millettia pinnata</i>	0.36	3.27	2710.90	704.83	3415.74	1707.87	6.27	184.28
244	<i>Millettia pinnata</i>	0.06	0.52	428.00	111.28	539.28	269.64	0.99	29.09
245	<i>Amoora lawii</i>	0.03	0.28	169.84	44.16	213.99	107.00	0.39	11.54
246	<i>Amoora lawii</i>	0.02	0.11	64.53	16.78	81.31	40.65	0.15	4.39
247	<i>Syzygium operculatum</i>	0.10	1.44	1090.75	283.59	1374.34	687.17	2.52	74.14
248	<i>Cassia fistula</i>	0.04	0.35	245.97	63.95	309.92	154.96	0.57	16.72
249	<i>Ixora brachiata</i>	0.03	0.24	237.81	61.83	299.64	149.82	0.55	16.17
250	<i>Ixora brachiata</i>	0.01	0.07	74.95	19.49	94.44	47.22	0.17	5.10
251	<i>Artocarpus heterophyllus</i>	0.12	1.83	1096.38	285.06	1381.44	690.72	2.53	74.53
252	<i>Artocarpus heterophyllus</i>	0.03	0.51	307.89	80.05	387.94	193.97	0.71	20.93
253	<i>Albizia lebbeck</i>	0.32	6.81	4494.26	1168.51	5662.77	2831.38	10.39	305.50
254	<i>Albizia amara</i>	0.41	7.97	5579.84	1450.76	7030.60	3515.30	12.90	379.29
255	<i>Syzygium operculatum</i>	0.11	1.97	1498.94	389.72	1888.66	944.33	3.47	101.89
256	<i>Aegle marmelos</i>	0.01	0.12	92.35	24.01	116.36	58.18	0.21	6.28
257	<i>Aegle marmelos</i>	0.03	0.26	196.93	51.20	248.13	124.07	0.46	13.39
258	<i>Bauhinia purpurea</i>	0.04	0.50	335.76	87.30	423.05	211.53	0.78	22.82

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259	<i>Aegle marmelos</i>	0.02	0.27	205.16	53.34	258.50	129.25	0.47	13.95
260	<i>Amoora lawii</i>	0.04	0.42	250.33	65.09	315.42	157.71	0.58	17.02
261	<i>Oroxylon indicum</i>	0.10	1.27	407.58	105.97	513.55	256.78	0.94	27.71
262	<i>Amoora lawii</i>	0.04	0.33	200.27	52.07	252.34	126.17	0.46	13.61
263	<i>Casuarina equisetifolia</i>	0.03	0.60	487.59	126.77	614.36	307.18	1.13	33.14
264	<i>Millettia pinnata</i>	0.09	0.93	775.44	201.61	977.05	488.53	1.79	52.71
265	<i>Tamarindus indica</i>	0.05	0.43	320.63	83.36	403.99	202.00	0.74	21.80
266	<i>Albizia lebbek</i>	0.39	8.36	5515.15	1433.94	6949.08	3474.54	12.75	374.90
267	<i>Albizia lebbek</i>	0.45	10.14	6693.77	1740.38	8434.14	4217.07	15.48	455.01
268	<i>Cassia spectabilis</i>	0.03	0.25	117.65	30.59	148.24	74.12	0.27	8.00
269	<i>Cassia spectabilis</i>	0.03	0.30	146.32	38.04	184.36	92.18	0.34	9.95
270	<i>Millettia pinnata</i>	0.06	0.65	542.35	141.01	683.36	341.68	1.25	36.87
271	<i>Casuarina equisetifolia</i>	0.05	0.44	358.36	93.17	451.54	225.77	0.83	24.36
272	<i>Amoora lawii</i>	0.04	0.38	227.32	59.10	286.42	143.21	0.53	15.45
273	<i>Amoora lawii</i>	0.02	0.18	107.64	27.99	135.63	67.81	0.25	7.32
274	<i>Amoora lawii</i>	0.05	0.62	372.48	96.85	469.33	234.66	0.86	25.32
275	<i>Kingiodendron pinnatum</i>	0.03	0.33	159.18	41.39	200.57	100.29	0.37	10.82
276	<i>Kingiodendron pinnatum</i>	0.04	0.52	247.62	64.38	312.00	156.00	0.57	16.83
277	<i>Syzygium operculatum</i>	0.05	0.63	482.06	125.34	607.39	303.70	1.11	32.77
278	<i>Tamarindus indica</i>	0.08	1.14	854.79	222.25	1077.04	538.52	1.98	58.11
279	<i>Santalum album</i>	0.01	0.14	129.36	33.63	163.00	81.50	0.30	8.79
280	<i>Santalum album</i>	0.01	0.13	117.47	30.54	148.02	74.01	0.27	7.99
281	<i>Senna siamea</i>	0.04	0.42	252.72	65.71	318.43	159.22	0.58	17.18
282	<i>Simarouba glauca</i>	0.01	0.10	36.14	9.40	45.54	22.77	0.08	2.46
283	<i>Albizia amara</i>	0.01	0.09	63.08	16.40	79.48	39.74	0.15	4.29
284	<i>Millettia pinnata</i>	0.04	0.36	295.10	76.72	371.82	185.91	0.68	20.06
285	<i>Syzygium operculatum</i>	0.06	0.57	435.48	113.22	548.70	274.35	1.01	29.60
286	<i>Azadirachta indica</i>	0.01	0.12	62.90	16.35	79.25	39.63	0.15	4.28
287	<i>Simarouba glauca</i>	0.01	0.08	27.75	7.22	34.97	17.49	0.06	1.89
288	<i>Senna siamea</i>	0.02	0.16	95.46	24.82	120.29	60.14	0.22	6.49
289	<i>Butea monosperma</i>	0.03	0.26	126.83	32.97	159.80	79.90	0.29	8.62
290	<i>Senna siamea</i>	0.04	0.33	198.70	51.66	250.36	125.18	0.46	13.51
291	<i>Senna siamea</i>	0.03	0.25	148.55	38.62	187.17	93.59	0.34	10.10

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292	<i>Azadirachta indica</i>	0.03	0.33	172.15	44.76	216.91	108.46	0.40	11.70
293	<i>Tamarindus indica</i>	0.06	0.76	573.69	149.16	722.85	361.43	1.33	39.00
294	<i>Tamarindus indica</i>	0.10	1.27	955.30	248.38	1203.68	601.84	2.21	64.94
295	<i>Thespesia populnea</i>	0.05	0.45	231.80	60.27	292.06	146.03	0.54	15.76
Block-2									
296	<i>Polyalthia longifolia</i>	0.10	0.55	282.51	73.45	355.96	177.98	0.65	19.20
297	<i>Polyalthia longifolia</i>	0.03	0.15	77.66	20.19	97.85	48.93	0.18	5.28
298	<i>Polyalthia longifolia</i>	0.03	0.15	74.27	19.31	93.59	46.79	0.17	5.05
299	<i>Polyalthia longifolia</i>	0.04	0.20	101.26	26.33	127.59	63.79	0.23	6.88
300	<i>Polyalthia longifolia</i>	0.01	0.04	18.12	4.71	22.83	11.42	0.04	1.23
301	<i>Polyalthia longifolia</i>	0.03	0.12	63.57	16.53	80.10	40.05	0.15	4.32
302	<i>Polyalthia longifolia</i>	0.03	0.15	75.95	19.75	95.69	47.85	0.18	5.16
303	<i>Polyalthia longifolia</i>	0.03	0.13	66.77	17.36	84.14	42.07	0.15	4.54
304	<i>Polyalthia longifolia</i>	0.02	0.10	49.38	12.84	62.22	31.11	0.11	3.36
305	<i>Polyalthia longifolia</i>	0.03	0.15	78.32	20.36	98.68	49.34	0.18	5.32
306	<i>Polyalthia longifolia</i>	0.04	0.17	87.70	22.80	110.50	55.25	0.20	5.96
307	<i>Polyalthia longifolia</i>	0.02	0.07	36.17	9.40	45.57	22.78	0.08	2.46
308	<i>Polyalthia longifolia</i>	0.02	0.07	36.17	9.40	45.57	22.78	0.08	2.46
309	<i>Millettia pinnata</i>	0.19	2.36	1958.03	509.09	2467.12	1233.56	4.53	133.10
310	<i>Hardwickia binata</i>	0.16	3.02	2206.47	573.68	2780.15	1390.07	5.10	149.99
311	<i>Millettia pinnata</i>	0.29	3.57	2963.38	770.48	3733.86	1866.93	6.85	201.44
312	<i>Polyalthia longifolia</i>	0.03	0.14	69.08	17.96	87.03	43.52	0.16	4.70
313	<i>Polyalthia longifolia</i>	0.03	0.15	79.01	20.54	99.56	49.78	0.18	5.37
314	<i>Polyalthia longifolia</i>	0.02	0.07	35.14	9.14	44.27	22.14	0.08	2.39
315	<i>Polyalthia longifolia</i>	0.05	0.23	115.43	30.01	145.44	72.72	0.27	7.85
316	<i>Polyalthia longifolia</i>	0.06	0.29	147.93	38.46	186.39	93.20	0.34	10.06
317	<i>Polyalthia longifolia</i>	0.06	0.26	131.95	34.31	166.26	83.13	0.31	8.97
318	<i>Polyalthia longifolia</i>	0.08	0.35	177.96	46.27	224.23	112.11	0.41	12.10
319	<i>Polyalthia longifolia</i>	0.06	0.25	127.33	33.11	160.44	80.22	0.29	8.66
320	<i>Polyalthia longifolia</i>	0.04	0.19	97.32	25.30	122.63	61.31	0.23	6.62
321	<i>Polyalthia longifolia</i>	0.03	0.15	75.07	19.52	94.58	47.29	0.17	5.10
322	<i>Polyalthia longifolia</i>	0.01	0.05	23.67	6.15	29.82	14.91	0.05	1.61
323	<i>Polyalthia longifolia</i>	0.02	0.09	44.29	11.52	55.81	27.90	0.10	3.01

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
324	<i>Polyalthia longifolia</i>	0.02	0.07	37.81	9.83	47.64	23.82	0.09	2.57
325	<i>Tamarindus indica</i>	0.50	9.20	6900.86	1794.22	8695.08	4347.54	15.96	469.09
326	<i>Millettia pinnata</i>	0.13	1.54	1279.28	332.61	1611.89	805.95	2.96	86.96
327	<i>Anacardium occidentale</i>	0.12	1.23	515.68	134.08	649.76	324.88	1.19	35.05
328	<i>Millettia pinnata</i>	0.18	2.11	1747.84	454.44	2202.28	1101.14	4.04	118.81
329	<i>Psidium quajava</i>	0.01	0.09	90.08	23.42	113.50	56.75	0.21	6.12
330	<i>Syzygium operculatum</i>	0.08	1.76	1339.60	348.30	1687.89	843.95	3.10	91.06
331	<i>Syzygium operculatum</i>	0.07	1.21	919.67	239.11	1158.78	579.39	2.13	62.51
332	<i>Moringa oleifera</i>	0.04	0.25	123.33	32.06	155.39	77.70	0.29	8.38
333	<i>Anacardium occidentale</i>	0.15	1.75	736.38	191.46	927.83	463.92	1.70	50.06
334	<i>Anacardium occidentale</i>	0.41	4.76	1998.00	519.48	2517.49	1258.74	4.62	135.82
335	<i>Gliricidia sepium</i>	0.02	0.24	159.00	41.34	200.34	100.17	0.37	10.81
336	<i>Gliricidia sepium</i>	0.02	0.25	165.79	43.11	208.90	104.45	0.38	11.27
337	<i>Syzygium operculatum</i>	0.26	5.16	3922.27	1019.79	4942.06	2471.03	9.07	266.62
338	<i>Hardwickia binata</i>	0.02	0.26	190.05	49.41	239.46	119.73	0.44	12.92
339	<i>Syzygium operculatum</i>	0.01	0.08	57.01	14.82	71.83	35.92	0.13	3.88
340	<i>Syzygium operculatum</i>	0.11	2.14	1627.24	423.08	2050.32	1025.16	3.76	110.61
341	<i>Syzygium operculatum</i>	0.09	1.71	1300.22	338.06	1638.28	819.14	3.01	88.38
342	<i>Diospyros melanoxylon</i>	0.60	11.17	7598.26	1975.55	9573.80	4786.90	17.57	516.50
343	<i>Diospyros melanoxylon</i>	0.20	3.64	2473.81	643.19	3117.00	1558.50	5.72	168.16
344	<i>Diospyros melanoxylon</i>	0.05	0.61	411.53	107.00	518.52	259.26	0.95	27.97
345	<i>Diospyros melanoxylon</i>	0.07	0.89	604.05	157.05	761.10	380.55	1.40	41.06
346	<i>Azadirachta indica</i>	0.02	0.16	84.12	21.87	105.99	52.99	0.19	5.72
347	<i>Acacia auriculiformis</i>	0.04	0.55	360.41	93.71	454.11	227.06	0.83	24.50
348	<i>Acacia auriculiformis</i>	0.04	0.48	312.31	81.20	393.51	196.75	0.72	21.23
349	<i>Acacia auriculiformis</i>	0.04	0.48	312.31	81.20	393.51	196.75	0.72	21.23
350	<i>Terminalia catappa</i>	0.06	0.60	310.24	80.66	390.90	195.45	0.72	21.09
351	<i>Azadirachta indica</i>	0.09	1.16	603.32	156.86	760.19	380.09	1.39	41.01
352	<i>Anacardium occidentale</i>	0.06	0.63	262.58	68.27	330.85	165.43	0.61	17.85
353	<i>Terminalia catappa</i>	0.03	0.26	137.35	35.71	173.07	86.53	0.32	9.34
354	<i>Albizia lebbeck</i>	0.03	0.31	204.37	53.14	257.51	128.75	0.47	13.89
355	<i>Millettia pinnata</i>	0.07	0.97	802.70	208.70	1011.40	505.70	1.86	54.56
356	<i>Terminalia catappa</i>	0.01	0.04	22.53	5.86	28.39	14.19	0.05	1.53

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357	<i>Mesua ferrea</i>	0.02	0.12	102.08	26.54	128.62	64.31	0.24	6.94
358	<i>Canthium parviflorum</i>	0.01	0.13	55.62	14.46	70.08	35.04	0.13	3.78
359	<i>Millettia pinnata</i>	0.06	0.71	593.35	154.27	747.63	373.81	1.37	40.33
360	<i>Cassia fistula</i>	0.01	0.03	23.65	6.15	29.80	14.90	0.05	1.61
361	<i>Cassia fistula</i>	0.01	0.06	43.79	11.38	55.17	27.59	0.10	2.98
362	<i>Albizia lebbbeck</i>	0.03	0.37	244.29	63.52	307.80	153.90	0.56	16.61
363	<i>Albizia lebbbeck</i>	0.02	0.21	136.28	35.43	171.71	85.85	0.32	9.26
364	<i>Cassia fistula</i>	0.02	0.10	69.46	18.06	87.51	43.76	0.16	4.72
365	<i>Acacia auriculiformis</i>	0.23	2.88	1870.34	486.29	2356.63	1178.31	4.32	127.14
366	<i>Syzygium operculatum</i>	0.07	1.22	925.26	240.57	1165.83	582.92	2.14	62.90
367	<i>Anacardium occidentale</i>	0.14	1.49	627.17	163.06	790.23	395.12	1.45	42.63
368	<i>Anacardium occidentale</i>	0.09	1.05	440.05	114.41	554.47	277.23	1.02	29.91
369	<i>Syzygium operculatum</i>	0.09	1.61	1221.82	317.67	1539.50	769.75	2.82	83.05
370	<i>Syzygium operculatum</i>	0.12	2.17	1651.69	429.44	2081.13	1040.56	3.82	112.27
371	<i>Syzygium operculatum</i>	0.07	1.16	881.75	229.25	1111.00	555.50	2.04	59.94
372	<i>Syzygium operculatum</i>	0.08	1.35	1026.87	266.99	1293.85	646.93	2.37	69.80
373	<i>Syzygium operculatum</i>	0.12	1.88	1429.78	371.74	1801.52	900.76	3.31	97.19
374	<i>Azadirachta indica</i>	0.04	0.54	279.43	72.65	352.09	176.04	0.65	18.99
375	<i>Tamarindus indica</i>	0.10	1.47	1103.43	286.89	1390.33	695.16	2.55	75.01
376	<i>Syzygium operculatum</i>	0.07	1.25	947.00	246.22	1193.22	596.61	2.19	64.37
377	<i>Syzygium operculatum</i>	0.09	1.11	842.22	218.98	1061.20	530.60	1.95	57.25
378	<i>Millettia pinnata</i>	0.04	0.46	381.97	99.31	481.28	240.64	0.88	25.96
379	<i>Syzygium operculatum</i>	0.09	1.76	1340.99	348.66	1689.64	844.82	3.10	91.15
380	<i>Syzygium operculatum</i>	0.09	1.85	1406.23	365.62	1771.85	885.93	3.25	95.59
381	<i>Syzygium operculatum</i>	0.07	1.34	1015.34	263.99	1279.33	639.67	2.35	69.02
382	<i>Syzygium operculatum</i>	0.06	0.81	617.98	160.68	778.66	389.33	1.43	42.01
383	<i>Syzygium operculatum</i>	0.13	2.07	1572.08	408.74	1980.82	990.41	3.63	106.86
384	<i>Syzygium operculatum</i>	0.06	0.90	686.65	178.53	865.18	432.59	1.59	46.68
385	<i>Millettia pinnata</i>	0.02	0.26	214.74	55.83	270.58	135.29	0.50	14.60
386	<i>Millettia pinnata</i>	0.03	0.44	367.01	95.42	462.43	231.22	0.85	24.95
387	<i>Millettia pinnata</i>	0.08	1.02	847.64	220.39	1068.03	534.01	1.96	57.62
388	<i>Syzygium operculatum</i>	0.13	2.57	1950.93	507.24	2458.17	1229.08	4.51	132.62
389	<i>Hardwickia binata</i>	0.12	1.89	1382.32	359.40	1741.73	870.86	3.20	93.96

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390	<i>Syzygium operculatum</i>	0.15	2.92	2220.81	577.41	2798.23	1399.11	5.13	150.96
391	<i>Guazuma ulmifolia</i>	0.02	0.22	116.17	30.21	146.38	73.19	0.27	7.90
392	<i>Acacia auriculiformis</i>	0.09	1.32	861.02	223.87	1084.89	542.44	1.99	58.53
393	<i>Acacia auriculiformis</i>	0.05	0.58	378.39	98.38	476.77	238.38	0.87	25.72
394	<i>Acacia auriculiformis</i>	0.17	2.49	1620.36	421.29	2041.65	1020.82	3.75	110.14
395	<i>Acacia auriculiformis</i>	0.17	2.52	1638.52	426.02	2064.54	1032.27	3.79	111.38
396	<i>Acacia auriculiformis</i>	0.12	2.57	1670.19	434.25	2104.44	1052.22	3.86	113.53
397	<i>Syzygium operculatum</i>	0.09	1.84	1397.82	363.43	1761.25	880.63	3.23	95.02
398	<i>Ailanthus excelsa</i>	0.97	19.50	9358.31	2433.16	11791.47	5895.74	21.64	636.14
399	<i>Syzygium operculatum</i>	0.02	0.23	172.03	44.73	216.76	108.38	0.40	11.69
400	<i>Millettia pinnata</i>	0.49	6.07	5037.00	1309.62	6346.62	3173.31	11.65	342.39
401	<i>Millettia pinnata</i>	0.11	1.36	1130.19	293.85	1424.03	712.02	2.61	76.83
402	<i>Tabebuia rosea</i>	0.16	2.14	1157.06	300.84	1457.90	728.95	2.68	78.65
403	<i>Tabebuia rosea</i>	0.06	0.66	357.40	92.92	450.32	225.16	0.83	24.29
404	<i>Polyalthia longifolia</i>	0.08	0.80	409.26	106.41	515.67	257.84	0.95	27.82
405	<i>Acacia auriculiformis</i>	0.13	1.83	1186.47	308.48	1494.95	747.48	2.74	80.65
406	<i>Leucaena leucocephala</i>	0.27	4.98	3189.90	829.37	4019.28	2009.64	7.38	216.84
407	<i>Leucaena leucocephala</i>	0.09	1.58	1009.31	262.42	1271.72	635.86	2.33	68.61
408	<i>Anacardium occidentale</i>	0.71	13.22	5554.19	1444.09	6998.28	3499.14	12.84	377.55
409	<i>Manihot glaziovii</i>	0.04	0.34	220.52	57.33	277.85	138.92	0.51	14.99
410	<i>Hibiscus tiliaceus</i>	0.06	0.65	373.33	97.07	470.39	235.20	0.86	25.38
411	<i>Syzygium operculatum</i>	0.04	0.52	394.37	102.54	496.91	248.45	0.91	26.81
412	<i>Tabebuia rosea</i>	0.04	0.52	280.21	72.86	353.07	176.53	0.65	19.05
413	<i>Syzygium operculatum</i>	0.03	0.43	324.05	84.25	408.31	204.15	0.75	22.03
414	<i>Millettia pinnata</i>	0.10	1.45	1206.47	313.68	1520.15	760.07	2.79	82.01
415	<i>Syzygium operculatum</i>	0.10	1.67	1266.77	329.36	1596.13	798.07	2.93	86.11
416	<i>Syzygium operculatum</i>	0.10	1.85	1402.39	364.62	1767.01	883.50	3.24	95.33
417	<i>Sterculia urens</i>	0.18	2.47	1655.09	430.32	2085.42	1042.71	3.83	112.51
418	<i>Leucaena leucocephala</i>	0.21	3.61	2313.27	601.45	2914.72	1457.36	5.35	157.25
419	<i>Sterculia urens</i>	0.10	1.33	892.40	232.02	1124.43	562.21	2.06	60.66
420	<i>Syzygium operculatum</i>	0.07	1.35	1024.28	266.31	1290.60	645.30	2.37	69.63
421	<i>Syzygium operculatum</i>	0.09	1.47	1118.25	290.75	1409.00	704.50	2.59	76.01
422	<i>Syzygium operculatum</i>	0.03	0.55	421.61	109.62	531.23	265.62	0.97	28.66

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423	<i>Syzygium operculatum</i>	0.03	0.37	284.92	74.08	359.00	179.50	0.66	19.37
424	<i>Syzygium operculatum</i>	0.03	0.48	365.80	95.11	460.91	230.45	0.85	24.87
425	<i>Syzygium operculatum</i>	0.04	0.72	548.66	142.65	691.32	345.66	1.27	37.30
426	<i>Syzygium operculatum</i>	0.05	0.77	584.00	151.84	735.84	367.92	1.35	39.70
427	<i>Syzygium operculatum</i>	0.07	1.26	958.15	249.12	1207.27	603.63	2.22	65.13
428	<i>Syzygium operculatum</i>	0.01	0.18	139.78	36.34	176.13	88.06	0.32	9.50
429	<i>Syzygium operculatum</i>	0.01	0.16	120.86	31.42	152.28	76.14	0.28	8.22
430	<i>Canthium parviflorum</i>	0.09	1.22	511.50	132.99	644.48	322.24	1.18	34.77
431	<i>Azadirachta indica</i>	0.06	0.82	426.11	110.79	536.89	268.45	0.99	28.96
432	<i>Syzygium operculatum</i>	0.09	1.42	1077.03	280.03	1357.06	678.53	2.49	73.21
433	<i>Sterculia urens</i>	0.03	0.47	312.40	81.22	393.63	196.81	0.72	21.24
434	<i>Syzygium operculatum</i>	0.09	1.38	1049.77	272.94	1322.71	661.36	2.43	71.36
435	<i>Azadirachta indica</i>	0.01	0.07	37.15	9.66	46.81	23.41	0.09	2.53
436	<i>Millettia pinnata</i>	0.06	0.56	462.28	120.19	582.48	291.24	1.07	31.42
437	<i>Azadirachta indica</i>	0.03	0.30	158.51	41.21	199.73	99.86	0.37	10.78
438	<i>Millettia pinnata</i>	0.22	2.85	2366.07	615.18	2981.25	1490.62	5.47	160.84
439	<i>Melia dubia</i>	0.05	0.71	284.42	73.95	358.37	179.18	0.66	19.33
440	<i>Melia dubia</i>	0.07	1.08	431.33	112.14	543.47	271.74	1.00	29.32
441	<i>Albizia amara</i>	0.33	6.13	4289.81	1115.35	5405.16	2702.58	9.92	291.60
442	<i>Azadirachta indica</i>	0.03	0.28	143.89	37.41	181.30	90.65	0.33	9.78
443	<i>Syzygium operculatum</i>	0.06	0.61	460.23	119.66	579.89	289.94	1.06	31.28
444	<i>Syzygium operculatum</i>	0.12	2.25	1706.51	443.69	2150.21	1075.10	3.95	116.00
445	<i>Albizia odoratissima</i>	0.05	0.80	607.12	157.85	764.98	382.49	1.40	41.27
446	<i>Tabebuia impetiginosa</i>	0.04	0.36	186.12	48.39	234.51	117.25	0.43	12.65
447	<i>Tabebuia impetiginosa</i>	0.01	0.12	62.91	16.36	79.26	39.63	0.15	4.28
448	<i>Millettia pinnata</i>	0.03	0.27	222.83	57.94	280.76	140.38	0.52	15.15
449	<i>Albizia amara</i>	0.22	4.75	3322.88	863.95	4186.83	2093.42	7.68	225.88
450	<i>Millettia pinnata</i>	0.08	0.82	679.96	176.79	856.75	428.37	1.57	46.22
451	<i>Millettia pinnata</i>	0.10	1.10	910.74	236.79	1147.53	573.77	2.11	61.91
452	<i>Syzygium operculatum</i>	0.07	1.06	808.19	210.13	1018.32	509.16	1.87	54.94
453	<i>Azadirachta indica</i>	0.20	3.87	2014.38	523.74	2538.12	1269.06	4.66	136.93
454	<i>Millettia pinnata</i>	0.18	1.70	1407.24	365.88	1773.12	886.56	3.25	95.66
455	<i>Cassia fistula</i>	0.01	0.07	47.01	12.22	59.23	29.62	0.11	3.20

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456	<i>Albizia amara</i>	0.13	1.85	1292.52	336.06	1628.58	814.29	2.99	87.86
457	<i>Anacardium occidentale</i>	0.22	2.68	1127.20	293.07	1420.27	710.14	2.61	76.62
458	<i>Millettia pinnata</i>	0.11	1.66	1379.11	358.57	1737.68	868.84	3.19	93.75
459	<i>Syzygium operculatum</i>	0.08	1.27	962.43	250.23	1212.66	606.33	2.23	65.42
460	<i>Millettia pinnata</i>	0.08	0.80	661.41	171.97	833.38	416.69	1.53	44.96
461	<i>Mangifera indica</i>	0.02	0.15	86.54	22.50	109.04	54.52	0.20	5.88
462	<i>Albizia amara</i>	0.04	0.55	382.13	99.35	481.49	240.74	0.88	25.98
463	<i>Syzygium operculatum</i>	0.07	0.84	641.27	166.73	808.00	404.00	1.48	43.59
464	<i>Millettia pinnata</i>	0.07	0.78	643.58	167.33	810.92	405.46	1.49	43.75
465	<i>Azadirachta indica</i>	0.02	0.20	104.26	27.11	131.37	65.69	0.24	7.09
466	<i>Sterculia balanghas</i>	0.07	1.57	864.80	224.85	1089.65	544.82	2.00	58.79
467	<i>Millettia pinnata</i>	0.05	0.48	401.84	104.48	506.32	253.16	0.93	27.32
468	<i>Syzygium operculatum</i>	0.15	2.65	2013.51	523.51	2537.02	1268.51	4.66	136.87
469	<i>Ixora brachiata</i>	0.01	0.12	118.89	30.91	149.80	74.90	0.27	8.08
470	<i>Sterculia balanghas</i>	0.45	9.69	5330.22	1385.86	6716.08	3358.04	12.32	362.33
471	<i>Sterculia balanghas</i>	0.26	5.61	3082.82	801.53	3884.36	1942.18	7.13	209.56
472	<i>Sterculia urens</i>	0.08	0.96	640.07	166.42	806.49	403.24	1.48	43.51
473	<i>Butea monosperma</i>	0.05	0.63	301.77	78.46	380.23	190.11	0.70	20.51
474	<i>Sterculia balanghas</i>	0.07	1.36	746.12	193.99	940.12	470.06	1.73	50.72
475	<i>Sterculia balanghas</i>	0.06	1.15	634.18	164.89	799.06	399.53	1.47	43.11
476	<i>Sterculia balanghas</i>	0.01	0.15	82.51	21.45	103.97	51.98	0.19	5.61
477	<i>Sterculia balanghas</i>	0.08	1.64	901.81	234.47	1136.28	568.14	2.09	61.30
478	<i>Sterculia balanghas</i>	0.31	6.55	3603.32	936.86	4540.18	2270.09	8.33	244.94
479	<i>Sterculia balanghas</i>	0.05	1.07	588.68	153.06	741.73	370.87	1.36	40.02
480	<i>Clusia rosea</i>	0.01	0.08	70.78	18.40	89.19	44.59	0.16	4.81
481	<i>Millettia pinnata</i>	0.06	0.80	667.17	173.46	840.63	420.31	1.54	45.35
482	<i>Syzygium operculatum</i>	0.09	1.78	1352.75	351.71	1704.46	852.23	3.13	91.95
483	<i>Caesalpinia coriaria</i>	0.17	3.85	4038.56	1050.03	5088.58	2544.29	9.34	274.52
Block-3									
484	<i>Sterculia urens</i>	0.13	0.89	597.80	155.43	753.23	376.62	1.38	40.64
485	<i>Senna siamea</i>	0.02	0.19	116.19	30.21	146.39	73.20	0.27	7.90
486	<i>Senna siamea</i>	0.02	0.19	116.19	30.21	146.39	73.20	0.27	7.90
487	<i>Senna siamea</i>	0.02	0.25	149.03	38.75	187.77	93.89	0.34	10.13

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
488	<i>Senna siamea</i>	0.02	0.30	177.27	46.09	223.36	111.68	0.41	12.05
489	<i>Azadirachta indica</i>	0.22	3.36	1746.20	454.01	2200.21	1100.10	4.04	118.70
490	<i>Syzygium operculatum</i>	0.15	2.63	1998.73	519.67	2518.40	1259.20	4.62	135.87
491	<i>Syzygium operculatum</i>	0.07	0.99	751.24	195.32	946.56	473.28	1.74	51.07
492	<i>Syzygium operculatum</i>	0.08	1.48	1122.84	291.94	1414.77	707.39	2.60	76.33
493	<i>Syzygium operculatum</i>	0.11	1.99	1515.79	394.11	1909.90	954.95	3.50	103.04
494	<i>Syzygium operculatum</i>	0.10	1.76	1341.29	348.74	1690.02	845.01	3.10	91.18
495	<i>Dimocarpus longan</i>	0.01	0.08	51.09	13.28	64.38	32.19	0.12	3.47
496	<i>Dimocarpus longan</i>	0.01	0.05	35.87	9.33	45.19	22.60	0.08	2.44
497	<i>Dimocarpus longan</i>	0.01	0.07	47.03	12.23	59.26	29.63	0.11	3.20
498	<i>Dimocarpus longan</i>	0.01	0.04	24.18	6.29	30.47	15.24	0.06	1.64
499	<i>Azadirachta indica</i>	0.13	1.96	1018.28	264.75	1283.03	641.52	2.35	69.22
500	<i>Diospyros melanoxylon</i>	0.07	1.25	851.40	221.36	1072.77	536.38	1.97	57.87
501	<i>Diospyros melanoxylon</i>	0.06	1.13	766.46	199.28	965.73	482.87	1.77	52.10
502	<i>Cassia fistula</i>	0.01	0.07	47.01	12.22	59.23	29.62	0.11	3.20
503	<i>Millettia pinnata</i>	0.04	0.60	499.54	129.88	629.42	314.71	1.15	33.96
504	<i>Mallotus philippensis</i>	0.10	1.46	932.79	242.53	1175.32	587.66	2.16	63.41
505	<i>Mallotus philippensis</i>	0.02	0.35	226.91	59.00	285.91	142.95	0.52	15.42
506	<i>Mallotus philippensis</i>	0.03	0.44	284.26	73.91	358.17	179.09	0.66	19.32
507	<i>Mallotus philippensis</i>	0.04	0.64	407.11	105.85	512.95	256.48	0.94	27.67
508	<i>Sterculia foetida</i>	0.05	0.67	314.50	81.77	396.27	198.13	0.73	21.38
509	<i>Syzygium operculatum</i>	0.11	1.79	1359.72	353.53	1713.24	856.62	3.14	92.43
510	<i>Syzygium operculatum</i>	0.11	1.91	1448.82	376.69	1825.51	912.75	3.35	98.48
511	<i>Erythroxylum monogynum</i>	0.06	1.00	499.55	129.88	629.43	314.71	1.16	33.96
512	<i>Erythroxylum monogynum</i>	0.10	1.50	751.54	195.40	946.95	473.47	1.74	51.09
513	<i>Sterculia foetida</i>	0.05	0.78	368.75	95.88	464.63	232.31	0.85	25.07
514	<i>Leucaena leucocephala</i>	0.16	3.03	1937.48	503.74	2441.22	1220.61	4.48	131.70
515	<i>Leucaena leucocephala</i>	0.15	2.84	1820.42	473.31	2293.73	1146.86	4.21	123.74
516	<i>Cassia fistula</i>	0.01	0.08	57.46	14.94	72.40	36.20	0.13	3.91
517	<i>Syzygium operculatum</i>	0.09	1.40	1063.25	276.44	1339.69	669.85	2.46	72.28
518	<i>Syzygium operculatum</i>	0.07	1.09	828.31	215.36	1043.67	521.83	1.92	56.30
519	<i>Leucaena leucocephala</i>	0.04	0.26	168.92	43.92	212.84	106.42	0.39	11.48
520	<i>Leucaena leucocephala</i>	0.04	0.34	220.11	57.23	277.34	138.67	0.51	14.96

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
521	<i>Syzygium operculatum</i>	0.08	1.17	889.13	231.17	1120.30	560.15	2.06	60.44
522	<i>Phoenix dactylifera</i>	0.05	0.76	414.49	107.77	522.26	261.13	0.96	28.18
523	<i>Azadirachta indica</i>	0.06	0.76	394.17	102.48	496.66	248.33	0.91	26.79
524	<i>Syzygium operculatum</i>	0.10	1.69	1285.52	334.24	1619.76	809.88	2.97	87.38
525	<i>Leucaena leucocephala</i>	0.13	3.05	1949.29	506.82	2456.11	1228.06	4.51	132.50
526	<i>Azadirachta indica</i>	0.12	2.31	1199.17	311.78	1510.96	755.48	2.77	81.51
527	<i>Leucaena leucocephala</i>	0.30	5.05	3234.23	840.90	4075.13	2037.56	7.48	219.85
528	<i>Azadirachta indica</i>	0.05	0.94	488.69	127.06	615.75	307.88	1.13	33.22
529	<i>Azadirachta indica</i>	0.05	1.01	527.38	137.12	664.50	332.25	1.22	35.85
530	<i>Syzygium operculatum</i>	0.08	1.35	1028.06	267.30	1295.36	647.68	2.38	69.88
531	<i>Azadirachta indica</i>	0.18	3.24	1687.09	438.64	2125.74	1062.87	3.90	114.68
532	<i>Phoenix dactylifera</i>	0.02	0.37	199.48	51.87	251.35	125.67	0.46	13.56
533	<i>Phoenix dactylifera</i>	0.03	0.64	347.83	90.44	438.27	219.13	0.80	23.64
534	<i>Syzygium operculatum</i>	0.03	0.40	303.81	78.99	382.80	191.40	0.70	20.65
535	<i>Gliricidia sepium</i>	0.04	0.53	355.89	92.53	448.42	224.21	0.82	24.19
536	<i>Azadirachta indica</i>	0.04	0.62	323.33	84.07	407.39	203.70	0.75	21.98
537	<i>Azadirachta indica</i>	0.04	0.53	274.49	71.37	345.86	172.93	0.63	18.66
538	<i>Azadirachta indica</i>	0.08	1.50	780.92	203.04	983.96	491.98	1.81	53.08
539	<i>Senna siamea</i>	0.06	1.08	650.18	169.05	819.23	409.62	1.50	44.20
540	<i>Commiphora wightii</i>	0.03	0.24	109.78	28.54	138.32	69.16	0.25	7.46
541	<i>Ligustrum perrottettii</i>	0.12	2.25	1010.43	262.71	1273.15	636.57	2.34	68.69
542	<i>Ligustrum perrottettii</i>	0.12	2.35	1057.27	274.89	1332.16	666.08	2.44	71.87
543	<i>Leucaena leucocephala</i>	0.13	2.50	1597.83	415.44	2013.26	1006.63	3.69	108.61
544	<i>Leucaena leucocephala</i>	0.15	3.46	2214.64	575.81	2790.45	1395.22	5.12	150.54
545	<i>Leucaena leucocephala</i>	0.06	0.75	478.36	124.37	602.73	301.36	1.11	32.52
546	<i>Senna siamea</i>	0.01	0.10	57.07	14.84	71.91	35.96	0.13	3.88
547	<i>Senna siamea</i>	0.01	0.12	72.36	18.81	91.18	45.59	0.17	4.92
548	<i>Azadirachta indica</i>	0.10	2.15	1119.45	291.06	1410.51	705.25	2.59	76.10
549	<i>Diospyros melanoxylon</i>	0.14	2.80	1903.69	494.96	2398.65	1199.32	4.40	129.40
550	<i>Diospyros melanoxylon</i>	0.09	1.73	1174.46	305.36	1479.82	739.91	2.72	79.83
551	<i>Senna siamea</i>	0.02	0.14	85.98	22.35	108.33	54.17	0.20	5.84
552	<i>Ailanthus excelsa</i>	0.19	3.75	1800.02	468.01	2268.03	1134.01	4.16	122.36
553	<i>Azadirachta indica</i>	0.14	2.73	1420.25	369.27	1789.52	894.76	3.28	96.54

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554	<i>Azadirachta indica</i>	0.08	1.42	738.71	192.06	930.78	465.39	1.71	50.21
555	<i>Melia dubia</i>	0.11	2.22	886.38	230.46	1116.84	558.42	2.05	60.25
556	<i>Eucalyptus globulus</i>	0.04	1.00	565.05	146.91	711.96	355.98	1.31	38.41
557	<i>Azadirachta indica</i>	0.07	0.52	268.46	69.80	338.26	169.13	0.62	18.25
558	<i>Azadirachta indica</i>	0.04	0.66	344.19	89.49	433.68	216.84	0.80	23.40
559	<i>Azadirachta indica</i>	0.14	2.69	1401.23	364.32	1765.55	882.78	3.24	95.25
560	<i>Averrhoa carambola</i>	0.04	0.34	187.54	48.76	236.30	118.15	0.43	12.75
561	<i>Azadirachta indica</i>	0.11	1.76	915.93	238.14	1154.07	577.03	2.12	62.26
562	<i>Azadirachta indica</i>	0.12	1.99	1032.97	268.57	1301.54	650.77	2.39	70.22
563	<i>Senna siamea</i>	0.05	0.34	205.45	53.42	258.87	129.43	0.48	13.97
564	<i>Syzygium operculatum</i>	0.08	1.17	889.13	231.17	1120.30	560.15	2.06	60.44
565	<i>Azadirachta indica</i>	0.06	0.84	438.22	113.94	552.16	276.08	1.01	29.79
566	<i>Senna siamea</i>	0.04	0.39	231.89	60.29	292.18	146.09	0.54	15.76
567	<i>Azadirachta indica</i>	0.02	0.19	98.78	25.68	124.46	62.23	0.23	6.71
568	<i>Azadirachta indica</i>	0.08	1.76	916.57	238.31	1154.87	577.44	2.12	62.30
569	<i>Senna siamea</i>	0.02	0.11	67.68	17.60	85.28	42.64	0.16	4.60
570	<i>Diospyros melanoxylon</i>	0.07	0.98	663.84	172.60	836.44	418.22	1.53	45.13
571	<i>Azadirachta indica</i>	0.01	0.10	52.17	13.56	65.73	32.87	0.12	3.55
572	<i>Azadirachta indica</i>	0.09	1.43	741.21	192.71	933.93	466.96	1.71	50.38
573	<i>Azadirachta indica</i>	0.07	0.89	465.27	120.97	586.24	293.12	1.08	31.63
574	<i>Azadirachta indica</i>	0.11	1.81	942.66	245.09	1187.75	593.87	2.18	64.08
575	<i>Albizia amara</i>	0.15	3.23	2260.15	587.64	2847.79	1423.89	5.23	153.64
576	<i>Azadirachta indica</i>	0.02	0.12	63.99	16.64	80.62	40.31	0.15	4.35
577	<i>Azadirachta indica</i>	0.17	2.99	1554.20	404.09	1958.29	979.15	3.59	105.65
578	<i>Azadirachta indica</i>	0.06	1.10	573.60	149.14	722.74	361.37	1.33	38.99
579	<i>Azadirachta indica</i>	0.17	3.82	1987.27	516.69	2503.96	1251.98	4.59	135.09
580	<i>Azadirachta indica</i>	0.03	0.46	237.29	61.70	298.99	149.49	0.55	16.13
581	<i>Syzygium operculatum</i>	0.04	0.52	396.34	103.05	499.38	249.69	0.92	26.94
582	<i>Syzygium operculatum</i>	0.02	0.22	167.67	43.59	211.26	105.63	0.39	11.40
583	<i>Syzygium operculatum</i>	0.01	0.21	156.24	40.62	196.86	98.43	0.36	10.62
584	<i>Syzygium operculatum</i>	0.02	0.26	200.05	52.01	252.07	126.03	0.46	13.60
585	<i>Azadirachta indica</i>	0.03	0.46	241.01	62.66	303.68	151.84	0.56	16.38
586	<i>Ligustrum perrottettii</i>	0.02	0.24	106.79	27.77	134.56	67.28	0.25	7.26

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587	<i>Limonia acidissima</i>	0.09	1.69	1416.45	368.28	1784.73	892.36	3.27	96.28
588	<i>Canthium parviflorum</i>	0.09	0.60	253.29	65.86	319.15	159.58	0.59	17.22
589	<i>Leucaena leucocephala</i>	0.01	0.23	145.96	37.95	183.91	91.96	0.34	9.92
590	<i>Leucaena leucocephala</i>	0.04	0.62	393.60	102.34	495.94	247.97	0.91	26.76
591	<i>Azadirachta indica</i>	0.07	1.34	697.90	181.45	879.36	439.68	1.61	47.44
592	<i>Senna siamea</i>	0.08	0.58	349.63	90.90	440.53	220.27	0.81	23.77
593	<i>Azadirachta indica</i>	0.23	4.68	2433.51	632.71	3066.23	1533.11	5.63	165.42
594	<i>Azadirachta indica</i>	0.04	0.71	368.85	95.90	464.75	232.38	0.85	25.07
595	<i>Azadirachta indica</i>	0.04	0.57	295.52	76.83	372.35	186.18	0.68	20.09
596	<i>Leucaena leucocephala</i>	0.04	0.48	308.08	80.10	388.18	194.09	0.71	20.94
597	<i>Cassia fistula</i>	0.02	0.09	62.30	16.20	78.49	39.25	0.14	4.23
598	<i>Azadirachta indica</i>	0.08	1.01	527.65	137.19	664.84	332.42	1.22	35.87
599	<i>Limonia acidissima</i>	0.06	0.77	649.73	168.93	818.67	409.33	1.50	44.17
600	<i>Zanthoxylum rhetsa</i>	0.06	0.41	136.70	35.54	172.24	86.12	0.32	9.29
601	<i>Cassia fistula</i>	0.04	0.36	256.33	66.65	322.98	161.49	0.59	17.42
602	<i>Cassia fistula</i>	0.03	0.29	209.20	54.39	263.59	131.79	0.48	14.22
603	<i>Hibiscus tiliaceus</i>	0.04	0.54	310.48	80.73	391.21	195.60	0.72	21.11
604	<i>Azadirachta indica</i>	0.04	0.50	259.84	67.56	327.40	163.70	0.60	17.66
605	<i>Cassia fistula</i>	0.01	0.09	66.48	17.29	83.77	41.88	0.15	4.52
606	<i>Cassia fistula</i>	0.02	0.12	82.04	21.33	103.37	51.68	0.19	5.58
607	<i>Cassia fistula</i>	0.01	0.10	71.44	18.57	90.01	45.01	0.17	4.86
608	<i>Cassia fistula</i>	0.04	0.29	206.00	53.56	259.55	129.78	0.48	14.00
609	<i>Acrocarpus fraxinifolius</i>	0.08	1.44	1004.64	261.21	1265.85	632.92	2.32	68.29
610	<i>Acrocarpus fraxinifolius</i>	0.12	2.20	1536.79	399.57	1936.36	968.18	3.55	104.46
611	<i>Leucaena leucocephala</i>	0.10	1.32	845.42	219.81	1065.22	532.61	1.95	57.47
612	<i>Leucaena leucocephala</i>	0.12	2.41	1541.03	400.67	1941.69	970.85	3.56	104.75
613	<i>Azadirachta indica</i>	0.42	9.30	4836.80	1257.57	6094.37	3047.18	11.18	328.78
614	<i>Acacia auriculiformis</i>	0.05	0.82	534.50	138.97	673.48	336.74	1.24	36.33
615	<i>Acrocarpus fraxinifolius</i>	0.04	0.55	386.47	100.48	486.95	243.47	0.89	26.27
616	<i>Cassia fistula</i>	0.17	1.25	890.84	231.62	1122.46	561.23	2.06	60.56
617	<i>Acacia auriculiformis</i>	0.06	0.86	559.35	145.43	704.78	352.39	1.29	38.02
618	<i>Simarouba glauca</i>	0.05	0.59	218.21	56.74	274.95	137.48	0.50	14.83
619	<i>Simarouba glauca</i>	0.11	1.43	528.36	137.37	665.74	332.87	1.22	35.92

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620	<i>Acacia auriculiformis</i>	0.09	1.26	819.04	212.95	1031.99	515.99	1.89	55.67
621	<i>Acacia auriculiformis</i>	0.07	0.81	525.36	136.59	661.96	330.98	1.21	35.71
622	<i>Acacia auriculiformis</i>	0.09	0.68	443.28	115.25	558.53	279.26	1.02	30.13
623	<i>Cassia fistula</i>	0.04	0.26	185.13	48.13	233.26	116.63	0.43	12.58
624	<i>Cassia fistula</i>	0.03	0.21	150.43	39.11	189.54	94.77	0.35	10.23
625	<i>Azadirachta indica</i>	0.05	0.79	412.29	107.19	519.48	259.74	0.95	28.03
626	<i>Leucaena leucocephala</i>	0.07	1.25	801.43	208.37	1009.80	504.90	1.85	54.48
627	<i>Azadirachta indica</i>	0.08	1.69	877.70	228.20	1105.90	552.95	2.03	59.66
628	<i>Casuarina equisetifolia</i>	0.07	1.43	1160.26	301.67	1461.93	730.96	2.68	78.87
629	<i>Millettia pinnata</i>	0.07	0.74	612.79	159.33	772.12	386.06	1.42	41.66
630	<i>Sterculia balanghas</i>	0.01	0.20	107.87	28.05	135.92	67.96	0.25	7.33
631	<i>Sterculia balanghas</i>	0.01	0.22	123.16	32.02	155.18	77.59	0.28	8.37
632	<i>Azadirachta indica</i>	0.08	1.58	823.04	213.99	1037.03	518.51	1.90	55.95
633	<i>Azadirachta indica</i>	0.10	2.07	1076.51	279.89	1356.40	678.20	2.49	73.18
634	<i>Tamarindus indica</i>	0.12	2.37	1775.09	461.52	2236.61	1118.31	4.10	120.66
635	<i>Millettia pinnata</i>	0.06	0.80	667.74	173.61	841.36	420.68	1.54	45.39
636	<i>Albizia amara</i>	0.35	8.25	5772.91	1500.96	7273.86	3636.93	13.35	392.42
637	<i>Butea monosperma</i>	0.05	0.99	473.65	123.15	596.80	298.40	1.10	32.20
638	<i>Casuarina equisetifolia</i>	0.03	0.65	524.85	136.46	661.31	330.66	1.21	35.68
639	<i>Senna siamea</i>	0.03	0.34	206.69	53.74	260.44	130.22	0.48	14.05
640	<i>Syzygium operculatum</i>	0.10	1.85	1403.50	364.91	1768.41	884.20	3.25	95.40
641	<i>Albizia lebbeck</i>	0.06	1.08	711.77	185.06	896.83	448.41	1.65	48.38
642	<i>Chukrasia tabularis</i>	0.11	2.20	1253.78	325.98	1579.76	789.88	2.90	85.23
643	<i>Chukrasia tabularis</i>	0.05	1.06	602.03	156.53	758.56	379.28	1.39	40.92
644	<i>Azadirachta indica</i>	0.03	0.25	132.24	34.38	166.63	83.31	0.31	8.99
645	<i>Cassia fistula</i>	0.06	0.55	390.17	101.44	491.62	245.81	0.90	26.52
646	<i>Azadirachta indica</i>	0.16	3.19	1657.05	430.83	2087.89	1043.94	3.83	112.64
647	<i>Millettia pinnata</i>	0.10	1.03	858.73	223.27	1082.00	541.00	1.99	58.37
648	<i>Azadirachta indica</i>	0.05	0.66	343.57	89.33	432.90	216.45	0.79	23.35
649	<i>Toona ciliata</i>	0.07	1.43	787.83	204.84	992.67	496.33	1.82	53.55
650	<i>Toona ciliata</i>	0.08	1.64	903.74	234.97	1138.71	569.36	2.09	61.43
651	<i>Toona ciliata</i>	0.09	2.02	1112.10	289.15	1401.25	700.62	2.57	75.60
652	<i>Anacardium occidentale</i>	0.20	2.31	968.68	251.86	1220.54	610.27	2.24	65.85

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
653	<i>Toona ciliata</i>	0.03	0.56	308.84	80.30	389.14	194.57	0.71	20.99
654	<i>Casuarina equisetifolia</i>	0.07	1.70	1380.59	358.95	1739.54	869.77	3.19	93.85
655	<i>Albizia amara</i>	0.07	1.36	949.73	246.93	1196.67	598.33	2.20	64.56
656	<i>Azadirachta indica</i>	0.15	2.20	1142.67	297.09	1439.76	719.88	2.64	77.67
657	<i>Albizia amara</i>	0.06	0.74	520.99	135.46	656.45	328.22	1.20	35.41
658	<i>Swietenia mahagoni</i>	0.26	6.13	3002.00	780.52	3782.52	1891.26	6.94	204.06
659	<i>Khaya grandifoliola</i>	0.08	0.83	532.30	138.40	670.70	335.35	1.23	36.18
660	<i>Khaya grandifoliola</i>	0.06	0.60	383.24	99.64	482.89	241.44	0.89	26.05
661	<i>Khaya senegalensis</i>	0.46	10.63	6378.28	1658.35	8036.63	4018.31	14.75	433.57
662	<i>Tamarindus indica</i>	0.27	4.13	3098.03	805.49	3903.51	1951.76	7.16	210.59
663	<i>Khaya senegalensis</i>	0.43	9.42	5653.79	1469.99	7123.78	3561.89	13.07	384.32
664	<i>Khaya grandifoliola</i>	0.17	4.01	2565.79	667.11	3232.90	1616.45	5.93	174.41
665	<i>Swietenia macrophylla</i>	0.35	6.64	3643.21	947.23	4590.44	2295.22	8.42	247.65
666	<i>Azadirachta indica</i>	0.06	0.83	433.46	112.70	546.17	273.08	1.00	29.47
667	<i>Azadirachta indica</i>	0.06	0.79	409.65	106.51	516.15	258.08	0.95	27.85
668	<i>Khaya senegalensis</i>	0.01	0.24	144.47	37.56	182.03	91.02	0.33	9.82
669	<i>Eucalyptus globulus</i>	0.09	2.07	1175.30	305.58	1480.87	740.44	2.72	79.89
670	<i>Eucalyptus globulus</i>	0.05	0.92	521.23	135.52	656.75	328.38	1.21	35.43
671	<i>Tamarindus indica</i>	0.47	8.16	6116.74	1590.35	7707.10	3853.55	14.14	415.79
672	<i>Tamarindus indica</i>	0.11	1.47	1103.03	286.79	1389.82	694.91	2.55	74.98
673	<i>Eucalyptus globulus</i>	0.04	0.81	457.10	118.85	575.94	287.97	1.06	31.07
674	<i>Eucalyptus globulus</i>	0.08	1.49	842.62	219.08	1061.70	530.85	1.95	57.28
675	<i>Tamarindus indica</i>	0.01	0.14	103.42	26.89	130.31	65.15	0.24	7.03
676	<i>Tamarindus indica</i>	0.01	0.18	132.42	34.43	166.86	83.43	0.31	9.00
677	<i>Tamarindus indica</i>	0.02	0.21	158.21	41.13	199.34	99.67	0.37	10.75
678	<i>Anacardium occidentale</i>	0.09	0.61	255.49	66.43	321.91	160.96	0.59	17.37
679	<i>Albizia lebbeck</i>	0.05	0.82	540.84	140.62	681.46	340.73	1.25	36.76
680	<i>Albizia odoratissima</i>	0.02	0.34	256.04	66.57	322.61	161.31	0.59	17.40
681	<i>Cassia fistula</i>	0.01	0.06	39.19	10.19	49.38	24.69	0.09	2.66
682	<i>Cassia fistula</i>	0.01	0.07	48.95	12.73	61.68	30.84	0.11	3.33
683	<i>Albizia lebbeck</i>	0.04	0.47	312.57	81.27	393.83	196.92	0.72	21.25
684	<i>Cassia fistula</i>	0.01	0.05	36.44	9.47	45.91	22.96	0.08	2.48
685	<i>Cassia fistula</i>	0.01	0.06	43.71	11.37	55.08	27.54	0.10	2.97

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
686	<i>Cassia fistula</i>	0.01	0.06	44.99	11.70	56.69	28.34	0.10	3.06
687	<i>Azadirachta indica</i>	0.38	7.56	3933.11	1022.61	4955.72	2477.86	9.09	267.36
688	<i>Albizia amara</i>	0.20	3.68	2572.61	668.88	3241.49	1620.74	5.95	174.88
689	<i>Millettia pinnata</i>	0.02	0.12	97.83	25.44	123.27	61.63	0.23	6.65
690	<i>Azadirachta indica</i>	0.01	0.05	27.84	7.24	35.07	17.54	0.06	1.89
691	<i>Albizia amara</i>	0.01	0.06	44.22	11.50	55.71	27.86	0.10	3.01
692	<i>Millettia pinnata</i>	0.06	0.57	469.49	122.07	591.55	295.78	1.09	31.91
693	<i>Albizia odoratissima</i>	0.04	0.50	381.09	99.08	480.18	240.09	0.88	25.91
694	<i>Albizia odoratissima</i>	0.04	0.54	408.40	106.18	514.59	257.29	0.94	27.76
695	<i>Albizia odoratissima</i>	0.07	0.96	726.20	188.81	915.01	457.50	1.68	49.36
696	<i>Albizia amara</i>	0.07	1.07	746.77	194.16	940.93	470.46	1.73	50.76
697	<i>Tamarindus indica</i>	0.53	10.59	7945.49	2065.83	10011.32	5005.66	18.37	540.10
698	<i>Albizia lebbek</i>	0.19	4.04	2666.61	693.32	3359.93	1679.97	6.17	181.27
699	<i>Millettia pinnata</i>	0.03	0.21	170.40	44.30	214.70	107.35	0.39	11.58
700	<i>Albizia amara</i>	0.16	2.03	1418.04	368.69	1786.73	893.36	3.28	96.39
701	<i>Eucalyptus globulus</i>	0.16	3.47	1968.77	511.88	2480.65	1240.33	4.55	133.83
702	<i>Grevillea robusta</i>	0.04	0.76	409.18	106.39	515.56	257.78	0.95	27.81
703	<i>Grevillea robusta</i>	0.04	0.75	403.27	104.85	508.12	254.06	0.93	27.41
704	<i>Millettia pinnata</i>	0.07	0.70	577.42	150.13	727.55	363.77	1.34	39.25
705	<i>Millettia pinnata</i>	0.06	0.64	529.07	137.56	666.63	333.31	1.22	35.96
Block-4									
706	<i>Sapindus laurifolius</i>	0.16	2.46	1427.12	371.05	1798.17	899.08	3.30	97.01
707	<i>Schleichera oleosa</i>	0.24	4.00	3842.09	998.94	4841.03	2420.51	8.88	261.17
708	<i>Azadirachta indica</i>	0.03	0.18	95.04	24.71	119.75	59.87	0.22	6.46
709	<i>Schleichera oleosa</i>	0.12	1.53	1471.64	382.63	1854.27	927.13	3.40	100.04
710	<i>Azadirachta indica</i>	0.11	1.39	723.86	188.20	912.06	456.03	1.67	49.20
711	<i>Sapindus laurifolius</i>	0.05	0.55	318.54	82.82	401.35	200.68	0.74	21.65
712	<i>Zizipus rugosa</i>	0.17	1.57	1192.45	310.04	1502.49	751.24	2.76	81.06
713	<i>Azadirachta indica</i>	0.36	6.32	3285.42	854.21	4139.63	2069.81	7.60	223.33
714	<i>Azadirachta indica</i>	0.09	1.45	755.07	196.32	951.38	475.69	1.75	51.33
715	<i>Cassia fistula</i>	0.02	0.16	115.33	29.99	145.31	72.66	0.27	7.84

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716	<i>Ziziphus xylopyrus</i>	0.04	0.36	306.39	79.66	386.05	193.03	0.71	20.83
717	<i>Ziziphus xylopyrus</i>	0.04	0.35	300.34	78.09	378.43	189.21	0.69	20.42
718	<i>Ziziphus xylopyrus</i>	0.03	0.22	188.01	48.88	236.89	118.44	0.43	12.78
719	<i>Ziziphus xylopyrus</i>	0.09	1.17	997.18	259.27	1256.45	628.23	2.31	67.78
720	<i>Pterocarpus marsupium</i>	0.04	0.40	266.53	69.30	335.83	167.92	0.62	18.12
721	<i>Diospyros melanoxylon</i>	0.04	0.34	233.90	60.81	294.71	147.36	0.54	15.90
722	<i>Diospyros melanoxylon</i>	0.75	13.05	8876.46	2307.88	11184.35	5592.17	20.52	603.38
723	<i>Diospyros melanoxylon</i>	0.16	2.61	1775.09	461.52	2236.62	1118.31	4.10	120.66
724	<i>Azadirachta indica</i>	0.01	0.10	52.17	13.56	65.73	32.87	0.12	3.55
725	<i>Azadirachta indica</i>	0.09	1.12	581.84	151.28	733.12	366.56	1.35	39.55
726	<i>Gliricidia sepium</i>	0.03	0.23	154.11	40.07	194.18	97.09	0.36	10.48
727	<i>Azadirachta indica</i>	0.03	0.25	129.95	33.79	163.74	81.87	0.30	8.83
728	<i>Syzygium operculatum</i>	0.22	3.91	2972.61	772.88	3745.49	1872.75	6.87	202.07
729	<i>Erythroxylum monogynum</i>	0.01	0.10	48.95	12.73	61.67	30.84	0.11	3.33
730	<i>Azadirachta indica</i>	0.01	0.10	53.45	13.90	67.35	33.67	0.12	3.63
731	<i>Diospyros melanoxylon</i>	0.02	0.19	129.20	33.59	162.79	81.40	0.30	8.78
732	<i>Diospyros melanoxylon</i>	0.02	0.18	119.64	31.11	150.74	75.37	0.28	8.13
733	<i>Diospyros melanoxylon</i>	0.02	0.20	134.12	34.87	169.00	84.50	0.31	9.12
734	<i>Syzygium operculatum</i>	0.05	0.71	541.63	140.82	682.45	341.23	1.25	36.82
735	<i>Azadirachta indica</i>	0.02	0.21	107.63	27.98	135.61	67.81	0.25	7.32
736	<i>Azadirachta indica</i>	0.02	0.22	114.05	29.65	143.71	71.85	0.26	7.75
737	<i>Azadirachta indica</i>	0.06	0.83	433.46	112.70	546.17	273.08	1.00	29.47
738	<i>Cassia fistula</i>	0.02	0.11	81.13	21.09	102.22	51.11	0.19	5.51
739	<i>Cassia fistula</i>	0.02	0.15	103.83	27.00	130.82	65.41	0.24	7.06
740	<i>Cassia fistula</i>	0.02	0.12	85.81	22.31	108.12	54.06	0.20	5.83
741	<i>Cassia fistula</i>	0.02	0.11	80.18	20.85	101.03	50.52	0.19	5.45
742	<i>Cassia fistula</i>	0.01	0.08	60.24	15.66	75.90	37.95	0.14	4.09
743	<i>Cassia fistula</i>	0.01	0.09	63.25	16.44	79.69	39.85	0.15	4.30
744	<i>Albizia lebbeck</i>	0.05	0.83	547.71	142.41	690.12	345.06	1.27	37.23
745	<i>Albizia amara</i>	0.04	0.57	400.74	104.19	504.94	252.47	0.93	27.24
746	<i>Albizia lebbeck</i>	0.08	1.38	910.81	236.81	1147.62	573.81	2.11	61.91
747	<i>Albizia amara</i>	0.09	1.29	902.30	234.60	1136.89	568.45	2.09	61.33
748	<i>Syzygium operculatum</i>	0.08	1.31	994.51	258.57	1253.08	626.54	2.30	67.60

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749	<i>Cassia fistula</i>	0.02	0.13	95.64	24.87	120.51	60.26	0.22	6.50
750	<i>Azadirachta indica</i>	0.03	0.23	118.89	30.91	149.80	74.90	0.27	8.08
751	<i>Millettia pinnata</i>	0.11	0.97	803.22	208.84	1012.06	506.03	1.86	54.60
752	<i>Azadirachta indica</i>	0.08	1.38	716.93	186.40	903.33	451.67	1.66	48.73
753	<i>Cassia fistula</i>	0.01	0.10	71.23	18.52	89.75	44.88	0.16	4.84
754	<i>Acacia auriculiformis</i>	0.02	0.18	119.50	31.07	150.56	75.28	0.28	8.12
755	<i>Azadirachta indica</i>	0.02	0.15	78.80	20.49	99.29	49.65	0.18	5.36
756	<i>Azadirachta indica</i>	0.06	0.76	396.02	102.97	498.99	249.49	0.92	26.92
757	<i>Azadirachta indica</i>	0.04	0.57	298.57	77.63	376.20	188.10	0.69	20.30
758	<i>Azadirachta indica</i>	0.05	0.70	361.56	94.00	455.56	227.78	0.84	24.58
759	<i>Albizia lebbeck</i>	0.18	3.72	2454.95	638.29	3093.23	1546.62	5.68	166.88
760	<i>Cassia fistula</i>	0.01	0.09	64.78	16.84	81.63	40.81	0.15	4.40
761	<i>Schleichera oleosa</i>	0.03	0.27	260.62	67.76	328.38	164.19	0.60	17.72
762	<i>Acacia auriculiformis</i>	0.03	0.31	202.09	52.54	254.64	127.32	0.47	13.74
763	<i>Acacia auriculiformis</i>	0.09	1.14	740.25	192.47	932.72	466.36	1.71	50.32
764	<i>Azadirachta indica</i>	0.02	0.20	102.25	26.58	128.83	64.42	0.24	6.95
765	<i>Azadirachta indica</i>	0.04	0.49	253.59	65.93	319.53	159.76	0.59	17.24
766	<i>Albizia lebbeck</i>	0.12	2.07	1368.02	355.68	1723.70	861.85	3.16	92.99
767	<i>Amoora lawii</i>	0.02	0.16	94.87	24.67	119.53	59.77	0.22	6.45
768	<i>Albizia lebbeck</i>	0.21	4.37	2885.75	750.30	3636.05	1818.02	6.67	196.16
769	<i>Azadirachta indica</i>	0.08	1.10	570.70	148.38	719.09	359.54	1.32	38.79
770	<i>Millettia pinnata</i>	0.04	0.46	379.77	98.74	478.51	239.26	0.88	25.82
771	<i>Amoora lawii</i>	0.03	0.36	213.26	55.45	268.71	134.36	0.49	14.50
772	<i>Spondias pinnata</i>	0.08	1.01	405.23	105.36	510.59	255.30	0.94	27.55
773	<i>Spondias pinnata</i>	0.08	0.82	327.61	85.18	412.79	206.39	0.76	22.27
774	<i>Spondias pinnata</i>	0.05	0.54	215.77	56.10	271.86	135.93	0.50	14.67
775	<i>Azadirachta indica</i>	0.02	0.20	103.45	26.90	130.35	65.17	0.24	7.03
776	<i>Azadirachta indica</i>	0.04	0.48	250.32	65.08	315.40	157.70	0.58	17.02
777	<i>Spondias pinnata</i>	0.02	0.19	74.51	19.37	93.89	46.94	0.17	5.07
778	<i>Spondias pinnata</i>	0.02	0.20	78.96	20.53	99.49	49.75	0.18	5.37
779	<i>Anacardium occidentale</i>	0.10	0.88	369.21	95.99	465.20	232.60	0.85	25.10
780	<i>Anacardium occidentale</i>	0.17	1.46	612.03	159.13	771.15	385.58	1.42	41.60
781	<i>Anacardium occidentale</i>	0.17	1.51	632.20	164.37	796.57	398.28	1.46	42.97

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782	<i>Acacia auriculiformis</i>	0.08	0.98	639.47	166.26	805.73	402.86	1.48	43.47
783	<i>Anacardium occidentale</i>	0.06	0.48	200.46	52.12	252.57	126.29	0.46	13.63
784	<i>Mangifera indica</i>	0.17	1.77	1045.63	271.86	1317.49	658.75	2.42	71.08
785	<i>Anacardium occidentale</i>	0.21	2.09	878.54	228.42	1106.97	553.48	2.03	59.72
786	<i>Anacardium occidentale</i>	0.25	2.83	1190.54	309.54	1500.08	750.04	2.75	80.93
787	<i>Streblus asper</i>	0.03	0.23	123.05	31.99	155.04	77.52	0.28	8.36
788	<i>Semecarpus anacardium</i>	0.05	0.49	353.05	91.79	444.85	222.42	0.82	24.00
789	<i>Semecarpus anacardium</i>	0.04	0.39	283.39	73.68	357.08	178.54	0.66	19.26
790	<i>Acacia auriculiformis</i>	0.02	0.21	138.03	35.89	173.92	86.96	0.32	9.38
791	<i>Millettia pinnata</i>	0.02	0.18	152.59	39.67	192.26	96.13	0.35	10.37
792	<i>Albizia lebbeck</i>	0.03	0.30	196.24	51.02	247.26	123.63	0.45	13.34
793	<i>Millettia pinnata</i>	0.06	0.52	433.78	112.78	546.57	273.28	1.00	29.49
794	<i>Santalum album</i>	0.01	0.10	88.11	22.91	111.01	55.51	0.20	5.99
795	<i>Millettia pinnata</i>	0.04	0.45	376.11	97.79	473.90	236.95	0.87	25.57
796	<i>Enterolobium contortisiliquum</i>	0.07	0.60	209.02	54.35	263.37	131.68	0.48	14.21
797	<i>Millettia pinnata</i>	0.10	1.21	1003.22	260.84	1264.06	632.03	2.32	68.19
798	<i>Millettia pinnata</i>	0.08	0.68	561.10	145.89	706.98	353.49	1.30	38.14
799	<i>Millettia pinnata</i>	0.05	0.45	372.91	96.96	469.86	234.93	0.86	25.35
800	<i>Millettia pinnata</i>	0.03	0.26	216.92	56.40	273.32	136.66	0.50	14.75
801	<i>Anacardium occidentale</i>	0.19	2.02	846.79	220.17	1066.96	533.48	1.96	57.56
802	<i>Eucalyptus citriodora</i>	0.02	0.32	203.72	52.97	256.69	128.34	0.47	13.85
803	<i>Sterulia guttata</i>	0.01	0.14	75.38	19.60	94.98	47.49	0.17	5.12
804	<i>Albizia lebbeck</i>	0.03	0.30	195.23	50.76	246.00	123.00	0.45	13.27
805	<i>Albizia lebbeck</i>	0.10	1.88	1239.24	322.20	1561.44	780.72	2.87	84.24
806	<i>Azadirachta indica</i>	0.10	1.22	635.85	165.32	801.17	400.59	1.47	43.22
807	<i>Millettia pinnata</i>	0.07	0.70	577.08	150.04	727.12	363.56	1.33	39.23
808	<i>Millettia pinnata</i>	0.08	0.90	746.24	194.02	940.26	470.13	1.73	50.73
809	<i>Azadirachta indica</i>	0.03	0.30	156.51	40.69	197.20	98.60	0.36	10.64
810	<i>Cassia fistula</i>	0.01	0.06	43.07	11.20	54.27	27.13	0.10	2.93
811	<i>Butea monosperma</i>	0.03	0.29	139.49	36.27	175.76	87.88	0.32	9.48
812	<i>Albizia odoratissima</i>	0.04	0.42	316.89	82.39	399.28	199.64	0.73	21.54
813	<i>Albizia amara</i>	0.17	3.09	2164.03	562.65	2726.67	1363.34	5.00	147.10
814	<i>Azadirachta indica</i>	0.02	0.17	90.57	23.55	114.12	57.06	0.21	6.16

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815	<i>Cassia fistula</i>	0.04	0.29	206.39	53.66	260.06	130.03	0.48	14.03
816	<i>Albizia lebbbeck</i>	0.11	2.46	1626.05	422.77	2048.83	1024.41	3.76	110.53
817	<i>Albizia lebbbeck</i>	0.39	9.07	5985.24	1556.16	7541.40	3770.70	13.84	406.85
818	<i>Anacardium occidentale</i>	0.35	4.21	1768.72	459.87	2228.59	1114.29	4.09	120.23
819	<i>Albizia amara</i>	0.10	1.86	1304.26	339.11	1643.37	821.69	3.02	88.66
820	<i>Azadirachta indica</i>	0.04	0.63	329.80	85.75	415.54	207.77	0.76	22.42
821	<i>Hardwickia binata</i>	0.14	2.93	2141.73	556.85	2698.58	1349.29	4.95	145.59
822	<i>Artocarpus heterophyllus</i>	0.12	1.75	1047.42	272.33	1319.75	659.87	2.42	71.20
823	<i>Anacardium occidentale</i>	0.08	0.57	237.87	61.85	299.71	149.86	0.55	16.17
824	<i>Cassia fistula</i>	0.03	0.21	150.02	39.00	189.02	94.51	0.35	10.20
825	<i>Azadirachta indica</i>	0.02	0.16	82.91	21.56	104.46	52.23	0.19	5.64
826	<i>Butea monosperma</i>	0.04	0.40	193.73	50.37	244.10	122.05	0.45	13.17
827	<i>Senna siamea</i>	0.04	0.46	278.26	72.35	350.60	175.30	0.64	18.91
828	<i>Casuarina equisetifolia</i>	0.03	0.61	490.62	127.56	618.18	309.09	1.13	33.35
829	<i>Anacardium occidentale</i>	0.10	0.71	300.26	78.07	378.32	189.16	0.69	20.41
830	<i>Anacardium occidentale</i>	0.15	1.31	550.09	143.02	693.12	346.56	1.27	37.39
831	<i>Syzygium operculatum</i>	0.05	0.68	516.03	134.17	650.19	325.10	1.19	35.08
832	<i>Syzygium operculatum</i>	0.02	0.24	185.17	48.15	233.32	116.66	0.43	12.59
833	<i>Senna siamea</i>	0.05	0.45	272.44	70.83	343.27	171.64	0.63	18.52
834	<i>Azadirachta indica</i>	0.04	0.31	160.26	41.67	201.93	100.96	0.37	10.89
835	<i>Amoora lawii</i>	0.06	0.61	363.34	94.47	457.81	228.90	0.84	24.70
836	<i>Cassia fistula</i>	0.03	0.13	95.03	24.71	119.74	59.87	0.22	6.46
837	<i>Cassia fistula</i>	0.01	0.04	25.23	6.56	31.79	15.89	0.06	1.71
838	<i>Eucalyptus citriodora</i>	0.20	4.94	3158.43	821.19	3979.62	1989.81	7.30	214.70
839	<i>Bridelia retusa</i>	0.02	0.23	116.43	30.27	146.70	73.35	0.27	7.91
840	<i>Bridelia retusa</i>	0.07	1.07	537.26	139.69	676.94	338.47	1.24	36.52
841	<i>Eucalyptus citriodora</i>	0.06	1.25	802.95	208.77	1011.72	505.86	1.86	54.58
842	<i>Anacardium occidentale</i>	0.07	0.52	216.80	56.37	273.17	136.59	0.50	14.74
843	<i>Cassia fistula</i>	0.07	0.44	311.91	81.10	393.01	196.51	0.72	21.20
844	<i>Cassia fistula</i>	0.07	0.96	679.67	176.71	856.38	428.19	1.57	46.20
845	<i>Eucalyptus citriodora</i>	0.04	0.91	583.52	151.71	735.23	367.62	1.35	39.67
846	<i>Eucalyptus citriodora</i>	0.04	0.95	607.74	158.01	765.76	382.88	1.41	41.31
847	<i>Eucalyptus citriodora</i>	0.04	0.91	583.52	151.71	735.23	367.62	1.35	39.67

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848	<i>Eucalyptus citriodora</i>	0.05	1.17	751.84	195.48	947.31	473.66	1.74	51.11
849	<i>Eucalyptus citriodora</i>	0.03	0.58	369.62	96.10	465.72	232.86	0.85	25.13
850	<i>Anacardium occidentale</i>	0.02	0.16	65.27	16.97	82.24	41.12	0.15	4.44
851	<i>Azadirachta indica</i>	0.02	0.14	73.00	18.98	91.98	45.99	0.17	4.96
852	<i>Cassia fistula</i>	0.04	0.42	297.91	77.46	375.37	187.68	0.69	20.25
853	<i>Eucalyptus citriodora</i>	0.06	1.39	886.62	230.52	1117.14	558.57	2.05	60.27
854	<i>Anacardium occidentale</i>	0.04	0.27	114.21	29.69	143.91	71.95	0.26	7.76
855	<i>Senna siamea</i>	0.01	0.04	26.79	6.97	33.76	16.88	0.06	1.82
856	<i>Simarouba glauca</i>	0.01	0.06	22.78	5.92	28.70	14.35	0.05	1.55
857	<i>Azadirachta indica</i>	0.01	0.09	47.20	12.27	59.48	29.74	0.11	3.21
858	<i>Millettia pinnata</i>	0.07	0.51	422.77	109.92	532.69	266.35	0.98	28.74
859	<i>Albizia amara</i>	0.29	4.27	2991.88	777.89	3769.77	1884.89	6.92	203.38
860	<i>Eucalyptus citriodora</i>	0.04	0.85	546.77	142.16	688.93	344.46	1.26	37.17
861	<i>Anacardium occidentale</i>	0.13	1.03	431.78	112.26	544.04	272.02	1.00	29.35
862	<i>Anacardium occidentale</i>	0.06	0.34	143.25	37.24	180.49	90.25	0.33	9.74
863	<i>Millettia pinnata</i>	0.03	0.18	147.98	38.47	186.45	93.22	0.34	10.06
864	<i>Butea monosperma</i>	0.05	0.53	253.72	65.97	319.68	159.84	0.59	17.25
865	<i>Albizia lebbeck</i>	0.08	1.56	1030.81	268.01	1298.83	649.41	2.38	70.07
866	<i>Albizia lebbeck</i>	0.09	1.70	1122.85	291.94	1414.79	707.40	2.60	76.33
867	<i>Senna siamea</i>	0.01	0.07	40.19	10.45	50.64	25.32	0.09	2.73
868	<i>Syzygium operculatum</i>	0.10	1.41	1071.61	278.62	1350.23	675.11	2.48	72.84
869	<i>Millettia pinnata</i>	0.05	0.39	326.18	84.81	410.98	205.49	0.75	22.17
870	<i>Anacardium occidentale</i>	0.14	1.09	458.85	119.30	578.15	289.08	1.06	31.19
871	<i>Anacardium occidentale</i>	0.08	0.66	278.18	72.33	350.51	175.25	0.64	18.91
872	<i>Anacardium occidentale</i>	0.08	0.61	256.79	66.77	323.56	161.78	0.59	17.46
873	<i>Anacardium occidentale</i>	0.15	1.26	529.33	137.62	666.95	333.48	1.22	35.98
874	<i>Anacardium occidentale</i>	0.13	1.08	454.61	118.20	572.81	286.40	1.05	30.90
875	<i>Simarouba glauca</i>	0.02	0.16	58.50	15.21	73.71	36.86	0.14	3.98
876	<i>Amoora lawii</i>	0.02	0.22	132.27	34.39	166.66	83.33	0.31	8.99
Block-5									
877	<i>Colvillea racemosa</i>	0.03	0.28	115.38	30.00	145.37	72.69	0.27	7.84
878	<i>Colvillea racemosa</i>	0.02	0.20	82.37	21.42	103.79	51.90	0.19	5.60
879	<i>Acacia auriculiformis</i>	0.02	0.20	130.40	33.90	164.31	82.15	0.30	8.86

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880	<i>Acacia auriculiformis</i>	0.02	0.19	125.32	32.58	157.90	78.95	0.29	8.52
881	<i>Leucaena leucocephala</i>	0.27	2.45	1566.90	407.39	1974.30	987.15	3.62	106.51
882	<i>Millettia pinnata</i>	0.06	0.68	561.78	146.06	707.84	353.92	1.30	38.19
883	<i>Millettia pinnata</i>	0.04	0.49	410.34	106.69	517.02	258.51	0.95	27.89
884	<i>Millettia pinnata</i>	0.04	0.46	382.90	99.55	482.45	241.23	0.89	26.03
885	<i>Millettia pinnata</i>	0.05	0.63	523.27	136.05	659.31	329.66	1.21	35.57
886	<i>Leucaena leucocephala</i>	0.06	0.54	346.76	90.16	436.92	218.46	0.80	23.57
887	<i>Albizia lebbbeck</i>	0.15	2.39	1577.23	410.08	1987.31	993.66	3.65	107.21
888	<i>Albizia lebbbeck</i>	0.17	3.29	2168.18	563.73	2731.90	1365.95	5.01	147.38
889	<i>Millettia pinnata</i>	0.04	0.34	285.45	74.22	359.67	179.83	0.66	19.40
890	<i>Millettia pinnata</i>	0.06	0.47	386.92	100.60	487.52	243.76	0.89	26.30
891	<i>Leucaena leucocephala</i>	0.03	0.22	138.70	36.06	174.76	87.38	0.32	9.43
892	<i>Leucaena leucocephala</i>	0.02	0.21	133.66	34.75	168.41	84.21	0.31	9.09
893	<i>Leucaena leucocephala</i>	0.72	16.28	10416.63	2708.32	13124.95	6562.48	24.08	708.08
894	<i>Acacia auriculiformis</i>	0.76	17.97	11681.40	3037.16	14718.56	7359.28	27.01	794.05
895	<i>Acacia auriculiformis</i>	0.15	2.93	1906.97	495.81	2402.78	1201.39	4.41	129.63
896	<i>Toona ciliata</i>	0.07	0.70	382.63	99.48	482.11	241.06	0.88	26.01
897	<i>Albizia lebbbeck</i>	0.06	0.66	436.82	113.57	550.39	275.20	1.01	29.69
898	<i>Azadirachta indica</i>	0.07	0.71	371.76	96.66	468.42	234.21	0.86	25.27
899	<i>Millettia pinnata</i>	0.05	0.53	438.32	113.96	552.28	276.14	1.01	29.80
900	<i>Leucaena leucocephala</i>	0.05	0.51	325.33	84.59	409.91	204.96	0.75	22.11
901	<i>Leucaena leucocephala</i>	0.14	1.20	766.39	199.26	965.65	482.82	1.77	52.10
902	<i>Leucaena leucocephala</i>	0.08	0.68	434.91	113.08	547.98	273.99	1.01	29.56
903	<i>Gliricidia sepium</i>	0.09	0.72	485.47	126.22	611.70	305.85	1.12	33.00
904	<i>Leucaena leucocephala</i>	0.10	0.83	533.38	138.68	672.06	336.03	1.23	36.26
905	<i>Millettia pinnata</i>	0.08	0.63	523.00	135.98	658.99	329.49	1.21	35.55
906	<i>Millettia pinnata</i>	0.16	1.65	1366.73	355.35	1722.08	861.04	3.16	92.90
907	<i>Acacia auriculiformis</i>	0.19	2.89	1877.08	488.04	2365.12	1182.56	4.34	127.60
908	<i>Syzygium operculatum</i>	0.08	0.94	716.40	186.26	902.67	451.33	1.66	48.70
909	<i>Azadirachta indica</i>	0.04	0.51	267.37	69.52	336.89	168.44	0.62	18.17
910	<i>Azadirachta indica</i>	0.02	0.25	131.43	34.17	165.61	82.80	0.30	8.93
911	<i>Azadirachta indica</i>	0.01	0.14	74.83	19.46	94.29	47.14	0.17	5.09
912	<i>Azadirachta indica</i>	0.08	1.03	533.72	138.77	672.49	336.24	1.23	36.28

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913	<i>Millettia pinnata</i>	0.05	0.48	401.40	104.36	505.76	252.88	0.93	27.29
914	<i>Azadirachta indica</i>	0.02	0.20	106.46	27.68	134.14	67.07	0.25	7.24
915	<i>Azadirachta indica</i>	0.02	0.22	113.01	29.38	142.39	71.20	0.26	7.68
916	<i>Cassia fistula</i>	0.01	0.09	61.73	16.05	77.79	38.89	0.14	4.20
917	<i>Albizia lebbeck</i>	0.14	2.27	1498.54	389.62	1888.17	944.08	3.46	101.86
918	<i>Tamarindus indica</i>	0.10	1.43	1073.42	279.09	1352.51	676.26	2.48	72.97
919	<i>Millettia pinnata</i>	0.07	0.76	629.25	163.60	792.85	396.42	1.45	42.77
920	<i>Senna siamea</i>	0.02	0.18	108.32	28.16	136.49	68.24	0.25	7.36
921	<i>Senna siamea</i>	0.01	0.10	61.67	16.04	77.71	38.85	0.14	4.19
922	<i>Senna siamea</i>	0.02	0.19	113.46	29.50	142.95	71.48	0.26	7.71
923	<i>Gliricidia sepium</i>	0.10	1.00	673.30	175.06	848.36	424.18	1.56	45.77
924	<i>Bauhinia purpurea</i>	0.05	0.43	288.72	75.07	363.79	181.90	0.67	19.63
925	<i>Albizia lebbeck</i>	0.41	9.36	6176.49	1605.89	7782.38	3891.19	14.28	419.85
926	<i>Millettia pinnata</i>	0.17	1.99	1652.36	429.61	2081.97	1040.98	3.82	112.32
927	<i>Bauhinia purpurea</i>	0.03	0.20	132.81	34.53	167.34	83.67	0.31	9.03
928	<i>Millettia pinnata</i>	0.09	0.93	769.27	200.01	969.28	484.64	1.78	52.29
929	<i>Gliricidia sepium</i>	0.09	0.76	508.43	132.19	640.62	320.31	1.18	34.56
930	<i>Acacia auriculiformis</i>	0.03	0.21	135.75	35.29	171.04	85.52	0.31	9.23
931	<i>Senna siamea</i>	0.08	0.82	491.36	127.75	619.12	309.56	1.14	33.40
932	<i>Caesalpinia platyloba</i>	0.08	0.83	873.74	227.17	1100.91	550.46	2.02	59.39
933	<i>Xylia xylocarpa</i>	0.10	1.03	833.32	216.66	1049.98	524.99	1.93	56.65
934	<i>Anacardium occidentale</i>	0.07	0.75	314.47	81.76	396.24	198.12	0.73	21.38
935	<i>Albizia lebbeck</i>	0.21	4.61	3043.49	791.31	3834.79	1917.40	7.04	206.88
936	<i>Gliricidia sepium</i>	0.04	0.36	241.82	62.87	304.69	152.35	0.56	16.44
937	<i>Albizia lebbeck</i>	0.08	1.06	701.96	182.51	884.47	442.24	1.62	47.72
938	<i>Azadirachta indica</i>	0.03	0.33	169.72	44.13	213.85	106.93	0.39	11.54
939	<i>Azadirachta indica</i>	0.06	0.88	457.97	119.07	577.04	288.52	1.06	31.13
940	<i>Anacardium occidentale</i>	0.17	1.54	647.26	168.29	815.55	407.77	1.50	44.00
941	<i>Hardwickia binata</i>	0.10	1.34	974.98	253.50	1228.48	614.24	2.25	66.28
942	<i>Millettia pinnata</i>	0.17	2.42	2011.87	523.09	2534.96	1267.48	4.65	136.76
943	<i>Millettia pinnata</i>	0.07	0.86	711.04	184.87	895.91	447.96	1.64	48.33
944	<i>Anacardium occidentale</i>	0.17	1.45	609.83	158.56	768.39	384.19	1.41	41.45
945	<i>Albizia lebbeck</i>	0.20	4.07	2683.04	697.59	3380.63	1690.32	6.20	182.38

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
946	<i>Albizia lebbeck</i>	0.15	3.54	2333.95	606.83	2940.78	1470.39	5.40	158.65
947	<i>Azadirachta indica</i>	0.05	0.50	260.97	67.85	328.82	164.41	0.60	17.74
948	<i>Hardwickia binata</i>	0.01	0.11	76.86	19.98	96.84	48.42	0.18	5.22
949	<i>Butea monosperma</i>	0.03	0.35	166.14	43.20	209.34	104.67	0.38	11.29
950	<i>Millettia pinnata</i>	0.05	0.53	438.32	113.96	552.28	276.14	1.01	29.80
951	<i>Millettia pinnata</i>	0.05	0.52	434.82	113.05	547.87	273.94	1.01	29.56
952	<i>Albizia lebbeck</i>	0.06	0.77	508.40	132.19	640.59	320.29	1.18	34.56
953	<i>Anacardium occidentale</i>	0.03	0.31	130.58	33.95	164.54	82.27	0.30	8.88
954	<i>Eucalyptus citriodora</i>	0.04	0.70	450.45	117.12	567.56	283.78	1.04	30.62
955	<i>Azadirachta indica</i>	0.04	0.52	268.26	69.75	338.00	169.00	0.62	18.23
956	<i>Azadirachta indica</i>	0.01	0.15	76.51	19.89	96.41	48.20	0.18	5.20
957	<i>Millettia pinnata</i>	0.16	1.94	1611.64	419.03	2030.66	1015.33	3.73	109.55
958	<i>Peltophorum pterocarpum</i>	0.75	17.68	10963.27	2850.45	13813.71	6906.86	25.35	745.24
959	<i>Schotia brachypetala</i>	0.03	0.24	183.66	47.75	231.41	115.70	0.42	12.48
960	<i>Millettia pinnata</i>	0.05	0.45	370.66	96.37	467.03	233.52	0.86	25.20
961	<i>Azadirachta indica</i>	0.03	0.33	169.37	44.04	213.41	106.71	0.39	11.51
962	<i>Azadirachta indica</i>	0.05	0.55	286.39	74.46	360.85	180.42	0.66	19.47
963	<i>Eucalyptus citriodora</i>	0.01	0.27	171.04	44.47	215.51	107.76	0.40	11.63
964	<i>Millettia pinnata</i>	0.09	1.62	1344.32	349.52	1693.84	846.92	3.11	91.38
965	<i>Tamarindus indica</i>	0.09	1.13	851.14	221.30	1072.44	536.22	1.97	57.86
966	<i>Phoenix sylvestris</i>	0.04	0.36	195.08	50.72	245.80	122.90	0.45	13.26
967	<i>Azadirachta indica</i>	0.04	0.36	186.30	48.44	234.73	117.37	0.43	12.66
968	<i>Xylia xylocarpa</i>	0.06	0.59	477.86	124.24	602.10	301.05	1.10	32.48
969	<i>Azadirachta indica</i>	0.03	0.35	183.12	47.61	230.73	115.37	0.42	12.45
970	<i>Albizia lebbeck</i>	0.10	2.01	1329.44	345.65	1675.10	837.55	3.07	90.37
971	<i>Albizia lebbeck</i>	0.09	1.78	1174.75	305.44	1480.19	740.10	2.72	79.85
972	<i>Azadirachta indica</i>	0.03	0.31	159.04	41.35	200.38	100.19	0.37	10.81
973	<i>Millettia pinnata</i>	0.11	1.18	980.89	255.03	1235.93	617.96	2.27	66.68
974	<i>Swietenia mahagoni</i>	0.04	0.49	239.21	62.19	301.40	150.70	0.55	16.26
975	<i>Swietenia mahagoni</i>	0.03	0.36	178.40	46.39	224.79	112.40	0.41	12.13
976	<i>Millettia pinnata</i>	0.04	0.33	270.09	70.22	340.31	170.16	0.62	18.36
977	<i>Albizia lebbeck</i>	0.10	1.78	1175.69	305.68	1481.36	740.68	2.72	79.92
978	<i>Santalum album</i>	0.05	0.34	305.78	79.50	385.29	192.64	0.71	20.79

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
979	<i>Anacardium occidentale</i>	0.31	2.46	1033.43	268.69	1302.12	651.06	2.39	70.25
980	<i>Simarouba glauca</i>	0.02	0.16	58.57	15.23	73.80	36.90	0.14	3.98
981	<i>Syzygium operculatum</i>	0.01	0.10	78.28	20.35	98.63	49.32	0.18	5.32
982	<i>Cassia fistula</i>	0.05	0.30	209.93	54.58	264.51	132.25	0.49	14.27
983	<i>Albizia lebbbeck</i>	0.12	2.53	1666.96	433.41	2100.37	1050.18	3.85	113.31
984	<i>Tamarindus indica</i>	0.04	0.39	289.86	75.36	365.22	182.61	0.67	19.70
985	<i>Santalum album</i>	0.05	0.55	491.49	127.79	619.28	309.64	1.14	33.41
986	<i>Swietenia mahagoni</i>	0.05	0.42	204.24	53.10	257.34	128.67	0.47	13.88
987	<i>Albizia odoratissima</i>	0.14	2.72	2070.48	538.32	2608.80	1304.40	4.79	140.74
988	<i>Simarouba glauca</i>	0.06	0.55	202.09	52.54	254.64	127.32	0.47	13.74
989	<i>Simarouba glauca</i>	0.04	0.34	125.56	32.65	158.21	79.11	0.29	8.54
990	<i>Cassia fistula</i>	0.02	0.10	73.10	19.01	92.10	46.05	0.17	4.97
991	<i>Cassine paniculata</i>	0.07	0.86	447.75	116.41	564.16	282.08	1.04	30.44
992	<i>Cassine paniculata</i>	0.04	0.52	268.14	69.72	337.86	168.93	0.62	18.23
993	<i>Bridelia retusa</i>	0.03	0.34	168.46	43.80	212.26	106.13	0.39	11.45
994	<i>Syzygium operculatum</i>	0.07	1.03	783.13	203.61	986.75	493.37	1.81	53.23
995	<i>Millettia pinnata</i>	0.03	0.25	205.49	53.43	258.92	129.46	0.48	13.97
996	<i>Eucalyptus citriodora</i>	0.11	2.64	1686.79	438.56	2125.35	1062.68	3.90	114.66
997	<i>Acacia ferruginea</i>	0.01	0.05	32.31	8.40	40.71	20.36	0.07	2.20
998	<i>Tectona grandis</i>	0.04	0.60	331.02	86.07	417.09	208.54	0.77	22.50
999	<i>Azadirachta indica</i>	0.04	0.42	216.71	56.35	273.06	136.53	0.50	14.73
1000	<i>Azadirachta indica</i>	0.03	0.27	141.61	36.82	178.43	89.22	0.33	9.63
1001	<i>Grevillea robusta</i>	0.01	0.25	133.21	34.64	167.85	83.93	0.31	9.06
1002	<i>Grevillea robusta</i>	0.01	0.26	143.02	37.18	180.20	90.10	0.33	9.72
1003	<i>Grevillea robusta</i>	0.01	0.17	89.36	23.23	112.59	56.29	0.21	6.07
1004	<i>Grevillea robusta</i>	0.01	0.17	91.89	23.89	115.78	57.89	0.21	6.25
1005	<i>Grevillea robusta</i>	0.01	0.19	105.10	27.33	132.42	66.21	0.24	7.14
1006	<i>Grevillea robusta</i>	0.01	0.13	72.61	18.88	91.48	45.74	0.17	4.94
1007	<i>Azadirachta indica</i>	0.01	0.14	74.25	19.30	93.55	46.78	0.17	5.05
1008	<i>Azadirachta indica</i>	0.05	0.41	213.99	55.64	269.63	134.82	0.49	14.55
1009	<i>Albizia lebbbeck</i>	0.16	2.89	1904.42	495.15	2399.56	1199.78	4.40	129.45
1010	<i>Eucalyptus citriodora</i>	0.03	0.60	385.26	100.17	485.42	242.71	0.89	26.19
1011	<i>Eucalyptus citriodora</i>	0.03	0.55	354.57	92.19	446.76	223.38	0.82	24.10

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1012	<i>Eucalyptus citriodora</i>	0.02	0.34	220.24	57.26	277.51	138.75	0.51	14.97
1013	<i>Eucalyptus citriodora</i>	0.40	8.35	5342.50	1389.05	6731.55	3365.77	12.35	363.16
1014	<i>Millettia pinnata</i>	0.03	0.26	212.87	55.35	268.22	134.11	0.49	14.47
1015	<i>Eucalyptus tereticornis</i>	0.35	8.60	5674.65	1475.41	7150.05	3575.03	13.12	385.74
1016	<i>Albizia lebbek</i>	0.06	1.03	677.45	176.14	853.59	426.79	1.57	46.05
1017	<i>Eucalyptus tereticornis</i>	0.45	11.72	7735.02	2011.10	9746.12	4873.06	17.88	525.79
1018	<i>Ailanthus excelsa</i>	0.26	6.09	2921.85	759.68	3681.54	1840.77	6.76	198.62
1019	<i>Tamarindus indica</i>	0.07	1.02	766.07	199.18	965.24	482.62	1.77	52.07
1020	<i>Butea monosperma</i>	0.35	5.79	2779.42	722.65	3502.07	1751.03	6.43	188.93
1021	<i>Anacardium occidentale</i>	0.18	1.85	777.76	202.22	979.98	489.99	1.80	52.87
1022	<i>Grevillea robusta</i>	0.01	0.21	111.24	28.92	140.16	70.08	0.26	7.56
1023	<i>Grevillea robusta</i>	0.01	0.19	103.61	26.94	130.55	65.28	0.24	7.04
1024	<i>Grevillea robusta</i>	0.01	0.17	93.87	24.41	118.27	59.14	0.22	6.38
1025	<i>Grevillea robusta</i>	0.01	0.18	98.68	25.66	124.33	62.17	0.23	6.71
1026	<i>Grevillea robusta</i>	0.01	0.20	106.12	27.59	133.72	66.86	0.25	7.21
1027	<i>Eucalyptus tereticornis</i>	0.07	1.50	992.27	257.99	1250.26	625.13	2.29	67.45
1028	<i>Eucalyptus tereticornis</i>	0.06	1.25	824.34	214.33	1038.66	519.33	1.91	56.03
1029	<i>Millettia pinnata</i>	0.04	0.26	215.19	55.95	271.13	135.57	0.50	14.63
1030	<i>Eucalyptus citriodora</i>	0.02	0.41	262.39	68.22	330.61	165.31	0.61	17.84
1031	<i>Eucalyptus citriodora</i>	0.03	0.50	316.96	82.41	399.36	199.68	0.73	21.55
1032	<i>Eucalyptus citriodora</i>	0.04	0.73	467.40	121.53	588.93	294.47	1.08	31.77
1033	<i>Eucalyptus tereticornis</i>	0.05	0.99	655.05	170.31	825.37	412.68	1.51	44.53
1034	<i>Eucalyptus tereticornis</i>	0.05	1.07	706.41	183.67	890.08	445.04	1.63	48.02
1035	<i>Eucalyptus tereticornis</i>	0.04	0.88	583.01	151.58	734.59	367.30	1.35	39.63
1036	<i>Azadirachta indica</i>	0.03	0.30	153.82	39.99	193.81	96.91	0.36	10.46
1037	<i>Eucalyptus globulus</i>	0.01	0.23	128.22	33.34	161.56	80.78	0.30	8.72
1038	<i>Eucalyptus globulus</i>	0.03	0.44	250.45	65.12	315.56	157.78	0.58	17.02
1039	<i>Eucalyptus globulus</i>	0.03	0.54	308.83	80.29	389.12	194.56	0.71	20.99
1040	<i>Eucalyptus globulus</i>	0.05	0.97	549.03	142.75	691.77	345.89	1.27	37.32
1041	<i>Eucalyptus globulus</i>	0.04	0.80	454.90	118.28	573.18	286.59	1.05	30.92
1042	<i>Grevillea robusta</i>	0.05	0.98	529.61	137.70	667.30	333.65	1.22	36.00
1043	<i>Grevillea robusta</i>	0.06	1.11	599.22	155.80	755.02	377.51	1.39	40.73
1044	<i>Grevillea robusta</i>	0.07	1.38	747.28	194.29	941.58	470.79	1.73	50.80

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1045	<i>Grevillea robusta</i>	0.03	0.50	269.25	70.01	339.26	169.63	0.62	18.30
1046	<i>Grevillea robusta</i>	0.03	0.55	295.81	76.91	372.72	186.36	0.68	20.11
1047	<i>Grevillea robusta</i>	0.02	0.41	221.39	57.56	278.96	139.48	0.51	15.05
1048	<i>Grevillea robusta</i>	0.03	0.56	300.68	78.18	378.86	189.43	0.70	20.44
1049	<i>Eucalyptus globulus</i>	0.02	0.26	145.14	37.74	182.88	91.44	0.34	9.87
1050	<i>Eucalyptus citriodora</i>	0.02	0.37	236.39	61.46	297.85	148.92	0.55	16.07
1051	<i>Eucalyptus globulus</i>	0.02	0.39	221.80	57.67	279.47	139.73	0.51	15.08
1052	<i>Eucalyptus citriodora</i>	0.02	0.38	241.00	62.66	303.66	151.83	0.56	16.38
1053	<i>Albizia amara</i>	0.11	1.37	961.33	249.95	1211.28	605.64	2.22	65.35
1054	<i>Azadirachta indica</i>	0.03	0.35	183.57	47.73	231.30	115.65	0.42	12.48
1055	<i>Azadirachta indica</i>	0.02	0.17	89.95	23.39	113.34	56.67	0.21	6.11
1056	<i>Azadirachta indica</i>	0.02	0.19	100.11	26.03	126.14	63.07	0.23	6.80
1057	<i>Azadirachta indica</i>	0.03	0.33	169.72	44.13	213.85	106.93	0.39	11.54
1058	<i>Millettia pinnata</i>	0.06	0.47	392.38	102.02	494.40	247.20	0.91	26.67
1059	<i>Grevillea robusta</i>	0.04	0.78	422.41	109.83	532.24	266.12	0.98	28.71
1060	<i>Grevillea robusta</i>	0.04	0.83	446.54	116.10	562.65	281.32	1.03	30.35
1061	<i>Grevillea robusta</i>	0.04	0.86	465.08	120.92	586.01	293.00	1.08	31.61
1062	<i>Grevillea robusta</i>	0.04	0.73	393.19	102.23	495.42	247.71	0.91	26.73
1063	<i>Grevillea robusta</i>	0.05	1.10	592.07	153.94	746.01	373.00	1.37	40.25
1064	<i>Delonix regia</i>	0.08	0.67	549.12	142.77	691.89	345.95	1.27	37.33
Block-6									
1065	<i>Millettia pinnata</i>	0.13	1.10	911.30	236.94	1148.23	574.12	2.11	61.95
1066	<i>Azadirachta indica</i>	0.13	1.23	639.41	166.25	805.65	402.83	1.48	43.46
1067	<i>Simarouba glauca</i>	0.04	0.35	127.94	33.27	161.21	80.61	0.30	8.70
1068	<i>Azadirachta indica</i>	0.02	0.10	50.90	13.23	64.13	32.06	0.12	3.46
1069	<i>Azadirachta indica</i>	0.02	0.22	114.63	29.80	144.44	72.22	0.27	7.79
1070	<i>Bauhinia purpurea</i>	0.09	0.90	599.70	155.92	755.62	377.81	1.39	40.77
1071	<i>Anacardium occidentale</i>	0.03	0.27	115.41	30.01	145.42	72.71	0.27	7.85
1072	<i>Millettia pinnata</i>	0.09	0.73	607.23	157.88	765.11	382.56	1.40	41.28
1073	<i>Azadirachta indica</i>	0.07	0.76	393.69	102.36	496.05	248.02	0.91	26.76
1074	<i>Millettia pinnata</i>	0.06	0.52	427.89	111.25	539.14	269.57	0.99	29.09
1075	<i>Millettia pinnata</i>	0.04	0.35	290.27	75.47	365.74	182.87	0.67	19.73
1076	<i>Millettia pinnata</i>	0.16	1.38	1145.48	297.82	1443.30	721.65	2.65	77.86

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1077	<i>Leucaena leucocephala</i>	0.11	1.42	909.28	236.41	1145.70	572.85	2.10	61.81
1078	<i>Butea monosperma</i>	0.09	1.55	743.44	193.30	936.74	468.37	1.72	50.54
1079	<i>Canthium parviflorum</i>	0.09	0.75	314.57	81.79	396.36	198.18	0.73	21.38
1080	<i>Azadirachta indica</i>	0.08	0.86	446.12	115.99	562.12	281.06	1.03	30.33
1081	<i>Hardwickia binata</i>	0.09	1.86	1355.16	352.34	1707.50	853.75	3.13	92.12
1082	<i>Millettia pinnata</i>	0.09	0.92	763.28	198.45	961.74	480.87	1.76	51.88
1083	<i>Albizia lebbeck</i>	0.07	1.09	716.55	186.30	902.85	451.43	1.66	48.71
1084	<i>Albizia lebbeck</i>	0.04	0.46	304.47	79.16	383.64	191.82	0.70	20.70
1085	<i>Albizia lebbeck</i>	0.03	0.36	239.72	62.33	302.05	151.03	0.55	16.30
1086	<i>Butea monosperma</i>	0.04	0.35	168.45	43.80	212.25	106.12	0.39	11.45
1087	<i>Leucaena leucocephala</i>	0.09	1.41	899.33	233.83	1133.16	566.58	2.08	61.13
1088	<i>Azadirachta indica</i>	0.04	0.45	235.97	61.35	297.32	148.66	0.55	16.04
1089	<i>Anacardium occidentale</i>	0.01	0.09	38.37	9.98	48.35	24.18	0.09	2.61
1090	<i>Millettia pinnata</i>	0.08	0.72	596.49	155.09	751.57	375.79	1.38	40.55
1091	<i>Millettia pinnata</i>	0.10	1.07	885.55	230.24	1115.80	557.90	2.05	60.20
1092	<i>Millettia pinnata</i>	0.11	1.20	998.67	259.65	1258.32	629.16	2.31	67.89
1093	<i>Erythroxylum monogynum</i>	0.04	0.30	148.42	38.59	187.01	93.51	0.34	10.09
1094	<i>Leucaena leucocephala</i>	0.13	2.08	1334.10	346.87	1680.97	840.48	3.08	90.69
1095	<i>Millettia pinnata</i>	0.29	3.62	3008.05	782.09	3790.14	1895.07	6.95	204.47
1096	<i>Millettia pinnata</i>	0.12	1.13	940.15	244.44	1184.59	592.30	2.17	63.91
1097	<i>Leucaena leucocephala</i>	0.06	0.85	546.18	142.01	688.19	344.09	1.26	37.13
1098	<i>Azadirachta indica</i>	0.11	1.69	878.00	228.28	1106.29	553.14	2.03	59.68
1099	<i>Anacardium occidentale</i>	0.11	1.43	601.61	156.42	758.02	379.01	1.39	40.89
1100	<i>Anacardium occidentale</i>	0.10	1.17	490.79	127.60	618.39	309.20	1.13	33.36
1101	<i>Millettia pinnata</i>	0.10	1.06	880.56	228.95	1109.50	554.75	2.04	59.86
1102	<i>Millettia pinnata</i>	0.06	0.69	575.49	149.63	725.12	362.56	1.33	39.12
1103	<i>Millettia pinnata</i>	0.09	0.89	738.67	192.05	930.73	465.36	1.71	50.21
1104	<i>Millettia pinnata</i>	0.03	0.28	235.93	61.34	297.28	148.64	0.55	16.04
1105	<i>Azadirachta indica</i>	0.06	0.95	491.66	127.83	619.49	309.75	1.14	33.42
1106	<i>Leucaena leucocephala</i>	0.19	3.06	1956.51	508.69	2465.20	1232.60	4.52	133.00
1107	<i>Millettia pinnata</i>	0.08	0.94	782.52	203.46	985.98	492.99	1.81	53.19
1108	<i>Cassia fistula</i>	0.04	0.34	240.87	62.63	303.50	151.75	0.56	16.37
1109	<i>Simarouba glauca</i>	0.09	1.07	396.99	103.22	500.21	250.11	0.92	26.99

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
1110	<i>Simarouba glauca</i>	0.03	0.32	116.60	30.32	146.91	73.46	0.27	7.93
1111	<i>Butea monosperma</i>	0.06	0.66	315.85	82.12	397.97	198.99	0.73	21.47
1112	<i>Butea monosperma</i>	0.09	1.04	498.01	129.48	627.50	313.75	1.15	33.85
1113	<i>Acacia auriculiformis</i>	0.02	0.21	137.05	35.63	172.68	86.34	0.32	9.32
1114	<i>Acacia auriculiformis</i>	0.02	0.21	137.05	35.63	172.68	86.34	0.32	9.32
1115	<i>Acacia auriculiformis</i>	0.02	0.29	188.89	49.11	238.00	119.00	0.44	12.84
1116	<i>Butea monosperma</i>	0.04	0.70	334.67	87.01	421.68	210.84	0.77	22.75
1117	<i>Acacia auriculiformis</i>	0.05	0.50	325.74	84.69	410.43	205.22	0.75	22.14
1118	<i>Anacardium occidentale</i>	0.11	1.08	454.88	118.27	573.15	286.57	1.05	30.92
1119	<i>Butea monosperma</i>	0.04	0.48	231.06	60.08	291.14	145.57	0.53	15.71
1120	<i>Simarouba glauca</i>	0.04	0.49	180.44	46.91	227.36	113.68	0.42	12.27
1121	<i>Azadirachta indica</i>	0.02	0.29	150.21	39.05	189.27	94.63	0.35	10.21
1122	<i>Millettia pinnata</i>	0.09	1.03	857.27	222.89	1080.16	540.08	1.98	58.27
1123	<i>Butea monosperma</i>	0.04	0.37	177.81	46.23	224.04	112.02	0.41	12.09
1124	<i>Albizia odoratissima</i>	0.08	1.31	994.51	258.57	1253.08	626.54	2.30	67.60
1125	<i>Albizia odoratissima</i>	0.02	0.23	171.46	44.58	216.04	108.02	0.40	11.65
1126	<i>Millettia pinnata</i>	0.04	0.52	432.84	112.54	545.38	272.69	1.00	29.42
1127	<i>Millettia pinnata</i>	0.05	0.56	466.74	121.35	588.09	294.04	1.08	31.73
1128	<i>Butea monosperma</i>	0.04	0.54	259.95	67.59	327.53	163.77	0.60	17.67
1129	<i>Millettia pinnata</i>	0.04	0.45	377.35	98.11	475.46	237.73	0.87	25.65
1130	<i>Millettia pinnata</i>	0.14	1.70	1410.73	366.79	1777.52	888.76	3.26	95.90
1131	<i>Millettia pinnata</i>	0.11	1.43	1190.76	309.60	1500.36	750.18	2.75	80.94
1132	<i>Wrightia tinctoria</i>	0.21	2.01	1508.53	392.22	1900.75	950.38	3.49	102.54
1133	<i>Eucalyptus citriodora</i>	0.02	0.34	219.38	57.04	276.42	138.21	0.51	14.91
1134	<i>Hardwickia binata</i>	0.11	2.58	1882.17	489.36	2371.53	1185.76	4.35	127.94
1135	<i>Santalum album</i>	0.02	0.17	156.76	40.76	197.52	98.76	0.36	10.66
1136	<i>Santalum album</i>	0.02	0.20	180.46	46.92	227.37	113.69	0.42	12.27
1137	<i>Millettia pinnata</i>	0.04	0.41	337.18	87.67	424.85	212.42	0.78	22.92
1138	<i>Azadirachta indica</i>	0.13	2.29	1188.86	309.10	1497.96	748.98	2.75	80.81
1139	<i>Erythroxylum monogynum</i>	0.07	0.61	306.67	79.73	386.40	193.20	0.71	20.85
1140	<i>Erythroxylum monogynum</i>	0.03	0.27	136.50	35.49	171.99	85.99	0.32	9.28
1141	<i>Millettia pinnata</i>	0.05	0.43	359.88	93.57	453.45	226.73	0.83	24.46
1142	<i>Millettia pinnata</i>	0.04	0.40	334.43	86.95	421.39	210.69	0.77	22.73

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1143	<i>Butea monosperma</i>	0.17	3.82	1831.98	476.31	2308.29	1154.14	4.24	124.53
1144	<i>Butea monosperma</i>	0.09	1.58	757.40	196.93	954.33	477.16	1.75	51.49
1145	<i>Butea monosperma</i>	0.02	0.23	112.66	29.29	141.95	70.98	0.26	7.66
1146	<i>Butea monosperma</i>	0.01	0.14	67.42	17.53	84.95	42.47	0.16	4.58
1147	<i>Butea monosperma</i>	0.18	4.06	1950.44	507.11	2457.55	1228.77	4.51	132.58
1148	<i>Erythroxylum monogynum</i>	0.08	0.71	357.32	92.90	450.22	225.11	0.83	24.29
1149	<i>Albizia odoratissima</i>	0.08	1.04	794.11	206.47	1000.58	500.29	1.84	53.98
1150	<i>Leucaena leucocephala</i>	0.07	0.89	568.52	147.81	716.33	358.17	1.31	38.65
1151	<i>Leucaena leucocephala</i>	0.11	1.44	921.89	239.69	1161.58	580.79	2.13	62.67
1152	<i>Butea monosperma</i>	0.07	0.82	395.39	102.80	498.19	249.09	0.91	26.88
1153	<i>Butea monosperma</i>	0.04	0.38	181.86	47.28	229.14	114.57	0.42	12.36
1154	<i>Albizia odoratissima</i>	0.02	0.15	111.23	28.92	140.15	70.08	0.26	7.56
1155	<i>Millettia pinnata</i>	0.05	0.53	438.37	113.98	552.35	276.17	1.01	29.80
1156	<i>Millettia pinnata</i>	0.05	0.45	373.03	96.99	470.02	235.01	0.86	25.36
1157	<i>Millettia pinnata</i>	0.04	0.48	397.85	103.44	501.30	250.65	0.92	27.04
1158	<i>Leucaena leucocephala</i>	0.05	0.57	361.68	94.04	455.72	227.86	0.84	24.59
1159	<i>Leucaena leucocephala</i>	0.04	0.56	357.67	93.00	450.67	225.34	0.83	24.31
1160	<i>Azadirachta indica</i>	0.07	0.81	420.29	109.28	529.57	264.78	0.97	28.57
1161	<i>Millettia pinnata</i>	0.06	0.60	497.02	129.22	626.24	313.12	1.15	33.79
1162	<i>Anacardium occidentale</i>	0.08	0.66	276.51	71.89	348.41	174.20	0.64	18.80
1163	<i>Erythroxylum monogynum</i>	0.09	0.85	425.02	110.50	535.52	267.76	0.98	28.89
1164	<i>Millettia pinnata</i>	0.06	0.67	556.26	144.63	700.89	350.44	1.29	37.81
1165	<i>Azadirachta indica</i>	0.04	0.43	222.12	57.75	279.88	139.94	0.51	15.10
1166	<i>Anacardium occidentale</i>	0.07	0.64	267.33	69.51	336.84	168.42	0.62	18.17
1167	<i>Anacardium occidentale</i>	0.03	0.27	114.55	29.78	144.34	72.17	0.26	7.79
1168	<i>Millettia pinnata</i>	0.05	0.57	471.20	122.51	593.71	296.85	1.09	32.03
1169	<i>Syzygium operculatum</i>	0.09	1.65	1254.84	326.26	1581.10	790.55	2.90	85.30
1170	<i>Santalum album</i>	0.03	0.26	236.84	61.58	298.42	149.21	0.55	16.10
1171	<i>Millettia pinnata</i>	0.09	0.86	711.00	184.86	895.86	447.93	1.64	48.33
1172	<i>Azadirachta indica</i>	0.08	1.56	812.16	211.16	1023.32	511.66	1.88	55.21
1173	<i>Santalum album</i>	0.02	0.15	130.53	33.94	164.46	82.23	0.30	8.87

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1174	<i>Butea monosperma</i>	0.03	0.47	223.93	58.22	282.15	141.08	0.52	15.22
1175	<i>Millettia pinnata</i>	0.07	0.69	571.26	148.53	719.79	359.89	1.32	38.83
1176	<i>Anacardium occidentale</i>	0.03	0.24	101.46	26.38	127.83	63.92	0.23	6.90
1177	<i>Azadirachta indica</i>	0.02	0.29	149.23	38.80	188.03	94.02	0.35	10.14
1178	<i>Pterocarpus santalinus</i>	0.07	0.96	741.95	192.91	934.86	467.43	1.72	50.43
1179	<i>Pterocarpus santalinus</i>	0.05	1.04	803.07	208.80	1011.87	505.94	1.86	54.59
1180	<i>Pterocarpus santalinus</i>	0.08	1.64	1265.24	328.96	1594.20	797.10	2.93	86.01
1181	<i>Pterocarpus santalinus</i>	0.14	3.14	2418.53	628.82	3047.35	1523.67	5.59	164.40
1182	<i>Millettia pinnata</i>	0.08	0.83	687.33	178.70	866.03	433.02	1.59	46.72
1183	<i>Tamarindus indica</i>	0.08	1.50	1126.33	292.85	1419.18	709.59	2.60	76.56
1184	<i>Careya arborea</i>	0.09	1.39	670.70	174.38	845.09	422.54	1.55	45.59
1185	<i>Senna siamea</i>	0.03	0.22	131.86	34.28	166.14	83.07	0.30	8.96
1186	<i>Leucaena leucocephala</i>	0.18	3.84	2454.79	638.25	3093.04	1546.52	5.68	166.87
1187	<i>Millettia pinnata</i>	0.11	1.39	1151.54	299.40	1450.95	725.47	2.66	78.28
1188	<i>Careya arborea</i>	0.04	0.56	269.16	69.98	339.14	169.57	0.62	18.30
1189	<i>Senna siamea</i>	0.03	0.23	136.47	35.48	171.95	85.97	0.32	9.28
1190	<i>Azadirachta indica</i>	0.10	1.57	818.66	212.85	1031.52	515.76	1.89	55.65
1191	<i>Butea monosperma</i>	0.03	0.34	162.27	42.19	204.46	102.23	0.38	11.03
1192	<i>Albizia lebbeck</i>	0.23	5.26	3470.57	902.35	4372.92	2186.46	8.02	235.91
1193	<i>Gliricidia sepium</i>	0.06	0.63	421.22	109.52	530.73	265.37	0.97	28.63
1194	<i>Senna siamea</i>	0.27	4.79	2872.09	746.74	3618.83	1809.41	6.64	195.23
1195	<i>Millettia pinnata</i>	0.08	1.10	910.93	236.84	1147.77	573.89	2.11	61.92
1196	<i>Senna siamea</i>	0.05	0.62	373.15	97.02	470.17	235.09	0.86	25.37
1197	<i>Senna siamea</i>	0.12	1.91	1146.17	298.00	1444.17	722.08	2.65	77.91
1198	<i>Senna siamea</i>	0.04	0.67	401.56	104.41	505.97	252.98	0.93	27.30
1199	<i>Senna siamea</i>	0.03	0.39	236.88	61.59	298.47	149.24	0.55	16.10
1200	<i>Leucaena leucocephala</i>	0.11	1.55	990.07	257.42	1247.49	623.74	2.29	67.30
1201	<i>Albizia lebbeck</i>	0.11	2.27	1500.03	390.01	1890.04	945.02	3.47	101.97
1202	<i>Albizia lebbeck</i>	0.41	9.68	6388.00	1660.88	8048.88	4024.44	14.77	434.23
1203	<i>Lagerstroemia lanceolata</i>	0.09	1.87	1027.25	267.08	1294.33	647.16	2.38	69.83
1204	<i>Lagerstroemia lanceolata</i>	0.06	1.34	736.24	191.42	927.66	463.83	1.70	50.05
1205	<i>Senna siamea</i>	0.11	1.08	646.45	168.08	814.53	407.26	1.49	43.94
1206	<i>Lagerstroemia lanceolata</i>	0.10	1.25	687.22	178.68	865.90	432.95	1.59	46.71

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1207	<i>Millettia pinnata</i>	0.09	1.01	837.75	217.81	1055.56	527.78	1.94	56.95
1208	<i>Albizia lebbbeck</i>	0.05	0.60	393.34	102.27	495.61	247.80	0.91	26.74
1209	<i>Millettia pinnata</i>	0.17	1.76	1462.37	380.22	1842.58	921.29	3.38	99.41
1210	<i>Millettia pinnata</i>	0.12	1.32	1096.15	285.00	1381.15	690.58	2.53	74.51
1211	<i>Eucalyptus citriodora</i>	0.03	0.52	331.35	86.15	417.50	208.75	0.77	22.52
1212	<i>Albizia lebbbeck</i>	0.06	0.93	611.47	158.98	770.45	385.23	1.41	41.57
1213	<i>Santalum album</i>	0.04	0.37	328.87	85.51	414.38	207.19	0.76	22.36
1214	<i>Leucaena leucocephala</i>	0.21	3.35	2145.81	557.91	2703.72	1351.86	4.96	145.86
1215	<i>Eucalyptus globulus</i>	0.04	0.85	480.89	125.03	605.93	302.96	1.11	32.69
1216	<i>Eucalyptus globulus</i>	0.06	1.25	706.79	183.77	890.55	445.28	1.63	48.04
1217	<i>Eucalyptus globulus</i>	0.05	1.06	599.40	155.84	755.25	377.62	1.39	40.74
1218	<i>Eucalyptus globulus</i>	0.04	0.87	494.16	128.48	622.64	311.32	1.14	33.59
1219	<i>Eucalyptus globulus</i>	0.05	0.85	482.14	125.36	607.49	303.75	1.11	32.77
1220	<i>Eucalyptus globulus</i>	0.05	0.91	514.38	133.74	648.12	324.06	1.19	34.97
1221	<i>Millettia pinnata</i>	0.07	0.51	422.55	109.86	532.41	266.21	0.98	28.72
1222	<i>Grevillea robusta</i>	0.03	0.48	258.29	67.16	325.44	162.72	0.60	17.56
1223	<i>Millettia pinnata</i>	0.10	0.72	599.71	155.92	755.63	377.82	1.39	40.77
1224	<i>Azadirachta indica</i>	0.05	0.63	327.83	85.24	413.06	206.53	0.76	22.28
1225	<i>Millettia pinnata</i>	0.08	0.63	524.66	136.41	661.07	330.53	1.21	35.66
1226	<i>Millettia pinnata</i>	0.07	0.55	452.40	117.62	570.02	285.01	1.05	30.75
1227	<i>Eucalyptus citriodora</i>	0.04	0.76	484.95	126.09	611.04	305.52	1.12	32.96
1228	<i>Eucalyptus citriodora</i>	0.04	0.88	565.34	146.99	712.33	356.17	1.31	38.43
1229	<i>Syzygium operculatum</i>	0.11	2.01	1524.07	396.26	1920.33	960.16	3.52	103.60
1230	<i>Azadirachta indica</i>	0.04	0.39	200.91	52.24	253.15	126.57	0.46	13.66
1231	<i>Grevillea robusta</i>	0.02	0.36	194.79	50.65	245.44	122.72	0.45	13.24
1232	<i>Grevillea robusta</i>	0.03	0.51	276.73	71.95	348.68	174.34	0.64	18.81
1233	<i>Grevillea robusta</i>	0.03	0.61	330.73	85.99	416.72	208.36	0.76	22.48
1234	<i>Grevillea robusta</i>	0.04	0.71	383.99	99.84	483.83	241.92	0.89	26.10
1235	<i>Eucalyptus tereticornis</i>	0.05	0.98	647.30	168.30	815.59	407.80	1.50	44.00
1236	<i>Eucalyptus tereticornis</i>	0.04	0.88	583.01	151.58	734.59	367.30	1.35	39.63
1237	<i>Eucalyptus tereticornis</i>	0.04	0.76	500.11	130.03	630.13	315.07	1.16	34.00
1238	<i>Eucalyptus tereticornis</i>	0.54	12.96	8553.83	2224.00	10777.83	5388.91	19.78	581.45
1239	<i>Eucalyptus globulus</i>	0.15	3.33	1890.40	491.50	2381.91	1190.95	4.37	128.50

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1240	<i>Eucalyptus citriodora</i>	0.06	1.19	763.66	198.55	962.22	481.11	1.77	51.91
1241	<i>Eucalyptus citriodora</i>	0.05	1.06	675.96	175.75	851.71	425.86	1.56	45.95
1242	<i>Eucalyptus citriodora</i>	0.02	0.32	205.33	53.38	258.71	129.35	0.47	13.96
1243	<i>Albizia amara</i>	0.07	1.43	1001.07	260.28	1261.35	630.68	2.31	68.05
1244	<i>Millettia pinnata</i>	0.04	0.32	266.08	69.18	335.26	167.63	0.62	18.09
1245	<i>Millettia pinnata</i>	0.08	0.61	509.10	132.37	641.47	320.74	1.18	34.61
1246	<i>Azadirachta indica</i>	0.25	3.15	1638.87	426.11	2064.97	1032.49	3.79	111.40
1247	<i>Callistemon viminalis</i>	0.05	0.46	299.52	77.88	377.40	188.70	0.69	20.36
1248	<i>Callistemon viminalis</i>	0.01	0.07	48.55	12.62	61.17	30.59	0.11	3.30
1249	<i>Santalum album</i>	0.01	0.09	78.22	20.34	98.56	49.28	0.18	5.32
1250	<i>Millettia pinnata</i>	0.04	0.30	246.77	64.16	310.92	155.46	0.57	16.77
1251	<i>Millettia pinnata</i>	0.02	0.12	100.73	26.19	126.92	63.46	0.23	6.85
1252	<i>Eucalyptus citriodora</i>	1.03	25.78	16501.18	4290.31	20791.49	10395.75	38.15	1121.68
1253	<i>Eucalyptus citriodora</i>	0.03	0.50	319.11	82.97	402.08	201.04	0.74	21.69
1254	<i>Eucalyptus citriodora</i>	0.03	0.58	372.83	96.94	469.77	234.88	0.86	25.34
1255	<i>Eucalyptus citriodora</i>	0.03	0.60	385.26	100.17	485.42	242.71	0.89	26.19
1256	<i>Grevillea robusta</i>	0.03	0.42	224.31	58.32	282.63	141.32	0.52	15.25
1257	<i>Grevillea robusta</i>	0.02	0.34	185.07	48.12	233.19	116.60	0.43	12.58
1258	<i>Grevillea robusta</i>	0.02	0.31	165.26	42.97	208.23	104.11	0.38	11.23
1259	<i>Grevillea robusta</i>	0.03	0.38	206.01	53.56	259.57	129.79	0.48	14.00
1260	<i>Millettia pinnata</i>	0.07	0.54	450.26	117.07	567.33	283.66	1.04	30.61
1261	<i>Cassia fistula</i>	0.01	0.04	29.86	7.76	37.63	18.81	0.07	2.03
1262	<i>Cassia fistula</i>	0.01	0.04	28.91	7.52	36.42	18.21	0.07	1.97
1263	<i>Azadirachta indica</i>	0.01	0.12	61.21	15.91	77.12	38.56	0.14	4.16
1264	<i>Azadirachta indica</i>	0.02	0.14	74.69	19.42	94.11	47.06	0.17	5.08
1265	<i>Azadirachta indica</i>	0.02	0.14	71.17	18.50	89.68	44.84	0.16	4.84
1266	<i>Grevillea robusta</i>	0.06	1.24	671.22	174.52	845.74	422.87	1.55	45.63
1267	<i>Grevillea robusta</i>	0.01	0.10	54.64	14.21	68.85	34.43	0.13	3.71
1268	<i>Grevillea robusta</i>	0.01	0.13	68.26	17.75	86.00	43.00	0.16	4.64
1269	<i>Grevillea robusta</i>	0.01	0.15	81.41	21.17	102.58	51.29	0.19	5.53
1270	<i>Grevillea robusta</i>	0.04	0.74	400.75	104.19	504.94	252.47	0.93	27.24
1271	<i>Grevillea robusta</i>	0.03	0.55	294.56	76.59	371.15	185.58	0.68	20.02
1272	<i>Grevillea robusta</i>	0.02	0.17	93.60	24.34	117.94	58.97	0.22	6.36

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
1273	<i>Grevillea robusta</i>	0.02	0.18	97.86	25.44	123.30	61.65	0.23	6.65
1274	<i>Grevillea robusta</i>	0.02	0.20	108.91	28.32	137.22	68.61	0.25	7.40
1275	<i>Millettia pinnata</i>	0.03	0.18	148.22	38.54	186.76	93.38	0.34	10.08
1276	<i>Syzygium operculatum</i>	0.13	2.78	2113.50	549.51	2663.01	1331.51	4.89	143.67
1277	<i>Millettia pinnata</i>	0.07	0.33	277.35	72.11	349.45	174.73	0.64	18.85
1278	<i>Tectona grandis</i>	0.03	0.35	190.44	49.52	239.96	119.98	0.44	12.95
1279	<i>Tectona grandis</i>	0.03	0.41	227.61	59.18	286.78	143.39	0.53	15.47
1280	<i>Erythroxylum monogynum</i>	0.03	0.12	61.67	16.03	77.70	38.85	0.14	4.19
1281	<i>Cassia fistula</i>	0.01	0.03	18.46	4.80	23.26	11.63	0.04	1.25
1282	<i>Tectona grandis</i>	0.01	0.20	108.09	28.10	136.19	68.10	0.25	7.35
1283	<i>Senna siamea</i>	0.05	0.30	178.79	46.49	225.28	112.64	0.41	12.15
1284	<i>Anacardium occidentale</i>	0.09	0.61	257.36	66.91	324.27	162.13	0.60	17.49
1285	<i>Azadirachta indica</i>	0.13	1.97	1026.38	266.86	1293.23	646.62	2.37	69.77
1286	<i>Melia dubia</i>	0.09	1.70	680.73	176.99	857.72	428.86	1.57	46.27
1287	<i>Millettia pinnata</i>	0.03	0.15	128.54	33.42	161.96	80.98	0.30	8.74
1288	<i>Millettia pinnata</i>	0.07	0.58	481.91	125.30	607.21	303.60	1.11	32.76
1289	<i>Senna siamea</i>	0.04	0.26	154.55	40.18	194.73	97.36	0.36	10.51
1290	<i>Senna siamea</i>	0.03	0.21	126.41	32.87	159.28	79.64	0.29	8.59
1291	<i>Ailanthus excelsa</i>	0.09	1.84	882.83	229.54	1112.37	556.18	2.04	60.01
1292	<i>Ailanthus excelsa</i>	0.07	1.09	521.91	135.70	657.61	328.81	1.21	35.48
1293	<i>Delonix regia</i>	0.10	1.73	1421.22	369.52	1790.74	895.37	3.29	96.61
1294	<i>Delonix regia</i>	0.09	1.58	1293.90	336.41	1630.31	815.16	2.99	87.95
1295	<i>Delonix regia</i>	0.11	2.12	1738.35	451.97	2190.33	1095.16	4.02	118.17
1296	<i>Delonix regia</i>	0.12	2.25	1841.24	478.72	2319.96	1159.98	4.26	125.16
1297	<i>Delonix regia</i>	0.14	2.53	2071.66	538.63	2610.29	1305.15	4.79	140.82
1298	<i>Delonix regia</i>	0.14	2.74	2242.86	583.14	2826.00	1413.00	5.19	152.46
1299	<i>Albizia amara</i>	0.08	1.07	748.98	194.73	943.71	471.86	1.73	50.91
1300	<i>Delonix regia</i>	0.08	1.27	1042.00	270.92	1312.92	656.46	2.41	70.83
1301	<i>Delonix regia</i>	0.07	1.16	951.65	247.43	1199.08	599.54	2.20	64.69
1302	<i>Delonix regia</i>	0.09	1.38	1129.25	293.61	1422.86	711.43	2.61	76.76
1303	<i>Delonix regia</i>	0.04	0.45	372.81	96.93	469.74	234.87	0.86	25.34
1304	<i>Delonix regia</i>	0.06	0.89	732.36	190.41	922.78	461.39	1.69	49.78
1305	<i>Delonix regia</i>	0.08	1.26	1033.64	268.75	1302.39	651.19	2.39	70.26

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
1306	<i>Delonix regia</i>	0.08	1.21	992.51	258.05	1250.56	625.28	2.29	67.47
1307	<i>Delonix regia</i>	0.11	2.02	1652.52	429.66	2082.18	1041.09	3.82	112.33
1308	<i>Gardenia latifolia</i>	0.03	0.14	90.15	23.44	113.59	56.80	0.21	6.13
1309	<i>Mitragyna parviflora</i>	0.07	1.17	656.64	170.73	827.36	413.68	1.52	44.64
1310	<i>Millettia pinnata</i>	0.05	0.27	226.37	58.86	285.23	142.62	0.52	15.39
1311	<i>Millettia pinnata</i>	0.04	0.23	189.80	49.35	239.14	119.57	0.44	12.90
1312	<i>Albizia lebbeck</i>	0.08	1.35	891.75	231.86	1123.61	561.80	2.06	60.62
1313	<i>Albizia lebbeck</i>	0.09	1.54	1013.33	263.47	1276.80	638.40	2.34	68.88
1314	<i>Millettia pinnata</i>	0.06	0.39	322.12	83.75	405.87	202.94	0.74	21.90
1315	<i>Albizia lebbeck</i>	0.25	5.05	3335.13	867.13	4202.27	2101.13	7.71	226.71
1316	<i>Millettia pinnata</i>	0.06	0.32	268.68	69.86	338.53	169.27	0.62	18.26
1317	<i>Albizia lebbeck</i>	0.08	0.91	599.13	155.78	754.91	377.45	1.39	40.73
1318	<i>Mitragyna parviflora</i>	0.04	0.34	190.95	49.65	240.59	120.30	0.44	12.98
1319	<i>Albizia lebbeck</i>	0.07	1.14	755.67	196.48	952.15	476.07	1.75	51.37
1320	<i>Albizia amara</i>	0.05	0.50	351.30	91.34	442.64	221.32	0.81	23.88
1321	<i>Albizia lebbeck</i>	0.06	0.71	466.14	121.20	587.33	293.67	1.08	31.69
1322	<i>Hardwickia binata</i>	0.08	1.82	1329.65	345.71	1675.35	837.68	3.07	90.38
1323	<i>Hardwickia binata</i>	0.09	1.91	1395.62	362.86	1758.49	879.24	3.23	94.87
1324	<i>Albizia lebbeck</i>	0.19	3.83	2530.49	657.93	3188.42	1594.21	5.85	172.01
1325	<i>Erythroxylum monogynum</i>	0.03	0.13	65.20	16.95	82.16	41.08	0.15	4.43
1326	<i>Millettia pinnata</i>	0.07	0.44	367.34	95.51	462.85	231.42	0.85	24.97
1327	<i>Terminalia tomentosa</i>	0.07	0.93	715.45	186.02	901.47	450.73	1.65	48.63
1328	<i>Delonix regia</i>	0.22	2.70	2214.40	575.74	2790.14	1395.07	5.12	150.53
1329	<i>Eucalyptus tereticornis</i>	0.02	0.35	233.87	60.81	294.67	147.34	0.54	15.90
1330	<i>Eucalyptus tereticornis</i>	0.02	0.43	284.15	73.88	358.03	179.01	0.66	19.32
1331	<i>Ailanthus excelsa</i>	0.53	11.48	5508.96	1432.33	6941.29	3470.64	12.74	374.48
1332	<i>Tamarindus indica</i>	0.01	0.09	68.43	17.79	86.23	43.11	0.16	4.65
1333	<i>Grevillea robusta</i>	0.03	0.40	216.84	56.38	273.21	136.61	0.50	14.74
1334	<i>Grevillea robusta</i>	0.03	0.50	268.57	69.83	338.40	169.20	0.62	18.26
1335	<i>Grevillea robusta</i>	0.01	0.09	49.68	12.92	62.59	31.30	0.11	3.38
1336	<i>Eucalyptus globulus</i>	0.04	0.82	462.47	120.24	582.71	291.36	1.07	31.44
1337	<i>Eucalyptus globulus</i>	0.01	0.11	62.59	16.27	78.86	39.43	0.14	4.25
1338	<i>Eucalyptus citriodora</i>	0.03	0.66	419.60	109.09	528.69	264.35	0.97	28.52

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1339	<i>Eucalyptus citriodora</i>	0.03	0.61	387.94	100.86	488.80	244.40	0.90	26.37
1340	<i>Eucalyptus citriodora</i>	0.05	0.99	635.70	165.28	800.99	400.49	1.47	43.21
1341	<i>Tamarindus indica</i>	0.04	0.53	397.51	103.35	500.86	250.43	0.92	27.02
1342	<i>Tamarindus indica</i>	0.04	0.40	300.86	78.22	379.09	189.54	0.70	20.45
1343	<i>Tamarindus indica</i>	0.05	0.48	363.11	94.41	457.52	228.76	0.84	24.68
1344	<i>Terminalia tomentosa</i>	0.03	0.24	188.24	48.94	237.18	118.59	0.44	12.80
1345	<i>Terminalia tomentosa</i>	0.03	0.28	216.68	56.34	273.02	136.51	0.50	14.73
1346	<i>Terminalia tomentosa</i>	0.03	0.24	188.24	48.94	237.18	118.59	0.44	12.80
1347	<i>Terminalia tomentosa</i>	0.04	0.29	223.35	58.07	281.42	140.71	0.52	15.18
1348	<i>Azadirachta indica</i>	0.10	2.10	1090.06	283.41	1373.47	686.74	2.52	74.10
1349	<i>Delonix regia</i>	0.02	0.13	110.46	28.72	139.18	69.59	0.26	7.51
1350	<i>Millettia pinnata</i>	0.07	0.48	397.65	103.39	501.04	250.52	0.92	27.03
1351	<i>Grevillea robusta</i>	0.01	0.12	63.96	16.63	80.59	40.29	0.15	4.35
1352	<i>Grevillea robusta</i>	0.01	0.19	105.10	27.33	132.42	66.21	0.24	7.14
1353	<i>Grevillea robusta</i>	0.02	0.33	175.61	45.66	221.27	110.63	0.41	11.94
1354	<i>Grevillea robusta</i>	0.02	0.44	236.13	61.39	297.52	148.76	0.55	16.05
1355	<i>Cassia fistula</i>	0.01	0.07	51.56	13.41	64.97	32.48	0.12	3.50
1356	<i>Azadirachta indica</i>	0.02	0.10	52.07	13.54	65.61	32.81	0.12	3.54
1357	<i>Azadirachta indica</i>	0.01	0.08	40.72	10.59	51.31	25.66	0.09	2.77
1358	<i>Millettia pinnata</i>	0.05	0.32	267.94	69.66	337.60	168.80	0.62	18.21
1359	<i>Grevillea robusta</i>	0.01	0.14	74.33	19.33	93.66	46.83	0.17	5.05
1360	<i>Grevillea robusta</i>	0.01	0.20	105.89	27.53	133.42	66.71	0.24	7.20
1361	<i>Eucalyptus citriodora</i>	0.02	0.47	300.43	78.11	378.54	189.27	0.69	20.42
1362	<i>Eucalyptus citriodora</i>	0.02	0.41	262.06	68.14	330.19	165.10	0.61	17.81
1363	<i>Eucalyptus citriodora</i>	0.42	10.95	7004.85	1821.26	8826.12	4413.06	16.20	476.16
1364	<i>Eucalyptus citriodora</i>	0.06	1.11	710.19	184.65	894.84	447.42	1.64	48.28
1365	<i>Eucalyptus citriodora</i>	0.03	0.58	372.83	96.94	469.77	234.88	0.86	25.34
1366	<i>Eucalyptus citriodora</i>	0.10	2.12	1355.75	352.49	1708.24	854.12	3.13	92.16
1367	<i>Eucalyptus citriodora</i>	0.12	2.54	1626.92	423.00	2049.92	1024.96	3.76	110.59
1368	<i>Azadirachta indica</i>	0.07	0.85	442.58	115.07	557.64	278.82	1.02	30.08
1369	<i>Callistemon viminalis</i>	0.08	0.51	329.56	85.69	415.24	207.62	0.76	22.40
1370	<i>Millettia pinnata</i>	0.08	0.36	300.73	78.19	378.92	189.46	0.70	20.44
1371	<i>Eucalyptus tereticornis</i>	0.28	6.71	4431.47	1152.18	5583.65	2791.83	10.25	301.23

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1372	<i>Eucalyptus tereticornis</i>	0.03	0.68	448.18	116.53	564.71	282.35	1.04	30.47
1373	<i>Eucalyptus tereticornis</i>	0.04	0.92	603.97	157.03	761.00	380.50	1.40	41.06
1374	<i>Barringtonia acutangula</i>	0.01	0.07	35.85	9.32	45.17	22.59	0.08	2.44
1375	<i>Millettia pinnata</i>	0.10	0.85	704.24	183.10	887.35	443.67	1.63	47.87
1376	<i>Albizia lebbbeck</i>	0.09	1.56	1029.61	267.70	1297.30	648.65	2.38	69.99
1377	<i>Millettia pinnata</i>	0.03	0.16	135.93	35.34	171.28	85.64	0.31	9.24
1378	<i>Millettia pinnata</i>	0.05	0.43	357.09	92.84	449.93	224.97	0.83	24.27
1379	<i>Eucalyptus globulus</i>	0.08	1.64	929.68	241.72	1171.40	585.70	2.15	63.20
1380	<i>Eucalyptus globulus</i>	0.04	0.68	386.67	100.53	487.21	243.60	0.89	26.28
1381	<i>Eucalyptus globulus</i>	0.06	1.15	653.78	169.98	823.76	411.88	1.51	44.44
1382	<i>Eucalyptus globulus</i>	0.10	2.02	1146.51	298.09	1444.60	722.30	2.65	77.93
1383	<i>Millettia pinnata</i>	0.09	0.69	572.65	148.89	721.54	360.77	1.32	38.93
1384	<i>Leucaena leucocephala</i>	0.05	0.52	333.74	86.77	420.52	210.26	0.77	22.69
1385	<i>Leucaena leucocephala</i>	0.06	0.59	377.33	98.11	475.43	237.72	0.87	25.65
1386	<i>Grevillea robusta</i>	0.01	0.18	96.18	25.01	121.19	60.59	0.22	6.54
1387	<i>Grevillea robusta</i>	0.01	0.23	122.11	31.75	153.86	76.93	0.28	8.30
1388	<i>Grevillea robusta</i>	0.01	0.18	99.71	25.92	125.63	62.82	0.23	6.78
1389	<i>Grevillea robusta</i>	0.02	0.34	184.42	47.95	232.37	116.18	0.43	12.54
1390	<i>Grevillea robusta</i>	0.01	0.23	125.07	32.52	157.59	78.80	0.29	8.50
1391	<i>Azadirachta indica</i>	0.04	0.40	206.86	53.78	260.65	130.32	0.48	14.06
1392	<i>Delonix regia</i>	0.07	0.70	571.31	148.54	719.85	359.92	1.32	38.84
1393	<i>Cassia fistula</i>	0.01	0.04	31.54	8.20	39.73	19.87	0.07	2.14
Block-7									
1394	<i>Albizia lebbbeck</i>	0.33	6.23	4112.25	1069.19	5181.44	2590.72	9.51	279.53
1395	<i>Simarouba glauca</i>	0.04	0.34	126.16	32.80	158.96	79.48	0.29	8.58
1396	<i>Manilkara hexandra</i>	0.07	0.76	634.78	165.04	799.82	399.91	1.47	43.15
1397	<i>Manilkara hexandra</i>	0.07	0.75	626.33	162.85	789.18	394.59	1.45	42.58
1398	<i>Manilkara hexandra</i>	0.13	1.37	1134.14	294.88	1429.02	714.51	2.62	77.09
1399	<i>Albizia lebbbeck</i>	0.07	0.80	528.03	137.29	665.31	332.66	1.22	35.89
1400	<i>Azadirachta indica</i>	0.03	0.29	148.69	38.66	187.34	93.67	0.34	10.11
1401	<i>Azadirachta indica</i>	0.03	0.30	153.56	39.93	193.49	96.74	0.36	10.44
1402	<i>Azadirachta indica</i>	0.05	0.69	356.34	92.65	448.98	224.49	0.82	24.22
1403	<i>Millettia pinnata</i>	0.07	0.55	458.86	119.30	578.17	289.08	1.06	31.19

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1404	<i>Millettia pinnata</i>	0.07	0.63	525.25	136.57	661.82	330.91	1.21	35.70
1405	<i>Azadirachta indica</i>	0.03	0.29	148.61	38.64	187.24	93.62	0.34	10.10
1406	<i>Millettia pinnata</i>	0.04	0.29	243.02	63.19	306.21	153.10	0.56	16.52
1407	<i>Millettia pinnata</i>	0.07	0.48	401.26	104.33	505.58	252.79	0.93	27.28
1408	<i>Cassia fistula</i>	0.01	0.08	58.38	15.18	73.56	36.78	0.13	3.97
1409	<i>Azadirachta indica</i>	0.03	0.26	135.19	35.15	170.34	85.17	0.31	9.19
1410	<i>Azadirachta indica</i>	0.03	0.23	117.38	30.52	147.90	73.95	0.27	7.98
1411	<i>Azadirachta indica</i>	0.05	0.37	194.89	50.67	245.57	122.78	0.45	13.25
1412	<i>Erythroxylum monogynum</i>	0.07	0.47	235.62	61.26	296.88	148.44	0.54	16.02
1413	<i>Azadirachta indica</i>	0.02	0.14	74.43	19.35	93.78	46.89	0.17	5.06
1414	<i>Azadirachta indica</i>	0.02	0.16	81.04	21.07	102.11	51.05	0.19	5.51
1415	<i>Azadirachta indica</i>	0.04	0.38	199.88	51.97	251.85	125.92	0.46	13.59
1416	<i>Azadirachta indica</i>	0.03	0.30	154.94	40.28	195.22	97.61	0.36	10.53
1417	<i>Anacardium occidentale</i>	0.04	0.31	129.44	33.65	163.09	81.55	0.30	8.80
1418	<i>Millettia pinnata</i>	0.04	0.32	263.98	68.64	332.62	166.31	0.61	17.94
1419	<i>Gmelina asiatica</i>	0.03	0.20	90.91	23.64	114.55	57.27	0.21	6.18
1420	<i>Albizia lebbbeck</i>	0.39	8.63	5694.59	1480.59	7175.19	3587.59	13.17	387.09
1421	<i>Millettia pinnata</i>	0.09	0.80	660.92	171.84	832.75	416.38	1.53	44.93
1422	<i>Azadirachta indica</i>	0.01	0.11	58.40	15.18	73.58	36.79	0.14	3.97
1423	<i>Hardwickia binata</i>	0.09	1.56	1142.25	296.99	1439.24	719.62	2.64	77.65
1424	<i>Millettia pinnata</i>	0.06	0.57	473.73	123.17	596.90	298.45	1.10	32.20
1425	<i>Gmelina asiatica</i>	0.03	0.20	88.05	22.89	110.95	55.47	0.20	5.99
1426	<i>Albizia lebbbeck</i>	0.06	0.97	637.52	165.76	803.28	401.64	1.47	43.34
1427	<i>Albizia lebbbeck</i>	0.04	0.62	406.63	105.72	512.35	256.18	0.94	27.64
1428	<i>Albizia lebbbeck</i>	0.10	1.83	1207.97	314.07	1522.04	761.02	2.79	82.11
1429	<i>Albizia lebbbeck</i>	0.08	1.42	935.95	243.35	1179.30	589.65	2.16	63.62
1430	<i>Azadirachta indica</i>	0.02	0.19	96.95	25.21	122.15	61.08	0.22	6.59
1431	<i>Millettia pinnata</i>	0.09	0.73	602.82	156.73	759.55	379.78	1.39	40.98
1432	<i>Simarouba glauca</i>	0.04	0.39	142.95	37.17	180.12	90.06	0.33	9.72
1433	<i>Anacardium occidentale</i>	0.05	0.30	126.87	32.99	159.86	79.93	0.29	8.62
1434	<i>Albizia odoratissima</i>	0.16	3.29	2499.97	649.99	3149.96	1574.98	5.78	169.94
1435	<i>Albizia odoratissima</i>	0.15	3.04	2310.06	600.62	2910.67	1455.34	5.34	157.03
1436	<i>Erythroxylum monogynum</i>	0.07	0.45	223.63	58.14	281.77	140.88	0.52	15.20

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1437	<i>Azadirachta indica</i>	0.02	0.17	86.04	22.37	108.41	54.20	0.20	5.85
1438	<i>Gmelina asiatica</i>	0.04	0.26	115.69	30.08	145.77	72.88	0.27	7.86
1439	<i>Millettia pinnata</i>	0.04	0.30	246.38	64.06	310.44	155.22	0.57	16.75
1440	<i>Millettia pinnata</i>	0.10	0.78	651.52	169.40	820.92	410.46	1.51	44.29
1441	<i>Erythroxylum monogynum</i>	0.08	0.58	290.56	75.55	366.11	183.05	0.67	19.75
1442	<i>Azadirachta indica</i>	0.04	0.46	239.85	62.36	302.21	151.11	0.55	16.30
1443	<i>Azadirachta indica</i>	0.04	0.50	257.42	66.93	324.35	162.17	0.60	17.50
1444	<i>Azadirachta indica</i>	0.02	0.22	112.52	29.25	141.77	70.89	0.26	7.65
1445	<i>Tectona grandis</i>	0.02	0.27	146.77	38.16	184.93	92.47	0.34	9.98
1446	<i>Tectona grandis</i>	0.02	0.29	157.84	41.04	198.88	99.44	0.36	10.73
1447	<i>Tectona grandis</i>	0.02	0.25	138.73	36.07	174.80	87.40	0.32	9.43
1448	<i>Azadirachta indica</i>	0.03	0.18	94.11	24.47	118.58	59.29	0.22	6.40
1449	<i>Azadirachta indica</i>	0.04	0.45	234.72	61.03	295.75	147.88	0.54	15.96
1450	<i>Millettia pinnata</i>	0.04	0.28	236.36	61.45	297.82	148.91	0.55	16.07
1451	<i>Erythroxylum monogynum</i>	0.05	0.38	190.78	49.60	240.38	120.19	0.44	12.97
1452	<i>Anacardium occidentale</i>	0.05	0.32	134.36	34.93	169.30	84.65	0.31	9.13
1453	<i>Azadirachta indica</i>	0.03	0.34	177.97	46.27	224.24	112.12	0.41	12.10
1454	<i>Azadirachta indica</i>	0.04	0.46	239.26	62.21	301.46	150.73	0.55	16.26
1455	<i>Anacardium occidentale</i>	0.06	0.38	159.14	41.38	200.52	100.26	0.37	10.82
1456	<i>Syzygium operculatum</i>	0.10	1.60	1215.95	316.15	1532.10	766.05	2.81	82.66
1457	<i>Azadirachta indica</i>	0.07	0.99	514.01	133.64	647.65	323.82	1.19	34.94
1458	<i>Albizia odoratissima</i>	0.09	1.58	1200.44	312.11	1512.56	756.28	2.78	81.60
1459	<i>Albizia odoratissima</i>	0.07	1.22	925.26	240.57	1165.83	582.92	2.14	62.90
1460	<i>Azadirachta indica</i>	0.03	0.40	206.58	53.71	260.29	130.15	0.48	14.04
1461	<i>Azadirachta indica</i>	0.01	0.10	54.30	14.12	68.42	34.21	0.13	3.69
1462	<i>Azadirachta indica</i>	0.02	0.17	89.51	23.27	112.79	56.39	0.21	6.08
1463	<i>Azadirachta indica</i>	0.03	0.24	124.52	32.38	156.90	78.45	0.29	8.46
1464	<i>Azadirachta indica</i>	0.03	0.28	145.48	37.82	183.30	91.65	0.34	9.89
1465	<i>Butea monosperma</i>	0.03	0.20	97.55	25.36	122.91	61.46	0.23	6.63
1466	<i>Azadirachta indica</i>	0.05	0.50	257.92	67.06	324.98	162.49	0.60	17.53
1467	<i>Azadirachta indica</i>	0.05	0.55	285.07	74.12	359.19	179.59	0.66	19.38
1468	<i>Azadirachta indica</i>	0.03	0.26	134.34	34.93	169.26	84.63	0.31	9.13
1469	<i>Simarouba glauca</i>	0.02	0.11	40.81	10.61	51.43	25.71	0.09	2.77

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1470	<i>Simarouba glauca</i>	0.03	0.26	95.73	24.89	120.61	60.31	0.22	6.51
1471	<i>Albizia lebbbeck</i>	0.09	1.52	1003.70	260.96	1264.66	632.33	2.32	68.23
1472	<i>Hardwickia binata</i>	0.07	1.33	973.73	253.17	1226.90	613.45	2.25	66.19
1473	<i>Azadirachta indica</i>	0.07	0.77	397.93	103.46	501.39	250.70	0.92	27.05
1474	<i>Azadirachta indica</i>	0.02	0.10	52.07	13.54	65.61	32.81	0.12	3.54
1475	<i>Millettia pinnata</i>	0.12	0.86	717.87	186.64	904.51	452.26	1.66	48.80
1476	<i>Erythroxylum monogynum</i>	0.05	0.28	137.85	35.84	173.69	86.85	0.32	9.37
1477	<i>Millettia pinnata</i>	0.02	0.16	134.63	35.01	169.64	84.82	0.31	9.15
1478	<i>Millettia pinnata</i>	0.09	0.61	505.98	131.55	637.53	318.76	1.17	34.39
1479	<i>Hardwickia binata</i>	0.08	1.35	987.48	256.75	1244.23	622.11	2.28	67.12
1480	<i>Hardwickia binata</i>	0.08	1.44	1047.70	272.40	1320.10	660.05	2.42	71.22
1481	<i>Millettia pinnata</i>	0.02	0.15	125.02	32.50	157.52	78.76	0.29	8.50
1482	<i>Millettia pinnata</i>	0.05	0.34	279.50	72.67	352.17	176.08	0.65	19.00
1483	<i>Erythroxylum monogynum</i>	0.01	0.09	44.54	11.58	56.12	28.06	0.10	3.03
1484	<i>Cassia fistula</i>	0.02	0.09	65.63	17.06	82.69	41.35	0.15	4.46
1485	<i>Cassia fistula</i>	0.02	0.09	64.15	16.68	80.83	40.41	0.15	4.36
1486	<i>Hardwickia binata</i>	0.08	1.30	948.95	246.73	1195.68	597.84	2.19	64.51
1487	<i>Ailanthus malabarica</i>	0.14	2.77	1203.03	312.79	1515.82	757.91	2.78	81.78
1488	<i>Millettia pinnata</i>	0.08	0.83	687.18	178.67	865.84	432.92	1.59	46.71
1489	<i>Albizia odoratissima</i>	0.10	1.69	1285.52	334.24	1619.76	809.88	2.97	87.38
1490	<i>Albizia odoratissima</i>	0.04	0.46	352.46	91.64	444.10	222.05	0.81	23.96
1491	<i>Azadirachta indica</i>	0.28	4.84	2518.77	654.88	3173.66	1586.83	5.82	171.22
1492	<i>Millettia pinnata</i>	0.05	0.39	325.01	84.50	409.52	204.76	0.75	22.09
1493	<i>Millettia pinnata</i>	0.09	0.70	582.89	151.55	734.44	367.22	1.35	39.62
1494	<i>Mangifera indica</i>	0.01	0.10	59.36	15.43	74.80	37.40	0.14	4.04
1495	<i>Azadirachta indica</i>	0.12	1.95	1016.24	264.22	1280.46	640.23	2.35	69.08
1496	<i>Azadirachta indica</i>	0.02	0.18	94.39	24.54	118.93	59.46	0.22	6.42
1497	<i>Azadirachta indica</i>	0.02	0.15	77.70	20.20	97.90	48.95	0.18	5.28
1498	<i>Azadirachta indica</i>	0.03	0.23	120.37	31.30	151.67	75.83	0.28	8.18
1499	<i>Azadirachta indica</i>	0.02	0.20	104.47	27.16	131.64	65.82	0.24	7.10
1500	<i>Mangifera indica</i>	0.03	0.24	138.92	36.12	175.04	87.52	0.32	9.44
1501	<i>Mangifera indica</i>	0.02	0.19	114.23	29.70	143.93	71.96	0.26	7.76
1502	<i>Millettia pinnata</i>	0.04	0.33	271.26	70.53	341.79	170.90	0.63	18.44

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1503	<i>Olea dioica</i>	0.04	0.26	219.38	57.04	276.42	138.21	0.51	14.91
1504	<i>Olea dioica</i>	0.02	0.10	90.08	23.42	113.50	56.75	0.21	6.12
1505	<i>Azadirachta indica</i>	0.06	0.65	336.65	87.53	424.18	212.09	0.78	22.88
1506	<i>Cassia fistula</i>	0.08	0.57	401.60	104.42	506.02	253.01	0.93	27.30
1507	<i>Chrysophyllum cainito</i>	0.10	0.73	410.28	106.67	516.95	258.47	0.95	27.89
1508	<i>Millettia pinnata</i>	0.05	0.35	291.83	75.88	367.71	183.85	0.67	19.84
1509	<i>Eucalyptus tereticornis</i>	0.06	1.32	873.64	227.15	1100.79	550.39	2.02	59.39
1510	<i>Madhuca indica</i>	0.07	0.59	434.16	112.88	547.05	273.52	1.00	29.51
1511	<i>Azadirachta indica</i>	0.01	0.10	52.17	13.56	65.73	32.87	0.12	3.55
1512	<i>Schleichera oleosa</i>	0.06	0.64	614.14	159.68	773.82	386.91	1.42	41.75
1513	<i>Azadirachta indica</i>	0.04	0.35	182.99	47.58	230.57	115.29	0.42	12.44
1514	<i>Anacardium occidentale</i>	0.09	0.79	331.52	86.20	417.72	208.86	0.77	22.54
1515	<i>Sapindus laurifolius</i>	0.02	0.17	97.24	25.28	122.52	61.26	0.22	6.61
1516	<i>Azadirachta indica</i>	0.06	0.54	281.75	73.25	355.00	177.50	0.65	19.15
1517	<i>Azadirachta indica</i>	0.03	0.23	120.37	31.30	151.67	75.83	0.28	8.18
1518	<i>Millettia pinnata</i>	0.04	0.36	295.10	76.72	371.82	185.91	0.68	20.06
1519	<i>Hopea parviflora</i>	0.02	0.16	100.85	26.22	127.08	63.54	0.23	6.86
1520	<i>Hopea parviflora</i>	0.02	0.17	110.12	28.63	138.75	69.38	0.25	7.49
1521	<i>Hardwickia binata</i>	0.02	0.25	181.17	47.11	228.28	114.14	0.42	12.32
1522	<i>Diospyros buxifolia</i>	0.16	1.48	1037.54	269.76	1307.31	653.65	2.40	70.53
1523	<i>Diospyros montana</i>	0.12	1.04	881.16	229.10	1110.26	555.13	2.04	59.90
1524	<i>Millettia pinnata</i>	0.07	0.46	377.89	98.25	476.14	238.07	0.87	25.69
1525	<i>Albizia lebbeck</i>	0.15	2.74	1810.39	470.70	2281.09	1140.54	4.19	123.06
1526	<i>Millettia pinnata</i>	0.04	0.27	220.12	57.23	277.36	138.68	0.51	14.96
1527	<i>Delonix regia</i>	0.17	3.05	2501.30	650.34	3151.64	1575.82	5.78	170.03
1528	<i>Albizia amara</i>	0.03	0.46	325.39	84.60	409.99	205.00	0.75	22.12
1529	<i>Albizia lebbeck</i>	0.03	0.47	312.69	81.30	393.99	196.99	0.72	21.26
1530	<i>Millettia pinnata</i>	0.05	0.33	272.51	70.85	343.37	171.68	0.63	18.52
1531	<i>Delonix regia</i>	0.07	1.31	1074.45	279.36	1353.80	676.90	2.48	73.04
1532	<i>Delonix regia</i>	0.08	1.52	1243.68	323.36	1567.03	783.52	2.88	84.54
1533	<i>Albizia lebbeck</i>	0.13	2.55	1680.91	437.04	2117.95	1058.97	3.89	114.26
1534	<i>Albizia lebbeck</i>	0.14	2.73	1802.63	468.68	2271.31	1135.66	4.17	122.54
1535	<i>Melia dubia</i>	0.07	0.74	296.42	77.07	373.49	186.74	0.69	20.15

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1536	<i>Azadirachta indica</i>	0.02	0.18	92.99	24.18	117.17	58.58	0.22	6.32
1537	<i>Azadirachta indica</i>	0.03	0.26	137.72	35.81	173.53	86.76	0.32	9.36
1538	<i>Azadirachta indica</i>	0.03	0.24	123.18	32.03	155.21	77.60	0.28	8.37
1539	<i>Albizia lebbbeck</i>	0.02	0.25	167.43	43.53	210.96	105.48	0.39	11.38
1540	<i>Albizia lebbbeck</i>	0.14	2.10	1383.11	359.61	1742.72	871.36	3.20	94.02
1541	<i>Melia dubia</i>	0.25	4.96	1983.21	515.64	2498.85	1249.42	4.59	134.81
1542	<i>Ailanthus excelsa</i>	0.20	4.05	1943.49	505.31	2448.80	1224.40	4.49	132.11
1543	<i>Melia dubia</i>	0.27	5.60	2238.57	582.03	2820.60	1410.30	5.18	152.17
1544	<i>Melia dubia</i>	0.32	6.72	2687.19	698.67	3385.86	1692.93	6.21	182.66
1545	<i>Melia dubia</i>	0.24	5.06	2023.80	526.19	2549.99	1274.99	4.68	137.57
1546	<i>Azadirachta indica</i>	0.05	0.61	318.74	82.87	401.62	200.81	0.74	21.67
1547	<i>Azadirachta indica</i>	0.03	0.41	215.19	55.95	271.14	135.57	0.50	14.63
1548	<i>Hardwickia binata</i>	0.06	1.12	819.79	213.14	1032.93	516.47	1.90	55.73
1549	<i>Hardwickia binata</i>	0.05	1.01	734.31	190.92	925.23	462.61	1.70	49.92
1550	<i>Hardwickia binata</i>	0.06	1.25	909.98	236.59	1146.57	573.28	2.10	61.86
1551	<i>Albizia lebbbeck</i>	0.07	1.24	817.66	212.59	1030.25	515.13	1.89	55.58
1552	<i>Simarouba glauca</i>	0.17	2.71	1003.08	260.80	1263.88	631.94	2.32	68.19
1553	<i>Millettia pinnata</i>	0.08	0.45	375.43	97.61	473.04	236.52	0.87	25.52
1554	<i>Ailanthus excelsa</i>	0.69	6.85	3290.39	855.50	4145.89	2072.95	7.61	223.67
1555	<i>Millettia pinnata</i>	0.02	0.12	97.25	25.28	122.53	61.27	0.22	6.61
1556	<i>Eucalyptus citriodora</i>	0.05	0.96	611.99	159.12	771.11	385.55	1.41	41.60
1557	<i>Ziziphus xylopyrus</i>	0.02	0.09	77.92	20.26	98.18	49.09	0.18	5.30
1558	<i>Ziziphus xylopyrus</i>	0.03	0.18	154.77	40.24	195.01	97.51	0.36	10.52
1559	<i>Hardwickia binata</i>	0.06	1.04	760.65	197.77	958.42	479.21	1.76	51.71
1560	<i>Millettia pinnata</i>	0.03	0.14	118.01	30.68	148.69	74.34	0.27	8.02
1561	<i>Millettia pinnata</i>	0.04	0.27	220.24	57.26	277.50	138.75	0.51	14.97
1562	<i>Millettia pinnata</i>	0.09	0.61	504.75	131.24	635.99	317.99	1.17	34.31
1563	<i>Eucalyptus globulus</i>	0.03	0.70	394.20	102.49	496.69	248.34	0.91	26.80
1564	<i>Eucalyptus globulus</i>	0.04	0.77	438.14	113.92	552.05	276.03	1.01	29.78
1565	<i>Azadirachta indica</i>	0.09	1.50	779.42	202.65	982.07	491.04	1.80	52.98
1566	<i>Albizia lebbbeck</i>	0.25	5.33	3517.73	914.61	4432.33	2216.17	8.13	239.12
1567	<i>Albizia amara</i>	0.04	0.29	201.80	52.47	254.27	127.13	0.47	13.72
1568	<i>Cassia fistula</i>	0.01	0.03	23.65	6.15	29.80	14.90	0.05	1.61

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
1569	<i>Delonix regia</i>	0.06	0.62	511.08	132.88	643.96	321.98	1.18	34.74
1570	<i>Delonix regia</i>	0.04	0.42	347.74	90.41	438.15	219.07	0.80	23.64
1571	<i>Delonix regia</i>	0.06	0.59	482.62	125.48	608.10	304.05	1.12	32.81
1572	<i>Delonix regia</i>	0.06	0.67	548.83	142.70	691.53	345.76	1.27	37.31
1573	<i>Azadirachta indica</i>	0.03	0.23	118.32	30.76	149.09	74.54	0.27	8.04
1574	<i>Albizia amara</i>	0.03	0.41	286.78	74.56	361.35	180.67	0.66	19.49
1575	<i>Albizia amara</i>	0.03	0.36	248.73	64.67	313.40	156.70	0.58	16.91
1576	<i>Azadirachta indica</i>	0.04	0.35	184.46	47.96	232.42	116.21	0.43	12.54
1577	<i>Azadirachta indica</i>	0.04	0.41	215.27	55.97	271.24	135.62	0.50	14.63
1578	<i>Azadirachta indica</i>	0.04	0.39	200.97	52.25	253.22	126.61	0.46	13.66
1579	<i>Senna siamea</i>	0.04	0.27	159.00	41.34	200.34	100.17	0.37	10.81
1580	<i>Albizia amara</i>	0.08	1.48	1032.60	268.48	1301.08	650.54	2.39	70.19
1581	<i>Canthium parviflorum</i>	0.02	0.15	62.25	16.19	78.44	39.22	0.14	4.23
1582	<i>Delonix regia</i>	0.08	1.75	1431.15	372.10	1803.25	901.62	3.31	97.28
1583	<i>Delonix regia</i>	0.07	1.19	977.07	254.04	1231.11	615.55	2.26	66.42
1584	<i>Delonix regia</i>	0.05	0.66	539.44	140.25	679.69	339.85	1.25	36.67
1585	<i>Delonix regia</i>	0.10	1.78	1460.70	379.78	1840.48	920.24	3.38	99.29
1586	<i>Hardwickia binata</i>	0.10	2.17	1580.73	410.99	1991.71	995.86	3.65	107.45
1587	<i>Hardwickia binata</i>	0.14	3.00	2188.02	568.89	2756.91	1378.46	5.06	148.73
1588	<i>Albizia amara</i>	0.13	2.47	1728.22	449.34	2177.56	1088.78	4.00	117.48
1589	<i>Albizia lebbek</i>	0.04	0.54	359.51	93.47	452.98	226.49	0.83	24.44
1590	<i>Melia dubia</i>	0.17	3.31	1323.61	344.14	1667.74	833.87	3.06	89.97
1591	<i>Albizia amara</i>	0.03	0.27	186.55	48.50	235.05	117.53	0.43	12.68
1592	<i>Albizia odoratissima</i>	0.06	0.71	540.43	140.51	680.94	340.47	1.25	36.74
1593	<i>Hardwickia binata</i>	0.04	0.69	505.07	131.32	636.39	318.20	1.17	34.33
1594	<i>Tectona grandis</i>	0.01	0.07	36.64	9.53	46.17	23.09	0.08	2.49
1595	<i>Tectona grandis</i>	0.02	0.17	94.58	24.59	119.17	59.58	0.22	6.43
1596	<i>Senna siamea</i>	0.07	0.45	272.62	70.88	343.50	171.75	0.63	18.53
1597	<i>Azadirachta indica</i>	0.03	0.25	129.31	33.62	162.93	81.47	0.30	8.79
1598	<i>Senna siamea</i>	0.04	0.37	222.24	57.78	280.02	140.01	0.51	15.11
1599	<i>Millettia pinnata</i>	0.10	0.58	481.36	125.15	606.51	303.26	1.11	32.72
1600	<i>Azadirachta indica</i>	0.04	0.30	157.61	40.98	198.59	99.29	0.36	10.71
1601	<i>Hardwickia binata</i>	0.07	0.98	712.95	185.37	898.31	449.16	1.65	48.46

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
Block-8									
1602	<i>Tabebuia rosea</i>	0.03	0.23	122.87	31.95	154.82	77.41	0.28	8.35
1603	<i>Tabebuia rosea</i>	0.05	0.58	312.33	81.21	393.54	196.77	0.72	21.23
1604	<i>Azadirachta indica</i>	0.11	1.05	547.25	142.29	689.54	344.77	1.27	37.20
1605	<i>Tabebuia rosea</i>	0.05	0.55	296.03	76.97	373.00	186.50	0.68	20.12
1606	<i>Tabebuia rosea</i>	0.03	0.32	175.14	45.54	220.68	110.34	0.40	11.91
1607	<i>Tabebuia rosea</i>	0.10	1.47	795.63	206.86	1002.49	501.24	1.84	54.08
1608	<i>Tabebuia rosea</i>	0.04	0.51	274.80	71.45	346.24	173.12	0.64	18.68
1609	<i>Hardwickia binata</i>	0.07	1.32	962.11	250.15	1212.26	606.13	2.22	65.40
1610	<i>Millingtonia hortensis</i>	0.22	4.06	2434.05	632.85	3066.90	1533.45	5.63	165.46
1611	<i>Millingtonia hortensis</i>	0.02	0.20	121.24	31.52	152.76	76.38	0.28	8.24
1612	<i>Hardwickia binata</i>	0.07	1.23	898.27	233.55	1131.82	565.91	2.08	61.06
1613	<i>Hardwickia binata</i>	0.05	0.96	700.34	182.09	882.42	441.21	1.62	47.61
1614	<i>Hardwickia binata</i>	0.02	0.18	128.43	33.39	161.82	80.91	0.30	8.73
1615	<i>Hardwickia binata</i>	0.06	1.04	759.24	197.40	956.64	478.32	1.76	51.61
1616	<i>Leucaena leucocephala</i>	0.08	1.27	813.27	211.45	1024.72	512.36	1.88	55.28
1617	<i>Leucaena leucocephala</i>	0.04	0.46	295.20	76.75	371.96	185.98	0.68	20.07
1618	<i>Crescentia cujete</i>	0.04	0.30	147.75	38.42	186.17	93.08	0.34	10.04
1619	<i>Jacaranda mimosifolia</i>	0.14	2.05	1128.90	293.51	1422.41	711.20	2.61	76.74
1620	<i>Hardwickia binata</i>	0.07	1.19	865.90	225.13	1091.04	545.52	2.00	58.86
1621	<i>Tabebuia rosea</i>	0.02	0.11	60.40	15.70	76.10	38.05	0.14	4.11
1622	<i>Tabebuia rosea</i>	0.03	0.21	111.90	29.09	141.00	70.50	0.26	7.61
1623	<i>Tabebuia rosea</i>	0.04	0.39	212.38	55.22	267.60	133.80	0.49	14.44
1624	<i>Tabebuia rosea</i>	0.04	0.34	181.47	47.18	228.65	114.33	0.42	12.34
1625	<i>Acacia auriculiformis</i>	0.10	1.56	1014.71	263.82	1278.53	639.26	2.35	68.98
1626	<i>Acacia auriculiformis</i>	0.05	0.67	435.80	113.31	549.11	274.56	1.01	29.62
1627	<i>Acacia auriculiformis</i>	0.07	0.96	626.32	162.84	789.17	394.58	1.45	42.57
1628	<i>Albizia lebbeck</i>	0.14	2.53	1667.43	433.53	2100.97	1050.48	3.86	113.34
1629	<i>Albizia lebbeck</i>	0.16	3.04	2007.36	521.91	2529.27	1264.64	4.64	136.45
1630	<i>Millettia pinnata</i>	0.09	0.70	583.16	151.62	734.78	367.39	1.35	39.64
1631	<i>Azadirachta indica</i>	0.01	0.11	57.69	15.00	72.69	36.35	0.13	3.92

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1632	<i>Millettia pinnata</i>	0.04	0.36	295.54	76.84	372.39	186.19	0.68	20.09
1633	<i>Albizia lebbeck</i>	0.05	0.52	344.59	89.59	434.18	217.09	0.80	23.42
1634	<i>Tabebuia rosea</i>	0.03	0.23	125.89	32.73	158.63	79.31	0.29	8.56
1635	<i>Dolichandrone atrovirens</i>	0.04	0.32	165.39	43.00	208.39	104.19	0.38	11.24
1636	<i>Albizia odoratissima</i>	0.09	1.33	1013.92	263.62	1277.53	638.77	2.34	68.92
1637	<i>Dolichandrone atrovirens</i>	0.03	0.20	101.73	26.45	128.18	64.09	0.24	6.92
1638	<i>Albizia lebbeck</i>	0.11	2.33	1537.53	399.76	1937.29	968.64	3.55	104.51
1639	<i>Albizia lebbeck</i>	0.07	1.17	773.89	201.21	975.11	487.55	1.79	52.61
1640	<i>Millettia pinnata</i>	0.05	0.39	325.61	84.66	410.27	205.13	0.75	22.13
1641	<i>Anacardium occidentale</i>	0.18	1.35	567.08	147.44	714.52	357.26	1.31	38.55
1642	<i>Dolichandrone atrovirens</i>	0.03	0.17	90.48	23.53	114.01	57.00	0.21	6.15
1643	<i>Olea dioica</i>	0.15	2.56	2199.44	571.85	2771.29	1385.65	5.09	149.51
1644	<i>Albizia lebbeck</i>	0.38	7.86	5187.49	1348.75	6536.23	3268.12	11.99	352.62
1645	<i>Tabebuia rosea</i>	0.05	0.72	387.15	100.66	487.81	243.90	0.90	26.32
1646	<i>Cassia fistula</i>	0.01	0.09	64.78	16.84	81.63	40.81	0.15	4.40
1647	<i>Cassia fistula</i>	0.02	0.11	74.84	19.46	94.30	47.15	0.17	5.09
1648	<i>Caesalpinia coriaria</i>	0.10	1.73	1813.78	471.58	2285.37	1142.68	4.19	123.29
1649	<i>Caesalpinia coriaria</i>	0.13	2.09	2195.56	570.85	2766.40	1383.20	5.08	149.24
1650	<i>Albizia odoratissima</i>	0.11	2.12	1611.16	418.90	2030.06	1015.03	3.73	109.52
1651	<i>Caesalpinia coriaria</i>	0.06	0.54	563.05	146.39	709.45	354.72	1.30	38.27
1652	<i>Madhuca indica</i>	0.09	1.36	1005.19	261.35	1266.54	633.27	2.32	68.33
1653	<i>Millettia pinnata</i>	0.05	0.40	332.87	86.54	419.41	209.71	0.77	22.63
1654	<i>Millettia pinnata</i>	0.04	0.34	281.58	73.21	354.79	177.40	0.65	19.14
1655	<i>Acacia auriculiformis</i>	0.07	1.03	671.24	174.52	845.76	422.88	1.55	45.63
1656	<i>Millettia pinnata</i>	0.05	0.39	325.01	84.50	409.52	204.76	0.75	22.09
1657	<i>Millettia pinnata</i>	0.06	0.44	366.38	95.26	461.63	230.82	0.85	24.90
1658	<i>Albizia lebbeck</i>	0.14	2.81	1852.73	481.71	2334.45	1167.22	4.28	125.94
1659	<i>Albizia lebbeck</i>	0.07	1.27	838.26	217.95	1056.21	528.10	1.94	56.98
1660	<i>Caesalpinia coriaria</i>	0.10	1.58	1660.55	431.74	2092.29	1046.15	3.84	112.88
1661	<i>Acacia auriculiformis</i>	0.04	0.38	246.26	64.03	310.29	155.15	0.57	16.74
1662	<i>Acacia auriculiformis</i>	0.04	0.44	283.25	73.64	356.89	178.45	0.65	19.25
1663	<i>Tabebuia rosea</i>	0.05	0.33	176.54	45.90	222.43	111.22	0.41	12.00
1664	<i>Acacia auriculiformis</i>	0.07	0.88	572.04	148.73	720.77	360.39	1.32	38.88

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1665	<i>Albizia odoratissima</i>	0.09	1.24	943.53	245.32	1188.84	594.42	2.18	64.14
1666	<i>Millettia pinnata</i>	0.04	0.32	263.98	68.64	332.62	166.31	0.61	17.94
1667	<i>Anacardium occidentale</i>	0.03	0.21	88.98	23.14	112.12	56.06	0.21	6.05
1668	<i>Anacardium occidentale</i>	0.04	0.24	100.45	26.12	126.57	63.29	0.23	6.83
1669	<i>Albizia odoratissima</i>	0.05	0.71	541.63	140.82	682.45	341.23	1.25	36.82
1670	<i>Azadirachta indica</i>	0.03	0.23	117.38	30.52	147.90	73.95	0.27	7.98
1671	<i>Millettia pinnata</i>	0.09	0.90	750.11	195.03	945.14	472.57	1.73	50.99
1672	<i>Azadirachta indica</i>	0.06	0.95	491.66	127.83	619.49	309.75	1.14	33.42
1673	<i>Albizia odoratissima</i>	0.10	1.43	1087.74	282.81	1370.55	685.27	2.51	73.94
1674	<i>Tectona grandis</i>	0.09	1.42	781.09	203.08	984.18	492.09	1.81	53.10
1675	<i>Anacardium occidentale</i>	0.03	0.17	70.99	18.46	89.45	44.73	0.16	4.83
1676	<i>Albizia odoratissima</i>	0.04	0.60	457.31	118.90	576.21	288.11	1.06	31.09
1677	<i>Acacia auriculiformis</i>	0.02	0.14	90.13	23.43	113.56	56.78	0.21	6.13
1678	<i>Azadirachta indica</i>	0.09	1.38	716.11	186.19	902.30	451.15	1.66	48.68
1679	<i>Hardwickia binata</i>	0.09	1.92	1401.93	364.50	1766.43	883.22	3.24	95.30
1680	<i>Butea monosperma</i>	0.08	0.85	409.13	106.37	515.51	257.75	0.95	27.81
1681	<i>Butea monosperma</i>	0.03	0.24	114.47	29.76	144.23	72.12	0.26	7.78
1682	<i>Millettia pinnata</i>	0.07	0.47	389.53	101.28	490.81	245.41	0.90	26.48
1683	<i>Acacia auriculiformis</i>	0.04	0.42	274.49	71.37	345.86	172.93	0.63	18.66
1684	<i>Hardwickia binata</i>	0.04	0.80	585.68	152.28	737.96	368.98	1.35	39.81
1685	<i>Hardwickia binata</i>	0.04	0.83	608.81	158.29	767.10	383.55	1.41	41.38
1686	<i>Albizia odoratissima</i>	0.04	0.40	306.73	79.75	386.49	193.24	0.71	20.85
1687	<i>Caesalpinia coriaria</i>	0.04	0.40	423.01	109.98	532.99	266.50	0.98	28.75
1688	<i>Caesalpinia coriaria</i>	0.05	0.48	501.69	130.44	632.13	316.07	1.16	34.10
1689	<i>Caesalpinia coriaria</i>	0.05	0.56	582.75	151.52	734.27	367.13	1.35	39.61
1690	<i>Albizia odoratissima</i>	0.07	0.86	651.07	169.28	820.35	410.18	1.51	44.26
1691	<i>Azadirachta indica</i>	0.13	2.49	1293.75	336.38	1630.13	815.07	2.99	87.94
1692	<i>Acacia auriculiformis</i>	0.07	1.24	808.36	210.17	1018.53	509.27	1.87	54.95
1693	<i>Albizia lebbeck</i>	0.11	2.50	1650.03	429.01	2079.04	1039.52	3.82	112.16
1694	<i>Azadirachta indica</i>	0.03	0.30	156.03	40.57	196.59	98.30	0.36	10.61
1695	<i>Azadirachta indica</i>	0.03	0.28	146.33	38.05	184.38	92.19	0.34	9.95
1696	<i>Azadirachta indica</i>	0.04	0.36	187.44	48.73	236.17	118.09	0.43	12.74
1697	<i>Eucalyptus citriodora</i>	0.04	0.82	525.74	136.69	662.44	331.22	1.22	35.74

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1698	<i>Eucalyptus citriodora</i>	0.06	1.33	852.23	221.58	1073.80	536.90	1.97	57.93
1699	<i>Cassia fistula</i>	0.03	0.20	138.90	36.11	175.02	87.51	0.32	9.44
1700	<i>Cassia fistula</i>	0.01	0.09	66.33	17.25	83.58	41.79	0.15	4.51
1701	<i>Cassia fistula</i>	0.02	0.11	76.57	19.91	96.48	48.24	0.18	5.20
1702	<i>Tabebuia rosea</i>	0.04	0.31	164.72	42.83	207.55	103.77	0.38	11.20
1703	<i>Mangifera indica</i>	0.08	0.77	455.00	118.30	573.30	286.65	1.05	30.93
1704	<i>Tabebuia rosea</i>	0.01	0.09	50.45	13.12	63.57	31.78	0.12	3.43
1705	<i>Cassia fistula</i>	0.02	0.11	76.57	19.91	96.48	48.24	0.18	5.20
1706	<i>Albizia odoratissima</i>	0.03	0.53	402.57	104.67	507.24	253.62	0.93	27.37
1707	<i>Azadirachta indica</i>	0.09	1.61	836.91	217.60	1054.50	527.25	1.94	56.89
1708	<i>Casuarina equisetifolia</i>	0.12	2.49	2014.72	523.83	2538.54	1269.27	4.66	136.95
1709	<i>Millettia pinnata</i>	0.02	0.16	129.87	33.77	163.64	81.82	0.30	8.83
1710	<i>Eucalyptus citriodora</i>	0.03	0.56	355.76	92.50	448.26	224.13	0.82	24.18
1711	<i>Eucalyptus citriodora</i>	0.03	0.58	368.35	95.77	464.13	232.06	0.85	25.04
1712	<i>Eucalyptus citriodora</i>	0.03	0.66	423.78	110.18	533.97	266.98	0.98	28.81
1713	<i>Azadirachta indica</i>	0.02	0.15	76.11	19.79	95.89	47.95	0.18	5.17
1714	<i>Cassia fistula</i>	0.02	0.11	79.41	20.65	100.05	50.03	0.18	5.40
1715	<i>Mangifera indica</i>	0.05	0.30	176.31	45.84	222.15	111.08	0.41	11.98
1716	<i>Millettia pinnata</i>	0.08	0.72	596.49	155.09	751.57	375.79	1.38	40.55
1717	<i>Anacardium occidentale</i>	0.13	1.23	515.84	134.12	649.96	324.98	1.19	35.06
1718	<i>Hardwickia binata</i>	0.04	0.54	395.33	102.79	498.12	249.06	0.91	26.87
1719	<i>Anacardium occidentale</i>	0.09	0.94	393.46	102.30	495.76	247.88	0.91	26.75
1720	<i>Millettia pinnata</i>	0.08	0.88	734.31	190.92	925.24	462.62	1.70	49.92
1721	<i>Azadirachta indica</i>	0.02	0.23	121.09	31.48	152.57	76.29	0.28	8.23
1722	<i>Eucalyptus globulus</i>	0.02	0.34	192.10	49.95	242.05	121.02	0.44	13.06
1723	<i>Leucaena leucocephala</i>	0.08	0.79	502.84	130.74	633.58	316.79	1.16	34.18
1724	<i>Millettia pinnata</i>	0.13	0.89	739.99	192.40	932.39	466.20	1.71	50.30
1725	<i>Hardwickia binata</i>	0.10	2.06	1503.07	390.80	1893.86	946.93	3.48	102.17
1726	<i>Eucalyptus globulus</i>	0.02	0.39	219.59	57.09	276.69	138.34	0.51	14.93
1727	<i>Eucalyptus globulus</i>	0.02	0.39	218.31	56.76	275.07	137.54	0.50	14.84
1728	<i>Albizia lebbeck</i>	0.12	2.37	1563.45	406.50	1969.95	984.97	3.61	106.28
1729	<i>Azadirachta indica</i>	0.05	0.47	245.34	63.79	309.13	154.57	0.57	16.68
1730	<i>Azadirachta indica</i>	0.04	0.36	187.16	48.66	235.82	117.91	0.43	12.72

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
1731	<i>Azadirachta indica</i>	0.02	0.12	60.08	15.62	75.71	37.85	0.14	4.08
1732	<i>Hardwickia binata</i>	0.10	2.18	1594.81	414.65	2009.46	1004.73	3.69	108.41
1733	<i>Azadirachta indica</i>	0.02	0.22	116.76	30.36	147.12	73.56	0.27	7.94
1734	<i>Hardwickia binata</i>	0.06	1.10	804.11	209.07	1013.18	506.59	1.86	54.66
1735	<i>Albizia odoratissima</i>	0.33	7.62	5788.84	1505.10	7293.94	3646.97	13.38	393.50
1736	<i>Cassia fistula</i>	0.07	0.55	393.18	102.23	495.41	247.70	0.91	26.73
1737	<i>Albizia odoratissima</i>	0.04	0.62	468.24	121.74	589.98	294.99	1.08	31.83
1738	<i>Plumeria alba</i>	0.04	0.33	189.56	49.29	238.84	119.42	0.44	12.89
1739	<i>Tectona grandis</i>	0.03	0.43	235.57	61.25	296.82	148.41	0.54	16.01
1740	<i>Azadirachta indica</i>	0.09	1.69	876.85	227.98	1104.83	552.42	2.03	59.60
1741	<i>Azadirachta indica</i>	0.01	0.11	59.13	15.37	74.50	37.25	0.14	4.02
1742	<i>Wrightia tinctoria</i>	0.03	0.31	233.98	60.84	294.82	147.41	0.54	15.91
1743	<i>Wrightia tomentosa</i>	0.11	0.95	710.00	184.60	894.60	447.30	1.64	48.26
1744	<i>Albizia odoratissima</i>	0.11	2.70	2055.46	534.42	2589.88	1294.94	4.75	139.72
1745	<i>Cassia fistula</i>	0.11	0.93	657.46	170.94	828.40	414.20	1.52	44.69
1746	<i>Azadirachta indica</i>	0.04	0.30	157.89	41.05	198.94	99.47	0.37	10.73
1747	<i>Hardwickia binata</i>	0.09	1.92	1401.93	364.50	1766.43	883.22	3.24	95.30
1748	<i>Hardwickia binata</i>	0.05	0.52	380.68	98.98	479.65	239.83	0.88	25.88
1749	<i>Hardwickia binata</i>	0.05	0.85	620.74	161.39	782.14	391.07	1.44	42.20
1750	<i>Anacardium occidentale</i>	0.17	1.83	768.69	199.86	968.55	484.28	1.78	52.25
1751	<i>Azadirachta indica</i>	0.25	3.57	1856.21	482.62	2338.83	1169.41	4.29	126.18
1752	<i>Melia dubia</i>	0.02	0.17	68.23	17.74	85.97	42.98	0.16	4.64
1753	<i>Ailanthus excelsa</i>	0.44	7.25	3480.58	904.95	4385.52	2192.76	8.05	236.59
1754	<i>Millettia pinnata</i>	0.08	0.62	510.54	132.74	643.28	321.64	1.18	34.70
1755	<i>Millettia pinnata</i>	0.05	0.31	261.20	67.91	329.11	164.56	0.60	17.76
1756	<i>Ixora brachiata</i>	0.03	0.10	98.92	25.72	124.64	62.32	0.23	6.72
1757	<i>Casuarina equisetifolia</i>	0.03	0.43	351.64	91.43	443.06	221.53	0.81	23.90
1758	<i>Delonix regia</i>	0.03	0.18	147.65	38.39	186.03	93.02	0.34	10.04
1759	<i>Azadirachta indica</i>	0.03	0.28	144.07	37.46	181.53	90.76	0.33	9.79
1760	<i>Azadirachta indica</i>	0.06	0.54	278.58	72.43	351.01	175.51	0.64	18.94
1761	<i>Delonix regia</i>	0.09	1.07	879.85	228.76	1108.61	554.30	2.03	59.81
1762	<i>Gliricidia sepium</i>	0.03	0.25	168.63	43.84	212.48	106.24	0.39	11.46
1763	<i>Hardwickia binata</i>	0.05	0.82	598.08	155.50	753.58	376.79	1.38	40.65

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
1764	<i>Azadirachta indica</i>	0.35	5.47	2842.03	738.93	3580.96	1790.48	6.57	193.19
1765	<i>Tectona grandis</i>	0.01	0.07	36.47	9.48	45.95	22.97	0.08	2.48
1766	<i>Tectona grandis</i>	0.01	0.06	32.57	8.47	41.04	20.52	0.08	2.21
1767	<i>Tectona grandis</i>	0.01	0.07	39.29	10.22	49.51	24.76	0.09	2.67
1768	<i>Tectona grandis</i>	0.02	0.17	93.06	24.20	117.26	58.63	0.22	6.33
1769	<i>Tectona grandis</i>	0.01	0.14	77.25	20.09	97.34	48.67	0.18	5.25
1770	<i>Tectona grandis</i>	0.02	0.17	91.00	23.66	114.67	57.33	0.21	6.19
1771	<i>Tectona grandis</i>	0.01	0.14	75.38	19.60	94.98	47.49	0.17	5.12
1772	<i>Tectona grandis</i>	0.01	0.10	55.39	14.40	69.80	34.90	0.13	3.77
1773	<i>Tectona grandis</i>	0.01	0.11	58.39	15.18	73.57	36.78	0.13	3.97
1774	<i>Tectona grandis</i>	0.02	0.14	78.68	20.46	99.13	49.57	0.18	5.35
1775	<i>Tectona grandis</i>	0.02	0.15	80.50	20.93	101.43	50.71	0.19	5.47
1776	<i>Tectona grandis</i>	0.01	0.05	28.23	7.34	35.57	17.78	0.07	1.92
1777	<i>Tectona grandis</i>	0.01	0.06	31.93	8.30	40.23	20.11	0.07	2.17
1778	<i>Tectona grandis</i>	0.01	0.09	47.40	12.32	59.72	29.86	0.11	3.22
1779	<i>Tectona grandis</i>	0.02	0.13	74.09	19.26	93.35	46.68	0.17	5.04
1780	<i>Tectona grandis</i>	0.01	0.09	51.50	13.39	64.89	32.45	0.12	3.50
1781	<i>Tectona grandis</i>	0.01	0.08	41.37	10.76	52.12	26.06	0.10	2.81
1782	<i>Tectona grandis</i>	0.01	0.04	24.43	6.35	30.78	15.39	0.06	1.66
1783	<i>Tectona grandis</i>	0.01	0.05	26.89	6.99	33.88	16.94	0.06	1.83
1784	<i>Tectona grandis</i>	0.01	0.06	30.98	8.06	39.04	19.52	0.07	2.11
1785	<i>Tectona grandis</i>	0.01	0.09	49.93	12.98	62.91	31.45	0.12	3.39
1786	<i>Erythroxylum monogynum</i>	0.02	0.14	71.87	18.69	90.56	45.28	0.17	4.89
1787	<i>Ixora brachiata</i>	0.01	0.06	65.52	17.04	82.56	41.28	0.15	4.45
1788	<i>Erythroxylum monogynum</i>	0.02	0.08	41.39	10.76	52.15	26.07	0.10	2.81
1789	<i>Canthium parviflorum</i>	0.01	0.05	21.76	5.66	27.42	13.71	0.05	1.48
1790	<i>Canthium parviflorum</i>	0.01	0.05	21.76	5.66	27.42	13.71	0.05	1.48
1791	<i>Tectona grandis</i>	0.01	0.06	35.42	9.21	44.63	22.31	0.08	2.41
1792	<i>Tectona grandis</i>	0.01	0.13	73.53	19.12	92.65	46.32	0.17	5.00
1793	<i>Albizia odoratissima</i>	0.25	4.82	3661.29	951.93	4613.22	2306.61	8.47	248.88
1794	<i>Bridelia retusa</i>	0.06	0.39	194.19	50.49	244.68	122.34	0.45	13.20
1795	<i>Bridelia retusa</i>	0.05	0.37	182.74	47.51	230.25	115.12	0.42	12.42
1796	<i>Albizia amara</i>	0.05	0.70	492.89	128.15	621.04	310.52	1.14	33.50

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1797	<i>Tectona grandis</i>	0.01	0.07	38.10	9.90	48.00	24.00	0.09	2.59
1798	<i>Tamarindus indica</i>	0.01	0.08	58.64	15.25	73.89	36.95	0.14	3.99
1799	<i>Delonix regia</i>	0.06	0.51	419.33	109.03	528.36	264.18	0.97	28.50
1800	<i>Tectona grandis</i>	0.01	0.08	42.54	11.06	53.60	26.80	0.10	2.89
1801	<i>Tectona grandis</i>	0.02	0.13	69.34	18.03	87.36	43.68	0.16	4.71
1802	<i>Delonix regia</i>	0.08	1.47	1202.90	312.75	1515.66	757.83	2.78	81.77
1803	<i>Delonix regia</i>	0.12	2.33	1910.75	496.80	2407.55	1203.77	4.42	129.88
1804	<i>Anacardium occidentale</i>	0.17	1.19	498.70	129.66	628.37	314.18	1.15	33.90
1805	<i>Delonix regia</i>	0.07	0.83	677.25	176.09	853.34	426.67	1.57	46.04
1806	<i>Azadirachta indica</i>	0.01	0.06	32.01	8.32	40.34	20.17	0.07	2.18
1807	<i>Azadirachta indica</i>	0.08	0.87	452.05	117.53	569.58	284.79	1.05	30.73
1808	<i>Casuarina equisetifolia</i>	0.02	0.38	310.16	80.64	390.80	195.40	0.72	21.08
1809	<i>Delonix regia</i>	0.01	0.06	45.26	11.77	57.03	28.51	0.10	3.08
1810	<i>Delonix regia</i>	0.01	0.06	49.34	12.83	62.17	31.09	0.11	3.35
1811	<i>Gliricidia sepium</i>	0.01	0.06	37.03	9.63	46.66	23.33	0.09	2.52
1812	<i>Millettia pinnata</i>	0.05	0.29	244.46	63.56	308.01	154.01	0.57	16.62
1813	<i>Millettia pinnata</i>	0.03	0.27	221.00	57.46	278.46	139.23	0.51	15.02
1814	<i>Millettia pinnata</i>	0.08	0.66	544.58	141.59	686.17	343.08	1.26	37.02
1815	<i>Azadirachta indica</i>	0.20	3.87	2014.38	523.74	2538.12	1269.06	4.66	136.93
1816	<i>Holoptelea integrifolia</i>	0.21	4.25	2191.27	569.73	2761.00	1380.50	5.07	148.95
1817	<i>Melia dubia</i>	0.18	3.29	1316.15	342.20	1658.34	829.17	3.04	89.47
1818	<i>Erythroxylum monogynum</i>	0.03	0.17	87.45	22.74	110.19	55.09	0.20	5.94
1819	<i>Alstonia scholaris</i>	0.05	0.62	221.52	57.60	279.12	139.56	0.51	15.06
1820	<i>Plumeria alba</i>	0.12	1.01	588.67	153.05	741.73	370.86	1.36	40.02
1821	<i>Azadirachta indica</i>	0.02	0.11	59.61	15.50	75.11	37.56	0.14	4.05
1822	<i>Delonix regia</i>	0.02	0.18	145.36	37.79	183.16	91.58	0.34	9.88
1823	<i>Plumeria alba</i>	0.06	1.15	668.77	173.88	842.65	421.32	1.55	45.46
1824	<i>Plumeria alba</i>	0.05	0.68	391.66	101.83	493.49	246.75	0.91	26.62
1825	<i>Hardwickia binata</i>	0.06	0.94	684.40	177.94	862.34	431.17	1.58	46.52
1826	<i>Hardwickia binata</i>	0.06	1.06	773.36	201.07	974.44	487.22	1.79	52.57
1827	<i>Hardwickia binata</i>	0.04	0.68	499.76	129.94	629.69	314.85	1.16	33.97
1828	<i>Millettia pinnata</i>	0.05	0.37	307.10	79.85	386.95	193.47	0.71	20.88
1829	<i>Azadirachta indica</i>	0.31	6.08	3163.43	822.49	3985.92	1992.96	7.31	215.04

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
1830	<i>Azadirachta indica</i>	0.37	7.95	4131.68	1074.24	5205.91	2602.96	9.55	280.85
1831	<i>Millettia pinnata</i>	0.02	0.09	71.94	18.70	90.64	45.32	0.17	4.89
1832	<i>Hardwickia binata</i>	0.06	0.80	585.04	152.11	737.15	368.58	1.35	39.77
1833	<i>Albizia lebbbeck</i>	0.07	1.42	938.05	243.89	1181.95	590.97	2.17	63.76
1834	<i>Delonix regia</i>	0.01	0.10	84.57	21.99	106.56	53.28	0.20	5.75
1835	<i>Delonix regia</i>	0.03	0.27	219.46	57.06	276.52	138.26	0.51	14.92
1836	<i>Hardwickia binata</i>	0.07	1.11	811.28	210.93	1022.22	511.11	1.88	55.15
1837	<i>Delonix regia</i>	0.16	3.47	2848.87	740.71	3589.57	1794.79	6.59	193.65
1838	<i>Delonix regia</i>	0.01	0.06	51.60	13.42	65.01	32.51	0.12	3.51
1839	<i>Delonix regia</i>	0.03	0.34	277.22	72.08	349.29	174.65	0.64	18.84
1840	<i>Delonix regia</i>	0.04	0.44	356.77	92.76	449.53	224.77	0.82	24.25
1841	<i>Azadirachta indica</i>	0.31	6.21	3228.18	839.33	4067.51	2033.75	7.46	219.44
1842	<i>Ailanthus excelsa</i>	0.56	10.37	4977.43	1294.13	6271.57	3135.78	11.51	338.34
Block-9									
1843	<i>Diospyros montana</i>	0.26	4.64	3944.81	1025.65	4970.47	2485.23	9.12	268.15
1844	<i>Diospyros montana</i>	0.10	1.28	1091.51	283.79	1375.31	687.65	2.52	74.20
1845	<i>Ficus microcarpa</i>	0.29	6.18	2408.80	626.29	3035.09	1517.54	5.57	163.74
1846	<i>Azadirachta indica</i>	0.07	0.71	370.82	96.41	467.23	233.62	0.86	25.21
1847	<i>Ixora brachiata</i>	0.03	0.11	109.44	28.46	137.90	68.95	0.25	7.44
1848	<i>Ficus elastica</i>	0.37	3.70	1441.41	374.77	1816.17	908.09	3.33	97.98
1849	<i>Grevillea robusta</i>	0.01	0.16	86.68	22.54	109.22	54.61	0.20	5.89
1850	<i>Grevillea robusta</i>	0.03	0.39	209.82	54.55	264.38	132.19	0.49	14.26
1851	<i>Grevillea robusta</i>	0.02	0.18	97.58	25.37	122.95	61.47	0.23	6.63
1852	<i>Ficus krishnae</i>	0.17	2.44	951.71	247.45	1199.16	599.58	2.20	64.69
1853	<i>Diospyros montana</i>	0.10	1.38	1176.34	305.85	1482.19	741.10	2.72	79.96
1854	<i>Ficus virens</i>	0.54	5.38	2097.98	545.47	2643.46	1321.73	4.85	142.61
1855	<i>Ficus benamina</i>	0.04	0.23	148.63	38.64	187.27	93.64	0.34	10.10
1856	<i>Ficus virens</i>	0.34	5.46	2127.72	553.21	2680.93	1340.47	4.92	144.63
1857	<i>Ficus lyrata</i>	0.05	0.37	145.27	37.77	183.04	91.52	0.34	9.87
1858	<i>Ficus virens</i>	0.41	6.91	2694.76	700.64	3395.40	1697.70	6.23	183.18
1859	<i>Artocarpus heterophyllus</i>	0.04	0.26	158.66	41.25	199.91	99.96	0.37	10.79
1860	<i>Albizia odoratissima</i>	0.17	2.93	2225.24	578.56	2803.81	1401.90	5.14	151.26
1861	<i>Ficus virens</i>	0.01	0.08	33.09	8.60	41.69	20.85	0.08	2.25

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1862	<i>Artocarpus lacucha</i>	0.02	0.11	60.56	15.75	76.30	38.15	0.14	4.12
1863	<i>Grevillea robusta</i>	0.02	0.16	87.15	22.66	109.81	54.90	0.20	5.92
1864	<i>Grevillea robusta</i>	0.02	0.18	98.40	25.58	123.98	61.99	0.23	6.69
1865	<i>Ixora brachiata</i>	0.04	0.58	587.73	152.81	740.54	370.27	1.36	39.95
1866	<i>Azadirachta indica</i>	0.48	7.88	4098.36	1065.57	5163.93	2581.96	9.48	278.59
1867	<i>Grevillea robusta</i>	0.02	0.18	96.88	25.19	122.06	61.03	0.22	6.59
1868	<i>Grevillea robusta</i>	0.02	0.20	110.49	28.73	139.22	69.61	0.26	7.51
1869	<i>Grevillea robusta</i>	0.02	0.12	62.40	16.22	78.62	39.31	0.14	4.24
1870	<i>Ficus religiosa</i>	0.63	10.47	4084.52	1061.98	5146.50	2573.25	9.44	277.65
1871	<i>Ficus tsjahela</i>	0.08	0.98	384.07	99.86	483.93	241.96	0.89	26.11
1872	<i>Simarouba glauca</i>	0.04	0.43	158.05	41.09	199.14	99.57	0.37	10.74
1873	<i>Simarouba glauca</i>	0.04	0.39	142.95	37.17	180.12	90.06	0.33	9.72
1874	<i>Albizia lebbeck</i>	0.10	1.45	955.59	248.45	1204.04	602.02	2.21	64.96
1875	<i>Terminalia catappa</i>	0.01	0.08	41.74	10.85	52.59	26.29	0.10	2.84
1876	<i>Terminalia catappa</i>	0.01	0.07	38.26	9.95	48.21	24.10	0.09	2.60
1877	<i>Acacia ferruginea</i>	0.03	0.20	132.76	34.52	167.28	83.64	0.31	9.02
1878	<i>Leucaena leucocephala</i>	0.08	0.81	519.53	135.08	654.61	327.31	1.20	35.32
1879	<i>Albizia lebbeck</i>	0.17	2.18	1438.03	373.89	1811.92	905.96	3.32	97.75
1880	<i>Albizia lebbeck</i>	0.08	0.90	595.19	154.75	749.94	374.97	1.38	40.46
1881	<i>Grevillea robusta</i>	0.04	0.87	469.44	122.06	591.50	295.75	1.09	31.91
1882	<i>Ficus microcarpa</i>	0.14	2.36	919.49	239.07	1158.56	579.28	2.13	62.50
1883	<i>Ficus microcarpa</i>	0.09	1.97	767.24	199.48	966.73	483.36	1.77	52.15
1884	<i>Ficus microcarpa</i>	0.09	1.91	746.18	194.01	940.18	470.09	1.73	50.72
1885	<i>Celtis tetrandra</i>	0.08	1.54	911.06	236.87	1147.93	573.96	2.11	61.93
1886	<i>Celtis tetrandra</i>	0.05	0.90	533.68	138.76	672.44	336.22	1.23	36.28
1887	<i>Grevillea robusta</i>	0.01	0.25	136.44	35.48	171.92	85.96	0.32	9.27
1888	<i>Grevillea robusta</i>	0.01	0.22	116.30	30.24	146.54	73.27	0.27	7.91
1889	<i>Grevillea robusta</i>	0.02	0.46	245.89	63.93	309.83	154.91	0.57	16.71
1890	<i>Grevillea robusta</i>	0.02	0.50	271.59	70.61	342.21	171.10	0.63	18.46
1891	<i>Artocarpus lacucha</i>	0.11	1.24	658.29	171.15	829.44	414.72	1.52	44.75
1892	<i>Ficus drupacea</i>	0.70	12.90	5030.49	1307.93	6338.41	3169.21	11.63	341.95
1893	<i>Ficus drupacea</i>	0.17	2.79	1087.67	282.79	1370.47	685.23	2.51	73.94
1894	<i>Azadirachta indica</i>	0.29	4.79	2490.83	647.62	3138.45	1569.22	5.76	169.32

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
1895	<i>Celtis wightii</i>	0.06	0.73	431.36	112.15	543.51	271.76	1.00	29.32
1896	<i>Butea monosperma</i>	0.18	3.90	1872.51	486.85	2359.36	1179.68	4.33	127.29
1897	<i>Ficus neriifolia</i>	0.01	0.09	35.58	9.25	44.84	22.42	0.08	2.42
1898	<i>Azadirachta indica</i>	0.02	0.11	56.91	14.80	71.71	35.86	0.13	3.87
1899	<i>Azadirachta indica</i>	0.02	0.10	53.26	13.85	67.11	33.56	0.12	3.62
1900	<i>Azadirachta indica</i>	0.01	0.09	48.58	12.63	61.21	30.61	0.11	3.30
1901	<i>Azadirachta indica</i>	0.02	0.13	66.74	17.35	84.09	42.05	0.15	4.54
1902	<i>Artocarpus lacucha</i>	0.02	0.10	51.32	13.34	64.66	32.33	0.12	3.49
1903	<i>Santalum album</i>	0.05	0.44	392.16	101.96	494.12	247.06	0.91	26.66
1904	<i>Millettia pinnata</i>	0.08	0.64	533.70	138.76	672.46	336.23	1.23	36.28
1905	<i>Millettia pinnata</i>	0.04	0.29	238.28	61.95	300.24	150.12	0.55	16.20
1906	<i>Streblus asper</i>	0.03	0.24	125.55	32.64	158.19	79.09	0.29	8.53
1907	<i>Streblus asper</i>	0.07	0.49	260.91	67.84	328.75	164.37	0.60	17.74
1908	<i>Celtis wightii</i>	0.03	0.22	130.43	33.91	164.34	82.17	0.30	8.87
1909	<i>Azadirachta indica</i>	0.18	3.01	1567.12	407.45	1974.57	987.29	3.62	106.53
1910	<i>Ixora brachiata</i>	0.03	0.11	108.13	28.11	136.25	68.12	0.25	7.35
1911	<i>Ixora brachiata</i>	0.03	0.09	95.76	24.90	120.66	60.33	0.22	6.51
1912	<i>Azadirachta indica</i>	0.10	1.62	841.25	218.72	1059.97	529.99	1.95	57.18
1913	<i>Azadirachta indica</i>	0.04	0.28	143.51	37.31	180.82	90.41	0.33	9.75
1914	<i>Ficus amplissima</i>	0.05	0.59	229.92	59.78	289.70	144.85	0.53	15.63
1915	<i>Albizia lebbeck</i>	0.80	18.11	11950.08	3107.02	15057.10	7528.55	27.63	812.32
1916	<i>Broussonetia papyrifera</i>	0.06	0.71	321.45	83.58	405.02	202.51	0.74	21.85
1917	<i>Ficus hispida</i>	0.09	0.89	346.01	89.96	435.97	217.99	0.80	23.52
1918	<i>Albizia lebbeck</i>	0.05	0.56	366.30	95.24	461.54	230.77	0.85	24.90
1919	<i>Hopea parviflora</i>	0.03	0.22	141.50	36.79	178.29	89.14	0.33	9.62
1920	<i>Erythroxylum monogynum</i>	0.07	0.41	203.64	52.95	256.58	128.29	0.47	13.84
1921	<i>Albizia lebbeck</i>	0.06	0.87	575.90	149.73	725.64	362.82	1.33	39.15
1922	<i>Tamarindus indica</i>	0.14	1.97	1478.03	384.29	1862.32	931.16	3.42	100.47
1923	<i>Tamarindus indica</i>	0.08	0.82	616.16	160.20	776.36	388.18	1.42	41.88
1924	<i>Azadirachta indica</i>	0.18	3.04	1582.80	411.53	1994.32	997.16	3.66	107.59
1925	<i>Plumeria alba</i>	0.04	0.24	138.11	35.91	174.02	87.01	0.32	9.39
1926	<i>Millettia pinnata</i>	0.04	0.32	263.98	68.64	332.62	166.31	0.61	17.94
1927	<i>Mangifera indica</i>	0.03	0.32	187.95	48.87	236.82	118.41	0.43	12.78

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1928	<i>Cassia fistula</i>	0.02	0.10	69.49	18.07	87.56	43.78	0.16	4.72
1929	<i>Vepris bilocularis</i>	0.05	1.20	842.75	219.11	1061.86	530.93	1.95	57.29
1930	<i>Suregada angustifolia</i>	0.07	0.48	237.84	61.84	299.68	149.84	0.55	16.17
1931	<i>Croton oblongifolius</i>	0.04	0.41	264.43	68.75	333.19	166.59	0.61	17.98
1932	<i>Syzygium operculatum</i>	0.01	0.09	66.08	17.18	83.26	41.63	0.15	4.49
1933	<i>Syzygium operculatum</i>	0.03	0.20	154.19	40.09	194.28	97.14	0.36	10.48
1934	<i>Madhuca indica</i>	0.07	0.67	494.31	128.52	622.83	311.42	1.14	33.60
1935	<i>Madhuca indica</i>	0.08	0.72	531.92	138.30	670.22	335.11	1.23	36.16
1936	<i>Reutealis trisperma</i>	0.06	0.62	264.99	68.90	333.88	166.94	0.61	18.01
1937	<i>Albizia lebbeck</i>	0.17	3.42	2254.44	586.16	2840.60	1420.30	5.21	153.25
1938	<i>Azadirachta indica</i>	0.02	0.20	104.61	27.20	131.81	65.91	0.24	7.11
1939	<i>Milicia excelsa</i>	0.06	0.77	423.67	110.15	533.82	266.91	0.98	28.80
1940	<i>Millettia pinnata</i>	0.17	1.95	1614.54	419.78	2034.31	1017.16	3.73	109.75
1941	<i>Cassia fistula</i>	0.01	0.07	50.97	13.25	64.22	32.11	0.12	3.46
1942	<i>Millettia pinnata</i>	0.05	0.33	277.70	72.20	349.90	174.95	0.64	18.88
1943	<i>Cassia fistula</i>	0.01	0.08	54.82	14.25	69.07	34.53	0.13	3.73
1944	<i>Ailanthus excelsa</i>	0.34	6.92	3322.92	863.96	4186.88	2093.44	7.68	225.88
1945	<i>Cassia fistula</i>	0.03	0.17	121.03	31.47	152.50	76.25	0.28	8.23
1946	<i>Millettia pinnata</i>	0.07	0.48	399.51	103.87	503.39	251.69	0.92	27.16
1947	<i>Millettia pinnata</i>	0.17	1.26	1047.37	272.32	1319.69	659.84	2.42	71.20
1948	<i>Albizia lebbeck</i>	0.17	3.22	2128.28	553.35	2681.64	1340.82	4.92	144.67
1949	<i>Azadirachta indica</i>	0.41	7.35	3821.22	993.52	4814.74	2407.37	8.84	259.75
1950	<i>Cassia fistula</i>	0.02	0.13	95.52	24.84	120.36	60.18	0.22	6.49
1951	<i>Cassia fistula</i>	0.01	0.09	61.23	15.92	77.15	38.58	0.14	4.16
1952	<i>Eucalyptus tereticornis</i>	0.07	1.52	1005.91	261.54	1267.45	633.72	2.33	68.38
1953	<i>Millettia pinnata</i>	0.06	0.39	322.36	83.81	406.17	203.09	0.75	21.91
1954	<i>Albizia odoratissima</i>	0.30	5.84	4438.56	1154.02	5592.58	2796.29	10.26	301.71
1955	<i>Millettia pinnata</i>	0.10	0.77	635.03	165.11	800.13	400.07	1.47	43.17
1956	<i>Millettia pinnata</i>	0.10	0.72	599.31	155.82	755.14	377.57	1.39	40.74
1957	<i>Azadirachta indica</i>	0.01	0.10	54.30	14.12	68.42	34.21	0.13	3.69
1958	<i>Azadirachta indica</i>	0.01	0.14	73.04	18.99	92.03	46.01	0.17	4.96
1959	<i>Azadirachta indica</i>	0.05	0.60	313.84	81.60	395.44	197.72	0.73	21.33
1960	<i>Cassia fistula</i>	0.02	0.13	95.52	24.84	120.36	60.18	0.22	6.49

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1961	<i>Cassia fistula</i>	0.02	0.14	101.22	26.32	127.54	63.77	0.23	6.88
1962	<i>Cassia fistula</i>	0.02	0.13	89.99	23.40	113.38	56.69	0.21	6.12
1963	<i>Azadirachta indica</i>	0.06	0.55	288.40	74.99	363.39	181.69	0.67	19.60
1964	<i>Millettia pinnata</i>	0.05	0.33	272.59	70.87	343.46	171.73	0.63	18.53
1965	<i>Cassia fistula</i>	0.01	0.10	67.90	17.66	85.56	42.78	0.16	4.62
1966	<i>Cassia fistula</i>	0.02	0.11	78.11	20.31	98.41	49.21	0.18	5.31
1967	<i>Cassia fistula</i>	0.02	0.10	73.10	19.01	92.10	46.05	0.17	4.97
1968	<i>Cassia fistula</i>	0.02	0.08	60.16	15.64	75.80	37.90	0.14	4.09
1969	<i>Albizia lebbeck</i>	0.33	6.89	4545.12	1181.73	5726.85	2863.43	10.51	308.96
1970	<i>Azadirachta indica</i>	0.02	0.12	63.27	16.45	79.72	39.86	0.15	4.30
1971	<i>Leucaena leucocephala</i>	0.10	0.97	623.28	162.05	785.34	392.67	1.44	42.37
1972	<i>Anacardium occidentale</i>	0.19	1.73	728.08	189.30	917.38	458.69	1.68	49.49
1973	<i>Albizia lebbeck</i>	0.32	6.97	4598.78	1195.68	5794.46	2897.23	10.63	312.61
1974	<i>Azadirachta indica</i>	0.25	3.70	1922.51	499.85	2422.36	1211.18	4.45	130.68
1975	<i>Azadirachta indica</i>	0.02	0.16	83.18	21.63	104.81	52.41	0.19	5.65
1976	<i>Hardwickia binata</i>	0.34	7.60	5546.64	1442.13	6988.77	3494.38	12.82	377.04
1977	<i>Araucaria cookii</i>	0.09	1.50	646.41	168.07	814.48	407.24	1.49	43.94
1978	<i>Reutealis trisperma</i>	0.05	0.33	142.88	37.15	180.03	90.01	0.33	9.71
1979	<i>Reutealis trisperma</i>	0.04	0.31	132.94	34.57	167.51	83.75	0.31	9.04
1980	<i>Pterospermum rubiginosum</i>	0.07	0.47	327.65	85.19	412.84	206.42	0.76	22.27
1981	<i>Millettia pinnata</i>	0.15	1.05	873.37	227.08	1100.45	550.22	2.02	59.37
1982	<i>Albizia odoratissima</i>	0.09	1.44	1093.41	284.29	1377.70	688.85	2.53	74.33
1983	<i>Millettia pinnata</i>	0.21	1.75	1452.59	377.67	1830.26	915.13	3.36	98.74
1984	<i>Albizia lebbeck</i>	0.15	3.26	2150.46	559.12	2709.58	1354.79	4.97	146.18
1985	<i>Millettia pinnata</i>	0.07	0.53	437.71	113.80	551.51	275.76	1.01	29.75
1986	<i>Millettia pinnata</i>	0.08	0.50	414.06	107.66	521.71	260.86	0.96	28.15
1987	<i>Millettia pinnata</i>	0.09	0.65	537.90	139.86	677.76	338.88	1.24	36.56
1988	<i>Millettia pinnata</i>	0.05	0.31	260.01	67.60	327.61	163.81	0.60	17.67
1989	<i>Bridelia retusa</i>	0.07	0.80	399.17	103.78	502.96	251.48	0.92	27.13
1990	<i>Millettia pinnata</i>	0.04	0.24	201.45	52.38	253.82	126.91	0.47	13.69
1991	<i>Millettia pinnata</i>	0.10	0.70	583.40	151.68	735.08	367.54	1.35	39.66
1992	<i>Millettia pinnata</i>	0.04	0.22	183.12	47.61	230.74	115.37	0.42	12.45
1993	<i>Millettia pinnata</i>	0.09	0.52	431.14	112.10	543.24	271.62	1.00	29.31

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1994	<i>Millettia pinnata</i>	0.24	2.19	1820.48	473.33	2293.81	1146.90	4.21	123.75
1995	<i>Erythroxylum monogynum</i>	0.01	0.06	28.36	7.37	35.74	17.87	0.07	1.93
1996	<i>Azadirachta indica</i>	0.02	0.13	65.55	17.04	82.60	41.30	0.15	4.46
1997	<i>Delonix regia</i>	0.05	0.53	437.83	113.84	551.67	275.83	1.01	29.76
1998	<i>Millettia pinnata</i>	0.02	0.31	260.01	67.60	327.61	163.81	0.60	17.67
1999	<i>Delonix regia</i>	0.03	0.43	349.94	90.99	440.93	220.46	0.81	23.79
2000	<i>Albizia lebbeck</i>	0.12	2.14	1410.85	366.82	1777.67	888.83	3.26	95.90
2001	<i>Delonix regia</i>	0.08	1.13	924.06	240.26	1164.31	582.16	2.14	62.81
2002	<i>Delonix regia</i>	0.06	1.16	949.23	246.80	1196.04	598.02	2.19	64.52
2003	<i>Albizia lebbeck</i>	0.08	1.39	917.23	238.48	1155.71	577.86	2.12	62.35
2004	<i>Albizia lebbeck</i>	0.05	0.77	505.84	131.52	637.36	318.68	1.17	34.39
2005	<i>Canthium parviflorum</i>	0.04	0.50	207.91	54.06	261.97	130.99	0.48	14.13
2006	<i>Azadirachta indica</i>	0.12	1.35	700.12	182.03	882.15	441.07	1.62	47.59
2007	<i>Erythroxylum monogynum</i>	0.02	0.08	42.21	10.98	53.19	26.59	0.10	2.87
2008	<i>Millettia pinnata</i>	0.03	0.24	198.66	51.65	250.31	125.15	0.46	13.50
2009	<i>Albizia lebbeck</i>	0.46	7.13	4708.64	1224.25	5932.89	2966.45	10.89	320.07
2010	<i>Delonix regia</i>	0.08	1.23	1008.39	262.18	1270.57	635.28	2.33	68.55
2011	<i>Albizia amara</i>	0.03	0.31	220.16	57.24	277.40	138.70	0.51	14.97
2012	<i>Millettia pinnata</i>	0.06	0.45	372.84	96.94	469.77	234.89	0.86	25.34
2013	<i>Millettia pinnata</i>	0.07	0.51	426.44	110.87	537.31	268.66	0.99	28.99
2014	<i>Delonix regia</i>	0.04	0.38	315.19	81.95	397.14	198.57	0.73	21.43
2015	<i>Delonix regia</i>	0.05	0.52	427.61	111.18	538.79	269.39	0.99	29.07
2016	<i>Azadirachta indica</i>	0.35	4.67	2428.51	631.41	3059.92	1529.96	5.61	165.08
2017	<i>Hardwickia binata</i>	0.13	2.17	1582.72	411.51	1994.22	997.11	3.66	107.59
2018	<i>Millettia pinnata</i>	0.03	0.15	128.61	33.44	162.04	81.02	0.30	8.74
2019	<i>Diospyros montana</i>	0.07	0.66	564.72	146.83	711.55	355.78	1.31	38.39
2020	<i>Azadirachta indica</i>	0.03	0.22	112.28	29.19	141.48	70.74	0.26	7.63
2021	<i>Azadirachta indica</i>	0.04	0.37	192.61	50.08	242.69	121.34	0.45	13.09
2022	<i>Delonix regia</i>	0.04	0.29	237.85	61.84	299.69	149.84	0.55	16.17
2023	<i>Delonix regia</i>	0.03	0.25	207.19	53.87	261.06	130.53	0.48	14.08
2024	<i>Millettia pinnata</i>	0.08	0.57	476.50	123.89	600.40	300.20	1.10	32.39
2025	<i>Hardwickia binata</i>	0.07	1.23	899.76	233.94	1133.70	566.85	2.08	61.16
2026	<i>Hardwickia binata</i>	0.07	1.23	898.27	233.55	1131.82	565.91	2.08	61.06

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2027	<i>Gliricidia sepium</i>	0.01	0.07	47.60	12.37	59.97	29.99	0.11	3.24
2028	<i>Delonix regia</i>	0.04	0.31	251.95	65.51	317.46	158.73	0.58	17.13
2029	<i>Albizia amara</i>	0.04	0.54	381.30	99.14	480.43	240.22	0.88	25.92
2030	<i>Azadirachta indica</i>	0.06	0.84	437.54	113.76	551.30	275.65	1.01	29.74
2031	<i>Delonix regia</i>	0.02	0.12	98.78	25.68	124.46	62.23	0.23	6.71
2032	<i>Delonix regia</i>	0.02	0.15	120.28	31.27	151.55	75.77	0.28	8.18
2033	<i>Delonix regia</i>	0.02	0.13	105.82	27.51	133.33	66.67	0.24	7.19
2034	<i>Ixora brachiata</i>	0.02	0.09	89.13	23.17	112.30	56.15	0.21	6.06
2035	<i>Albizia odoratissima</i>	0.02	0.10	77.85	20.24	98.09	49.04	0.18	5.29
2036	<i>Azadirachta indica</i>	0.04	0.33	169.90	44.17	214.07	107.03	0.39	11.55
2037	<i>Erythroxylum monogynum</i>	0.03	0.18	92.44	24.03	116.47	58.24	0.21	6.28
Block-10									
2038	<i>Roystonea regia</i>	0.11	1.32	684.07	177.86	861.93	430.96	1.58	46.50
2039	<i>Roystonea regia</i>	0.12	1.59	827.14	215.06	1042.20	521.10	1.91	56.23
2040	<i>Roystonea regia</i>	0.09	1.07	557.94	145.06	703.00	351.50	1.29	37.93
2041	<i>Roystonea regia</i>	0.15	1.94	1009.67	262.51	1272.18	636.09	2.33	68.63
2042	<i>Roystonea regia</i>	0.05	0.56	288.60	75.04	363.64	181.82	0.67	19.62
2043	<i>Roystonea regia</i>	0.08	0.92	475.87	123.73	599.60	299.80	1.10	32.35
2044	<i>Roystonea regia</i>	0.07	0.82	428.28	111.35	539.64	269.82	0.99	29.11
2045	<i>Roystonea regia</i>	0.03	0.15	77.89	20.25	98.14	49.07	0.18	5.29
2046	<i>Roystonea regia</i>	0.09	0.60	313.73	81.57	395.30	197.65	0.73	21.33
2047	<i>Roystonea regia</i>	0.07	0.88	457.05	118.83	575.88	287.94	1.06	31.07
2048	<i>Roystonea regia</i>	0.08	0.92	476.90	123.99	600.89	300.45	1.10	32.42
2049	<i>Roystonea regia</i>	0.09	1.11	579.19	150.59	729.78	364.89	1.34	39.37
2050	<i>Roystonea regia</i>	0.06	0.60	313.92	81.62	395.54	197.77	0.73	21.34
2051	<i>Roystonea regia</i>	0.09	1.07	557.94	145.06	703.00	351.50	1.29	37.93
2052	<i>Roystonea regia</i>	0.10	1.23	637.31	165.70	803.01	401.50	1.47	43.32
2053	<i>Roystonea regia</i>	0.02	0.09	47.67	12.39	60.06	30.03	0.11	3.24
2054	<i>Roystonea regia</i>	0.10	1.23	637.31	165.70	803.01	401.50	1.47	43.32
2055	<i>Roystonea regia</i>	0.11	1.37	711.43	184.97	896.40	448.20	1.64	48.36
2056	<i>Roystonea regia</i>	0.08	1.05	547.52	142.35	689.87	344.94	1.27	37.22
2057	<i>Roystonea regia</i>	0.03	0.34	178.76	46.48	225.24	112.62	0.41	12.15
2058	<i>Roystonea regia</i>	0.06	0.77	400.56	104.15	504.71	252.35	0.93	27.23

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
2059	<i>Cocos nucifera</i>	0.06	0.35	175.29	45.58	220.87	110.44	0.41	11.92
2060	<i>Adonidia merrillii</i>	0.06	0.61	317.63	82.58	400.21	200.10	0.73	21.59
2061	<i>Albizia lebbbeck</i>	0.13	1.48	976.37	253.86	1230.22	615.11	2.26	66.37
2062	<i>Millettia pinnata</i>	0.04	0.20	167.98	43.67	211.65	105.83	0.39	11.42
2063	<i>Millettia pinnata</i>	0.06	0.45	372.84	96.94	469.77	234.89	0.86	25.34
2064	<i>Millettia pinnata</i>	0.08	0.62	517.88	134.65	652.53	326.26	1.20	35.20
2065	<i>Anacardium occidentale</i>	0.11	0.74	309.41	80.45	389.86	194.93	0.72	21.03
2066	<i>Anacardium occidentale</i>	0.18	1.25	526.40	136.87	663.27	331.64	1.22	35.78
2067	<i>Araucaria cunninghamii</i>	0.04	0.35	150.31	39.08	189.40	94.70	0.35	10.22
2068	<i>Araucaria cookii</i>	0.22	3.48	1496.96	389.21	1886.16	943.08	3.46	101.76
2069	<i>Araucaria cookii</i>	0.02	0.24	101.78	26.46	128.24	64.12	0.24	6.92
2070	<i>Araucaria cookii</i>	0.02	0.21	90.71	23.58	114.29	57.14	0.21	6.17
2071	<i>Pinus roxburghii</i>	0.01	0.10	46.86	12.18	59.04	29.52	0.11	3.19
2072	<i>Cupressus sempervirens</i>	0.01	0.12	52.97	13.77	66.75	33.37	0.12	3.60
2073	<i>Pinus roxburghii</i>	0.04	0.38	172.54	44.86	217.40	108.70	0.40	11.73
2074	<i>Cupressus torulosa</i>	0.03	0.31	136.25	35.42	171.67	85.84	0.32	9.26
2075	<i>Agathis robusta</i>	0.01	0.12	53.76	13.98	67.73	33.87	0.12	3.65
2076	<i>Podocarpus chinensis</i>	0.03	0.27	117.44	30.54	147.98	73.99	0.27	7.98
2077	<i>Podocarpus chinensis</i>	0.04	0.30	130.33	33.89	164.22	82.11	0.30	8.86
2078	<i>Agathis robusta</i>	0.15	2.43	1068.57	277.83	1346.40	673.20	2.47	72.64
2079	<i>Thuja occidentalis</i>	0.01	0.10	35.11	9.13	44.24	22.12	0.08	2.39
2080	<i>Anacardium occidentale</i>	0.19	1.15	482.73	125.51	608.24	304.12	1.12	32.81
2081	<i>Pinus roxburghii</i>	0.14	1.62	744.64	193.61	938.25	469.13	1.72	50.62
2082	<i>Podocarpus macrophyllus</i>	0.14	1.18	505.70	131.48	637.18	318.59	1.17	34.38
2083	<i>Podocarpus macrophyllus</i>	0.10	0.88	378.01	98.28	476.29	238.15	0.87	25.70
2084	<i>Saraca asoca</i>	0.06	0.44	286.07	74.38	360.45	180.22	0.66	19.45
2085	<i>Saraca asoca</i>	0.01	0.08	49.27	12.81	62.09	31.04	0.11	3.35
2086	<i>Delonix regia</i>	0.10	0.73	597.57	155.37	752.94	376.47	1.38	40.62
2087	<i>Millettia pinnata</i>	0.04	0.39	323.64	84.15	407.79	203.89	0.75	22.00
2088	<i>Eucalyptus tereticornis</i>	0.04	0.46	306.08	79.58	385.66	192.83	0.71	20.81
2089	<i>Pinus roxburghii</i>	0.02	0.18	82.26	21.39	103.65	51.82	0.19	5.59

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
2090	<i>Eucalyptus globulus</i>	0.05	0.61	347.55	90.36	437.92	218.96	0.80	23.63
2091	<i>Eucalyptus globulus</i>	0.05	0.65	366.08	95.18	461.26	230.63	0.85	24.88
2092	<i>Eucalyptus globulus</i>	0.04	0.57	325.56	84.65	410.20	205.10	0.75	22.13
2093	<i>Azadirachta indica</i>	0.03	0.18	93.63	24.34	117.97	58.99	0.22	6.36
2094	<i>Combretum erythrophyllum</i>	0.10	0.94	845.06	219.71	1064.77	532.39	1.95	57.44
2095	<i>Millettia pinnata</i>	0.10	0.58	482.68	125.50	608.17	304.09	1.12	32.81
2096	<i>Eucalyptus citriodora</i>	0.12	1.91	1220.19	317.25	1537.44	768.72	2.82	82.94
2097	<i>Anacardium occidentale</i>	0.06	0.30	127.49	33.15	160.64	80.32	0.29	8.67
2098	<i>Albizia amara</i>	0.11	0.87	610.27	158.67	768.94	384.47	1.41	41.48
2099	<i>Albizia amara</i>	0.01	0.06	40.22	10.46	50.68	25.34	0.09	2.73
2100	<i>Albizia lebbeck</i>	0.01	0.12	80.64	20.97	101.60	50.80	0.19	5.48
2101	<i>Santalum album</i>	0.03	0.21	188.10	48.91	237.00	118.50	0.43	12.79
2102	<i>Santalum album</i>	0.03	0.20	183.83	47.79	231.62	115.81	0.43	12.50
2103	<i>Millettia pinnata</i>	0.03	0.27	221.19	57.51	278.70	139.35	0.51	15.04
2104	<i>Albizia lebbeck</i>	0.05	0.51	339.60	88.30	427.89	213.95	0.79	23.08
2105	<i>Ficus benghalensis</i>	0.13	1.46	568.10	147.71	715.81	357.90	1.31	38.62
2106	<i>Azadirachta indica</i>	0.05	0.46	239.17	62.18	301.35	150.68	0.55	16.26
2107	<i>Millettia pinnata</i>	0.03	0.29	239.69	62.32	302.02	151.01	0.55	16.29
2108	<i>Ficus benghalensis</i>	0.10	1.02	396.29	103.04	499.32	249.66	0.92	26.94
2109	<i>Ficus benghalensis</i>	0.13	1.52	591.26	153.73	744.99	372.49	1.37	40.19
2110	<i>Albizia lebbeck</i>	0.09	1.02	672.26	174.79	847.05	423.52	1.55	45.70
2111	<i>Albizia lebbeck</i>	0.05	0.52	344.17	89.49	433.66	216.83	0.80	23.40
2112	<i>Albizia lebbeck</i>	0.06	0.56	369.02	95.95	464.97	232.49	0.85	25.08
2113	<i>Roystonea regia</i>	0.01	0.06	32.85	8.54	41.39	20.69	0.08	2.23
2114	<i>Millettia pinnata</i>	0.01	0.13	104.86	27.26	132.12	66.06	0.24	7.13
2115	<i>Tamarindus indica</i>	0.01	0.10	72.62	18.88	91.50	45.75	0.17	4.94
2116	<i>Albizia lebbeck</i>	0.07	0.87	574.81	149.45	724.26	362.13	1.33	39.07
2117	<i>Albizia lebbeck</i>	0.10	1.20	794.38	206.54	1000.92	500.46	1.84	54.00
2118	<i>Phoenix dactylifera</i>	0.02	0.08	44.65	11.61	56.25	28.13	0.10	3.03
2119	<i>Millettia pinnata</i>	0.07	0.77	639.15	166.18	805.32	402.66	1.48	43.45
2120	<i>Albizia lebbeck</i>	0.08	0.96	634.57	164.99	799.56	399.78	1.47	43.14
2121	<i>Millettia pinnata</i>	0.10	0.78	650.31	169.08	819.39	409.69	1.50	44.21
2122	<i>Elaeis guineensis</i>	0.10	1.00	399.29	103.81	503.10	251.55	0.92	27.14

Sl. No.	Tree species	BA (m ²)	Volume (m ³)	AGB (kg)	BGB (kg)	Total Biomass (kg)	Total carbon (kg)	Total CO ₂ sequestration (Tonnes)	CO ₂ valuation (Rs)
2123	<i>Roystonea regia</i>	0.07	0.73	381.36	99.15	480.51	240.26	0.88	25.92
2124	<i>Tamarindus indica</i>	0.11	1.09	816.46	212.28	1028.75	514.37	1.89	55.50
2125	<i>Albizia lebbbeck</i>	0.22	2.21	1456.95	378.81	1835.76	917.88	3.37	99.04
2126	<i>Albizia lebbbeck</i>	0.09	0.94	618.29	160.76	779.05	389.52	1.43	42.03
2127	<i>Albizia lebbbeck</i>	0.08	0.83	546.43	142.07	688.50	344.25	1.26	37.14
2128	<i>Millettia pinnata</i>	0.06	0.50	414.46	107.76	522.22	261.11	0.96	28.17
2129	<i>Millettia pinnata</i>	0.05	0.45	370.99	96.46	467.45	233.73	0.86	25.22
2130	<i>Millettia pinnata</i>	0.12	1.50	1249.07	324.76	1573.83	786.92	2.89	84.91
2131	<i>Millettia pinnata</i>	0.10	1.10	910.74	236.79	1147.53	573.77	2.11	61.91
2132	<i>Hardwickia binata</i>	0.07	0.70	513.91	133.62	647.53	323.77	1.19	34.93
2133	<i>Hardwickia binata</i>	0.08	0.69	502.12	130.55	632.67	316.34	1.16	34.13
2134	<i>Hardwickia binata</i>	0.09	0.85	622.29	161.80	784.09	392.04	1.44	42.30
2135	<i>Hardwickia binata</i>	0.11	1.20	878.34	228.37	1106.71	553.36	2.03	59.71
2136	<i>Eucalyptus globulus</i>	0.05	0.68	383.88	99.81	483.68	241.84	0.89	26.09
2137	<i>Santalum album</i>	0.06	0.63	562.52	146.26	708.78	354.39	1.30	38.24
2138	<i>Santalum album</i>	0.07	0.69	619.44	161.05	780.49	390.25	1.43	42.11
2139	<i>Millettia pinnata</i>	0.12	1.10	911.10	236.89	1147.99	573.99	2.11	61.93
2140	<i>Mangifera indica</i>	0.04	0.30	178.08	46.30	224.38	112.19	0.41	12.11

BA- Basal area

AGB- Above ground biomass

BGB- Below ground biomass