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Research Article

PLANT COMMUNITY STRUCTURE AND CARBON STOCK ASSESSMENT THROUGH PHYTOSOCIOLOGICAL APPROACH AT DRY TROPICS OF BANKA FOREST DIVISION, BIHAR

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ABSTRACT
Study on sociology of plants is highly significance in developing conservation and management strategies for forests. Our study aimed to conduct phytosociological at Katoria Forest Range comprising of three beats viz. Chandan, Katoria and Suiya of Banka Forest Division exposed to anthropogenic activities. Total 60285 individuals were recorded during vegetation enumeration for 2333.4 ha of forested area. Total basal area for the entire tree species recorded was 595472.469 cm^2 ha^{-1}. Important Value Index is highest for *Shorea robusta* at Chandan and Katoria beat while it is highest for *Tectona grandis* at Suiya beat. Species diversity Index ranges between 0.001 – 0.370. Dominance index and evenness ranges between 0.166 – 0.264 and 0.296 – 0.332 respectively. These values indicate presence of severe anthropogenic disturbances. Maximum number of tree individual fall under diameter at breast height (dbh) class of 0-10 cm. Total carbon stock of top most 10 tree species is found to be 0.064 kg ha^{-1} with total volume of 0.103 m^3 ha^{-1}. Lowered tree volume is recorded due to lowered tree height and dbh. Therefore, it is inferred that tree height and dbh are significant indicators for net crop volume contributing to greater C stock amount.

Keywords: *Phytosociology, Important Value Index, Biomass, Crop Volume, Carbon Stock*

INTRODUCTION
In India, tropical forests constitutes about 86% of the total forested land, where 53% is contributed by tropical dry deciduous forests and moist deciduous forest is about 37%. Rest 10% is shared by semi evergreen and wet evergreen forests (Singh & Singh, 1991).

Anthropogenic activities in particular have strong impact on tropical forests, biotic factors includes grazing, collection of firewood, illegal felling of trees etc. and in many area these forests are converted to dry deciduous scrubs and savanna (Champion & Seth, 1968; Singh *et al.*, 1991; Chaturvedi *et al.*, 2011). Forest managers with traditional practice of forest management removes selected trees of certain diameter at breast height (dbh) class with few mother trees leftover for regeneration (Upadhyay & Srivastava, 1980; Harikant & Ghildiyal, 1982). Tropical forests are distributed in patches with cluster or assemblages of trees that would also represent patchy distribution of biomass in the tropical forests (Jha & Singh, 1990).

Phytosociological analysis or the forest survey is one of the major components of forest management that are usually carried out by the practitioners through which forest structure, its distribution (through species diversity assessment) are understood. It is also noticed that species diversity in the tropical forests are variable which is highly comparable to dry deciduous forests that are explicitly exploited and degraded (Murphy & Lugo, 1986; Gentry, 1992). However, forests of Bihar are also not excluded of exploitation. Therefore, assessment of biodiversity is vital for site selection for forest management (Villasenor *et al.*, 2007).

As forests are the major sources of carbon sink, it is essential to know the total amount of carbon sequestered. Biodiversity conservation, protection and carbon sequestration ensure higher priority for climate change adaptation and mitigation in scientific communities, government sector and civil society programs (Diáz *et al.*, 2009). Inventories of forest carbon sources and sinks are required by the United Nations Framework Convention on Climate Change (UNFCCC, 1992). Therefore, the developing countries are also required to furnish the estimates of carbon stocks in forests for effective implementation of climate change mitigation policies under REDD+ programmes (Saatchi *et al.,* 2011; Salimon *et al.,* 2011). It was estimated that carbon stocks are decreasing in tropical forests of India since 2003 (Sheikh *et al.,* 2011).

Carbon stocks are dependent on forest tree density, above and below ground biomass. Studies have inferred that principal pool of stored carbon comes from above ground biomass of trees (Gibbs *et al.,* 2007) but D'Amato *et al.,* (2011) depicted that carbon pool is not limited to above ground biomass of live tree rather it is the most dynamic pool of carbon in tropical forests. In our present study, forest structure, distribution and carbon stock is assessed in the tropical dry deciduous forests of Katoria Range, Banka Division, Bihar.

MATERIALS AND METHODS

Study Area

The study was carried out tropical dry deciduous forest at Katoria range of Banka Forest Division (latitude 24°30'00" N to 25°15'00" N longitude 86°30'00" E to 87°15'00"E) which is situated in Banka district in extreme SE of Bihar state. The Katoria range is further sub-divided into three forest beats namely Chandan, Katoria and Suiya beat.

The total area of Katoria forest Range is 21690.934 ha of which 141.12 ha was released in the year 1966. The area of Chandan, Katoria and Suiya beat are 4989.053 ha, 11388.190 ha and 5172.568 ha respectively.

The main river of the area is Chanan that rises from north part of Deoghar in Jharkhand state finally passes near Banka and join Ganges at Ghogha of Bhagalpur district. Climate of the area is characterized by hot summer (March to June) and pleasant winter (November to February) season. South west monsoon breaks during June. The average rainfall of the area is 1200 mm.

Forest Survey

The study area is divided into several grids of 25″×25″ and survey was done with random sampling. Nested quadrat was laid in each sampling plot where vegetation enumeration was carried out. Each plot is representative of 2 ha and the enumeration area in each sample plot covers 0.5 ha. Five sub-quadrats, one at the centre and four in the direction of N, S, E and W—was used as tree quadrats with size of 31.62 m X 31.62 m each sub quadrat.

Phytosociological Analysis

CBH (circumference at breast height) and approximate tree height of each species in each sub-quadrats was noted. Accordingly DBH (diameter at breast height) was calculated. Quantitative analysis of frequency, density, abundance was done following Curtis and McIntosh (1950). Distribution pattern of species was analyzed following Whitford, (1949). Importance Value Index (IVI) was determined following Curtis (1959) & Mishra (1968). Species diversity was calculated through Shannon Weiner Index (H′) (Shannon & Wiener, 1963). Evenness was calculated using the formula given by Pielou (1969). Species dominance was measured using Simpson's Index (1949). Similarity Index was also calculated following Jaccard (1912).

C Stock Measurement

The method used to estimate Above-ground biomass was estimated following the equation (Brown *et al.,* 1989; Brown & Iverson, 1992; Brown & Lugo, 1992; Gillespie *et al.,* 1992; IPCC 2003).

Above Ground Biomass (AGB) = Stem Volume × Specific Gravity × Biomass Expansion Factor

Timber volume was calculated using equation given by Pearson *et al.,* (2007)

BEF value for Indian forests is 1.575 (Kishwan *et al.,* 2009).

Below Ground Biomass (BGB) was calculated following the equation given by Mokany *et al.,* (2006)

Below Ground Biomass (BGB) = AGB * 0.235

Total Biomass (TB) = AGB+BGB

Carbon stock estimation was done as follows, (Brown *et al.,* 1989)

C-stock = TB x 0.50

RESULTS AND DISCUSSION

Forest Structure

The forest type of Katoria range of Banka Forest Division is tropical dry deciduous forest. Total number of quadrat studied at Chandan Beat (CB), Katoria Beat (KB) and Suiya Beat (SB) are 2036, 2315 and 1184 respectively which are represented by total number of tree species of 37 at CB and KB while the same is 33 for SB.

Diameter at Breast Height (DBH) class wise tree number was recorded. Total number of individuals recorded as per vegetation enumeration is 16704 (12816 individuals within 0-10 dbh class), 32029 (21895 individuals within 0-10 dbh class) and 11552 (7823 individuals within 0-10 dbh class) at CB, KB and SB respectively.

Total number of trees (inclusive of all DBH class) at CB is highest (592 individuals/ha) followed by KB (494 individuals/ha) and SB (456 individuals/ha). The data recorded for each parameter is inclusive of all DBH class. For volume calculation and C stock estimation, trees >10 cm DBH is considered. Trees >10 cm DBH class is considered as matured trees. Total basal area is 595472.469 cm^2 for the total area enumerated (2333.5 ha). Among which CB contributes 145998 cm^2 (for 584 ha), KB 333744.958 cm^2 (for 1157.5 ha) and SB 115729.511 cm^2 (for 592 ha). According to the Rankier's Law of frequency class, at CB, Class A contributes 9 tree species, Class B 15 tree species, Class C 6 tree species, Class D 4 tree species and Class E 3 tree species. Tree species distribution in frequency class at KB and SB are as follows, Class A- 10 and 0, Class B- 17 and 12, Class C- 6 and 7, Class D- 3 and 4, Class E- 1 and 0 respectively. The density of forest ranges between 0.20 to 38.77 at CB, 0.20 to 42.19 at KB and 0.20 to 117.80 at SB.

Abundance of tree species ranges from 0.02 – 47.2, 1.00 – 63.57 and 1.00 – 147.25 at CB, KB and SB respectively. A/F ratio varies from 0.025 – 0.878, 0.050 – 2.724 and 0.025 – 1.841 at CB, KB and SB respectively.

In this study, Importance Value Index (IVI) is highest for *Shorea robusta* at CB (62.37) and KB (63.40) while highest IVI value at SB is recorded for *Tectona grandis* (62.90) (Table 1, 2 and 3). With respect to IVI values, the top 10 tree species were recorded for each forest beat and dominance-diversity curve is established to assess the pattern of species distribution as shown in Figure 1. The dominance diversity curve for three beats showed geometric pattern of species distribution is single tree species dominance with little co-dominance by associated tree species.

Species Diversity

Several indices are used to assess the distribution of trees in a community. Species diversity ranges between 0.001 – 0.355, 0.000 – 0.368 and 0.001 – 0.362 at CB, KB and SB respectively. The total value of species diversity following Shannon Weiner Index is higher for CB followed by KB and SB (Figure 3). In our study, the species diversity index is lower than compared to other studies done at Eastern Ghats (Sahu *et al.*, 2007; Reddy *et al.*, 2008; Ganguli *et al.*, 2016). Dominance index of the area varies from 0.166 to 0.264.

The trend of dominance is different from the trend of Species Diversity as the highest dominance value is recorded for SB followed by KB and CB (Figure 2). The forest being single species dominant, IVI of *Shorea robusta* is highest but the value is much lower than forests of Doon Valley at Western Himalaya (Mondal & Joshi, 2014; Goutam *et al.*, 2008; Chauhan, 2001) and other tropical forests (Gupta Joshi, 2012; Ganguli *et al.*, 2016).

The area is subjected to human interference and such disturbances are supported by the low value of diversity index as well as dominance value. Evenness in each beat was also recorded that ranges from 0.296 to 0.332.

The value of evenness is more or less similar in all the beats (Figure 2). Likewise, similarity index was also determined to quantify the degree of overlap between the species or to know whether similar species are present in two communities.

The similarity index value for the area is represented in Table 4. The values are near to 1 which indicates most of the species are similar in between the communities.

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Table 1: Phytosociological Attributes of Chandan Beat

Name of Species	TNI	NQO	TQS	VEA	F (%)	D	BA (cm^2)	IVI
Melia azedarach	9	3	10	1.5	30	0.90	204.939	2.645
Feronia limonia	9	1	5	0.5	20	1.80	391.354	2.660
Artocarpus heterophyllus	1	1	5	0.5	20	0.20	1.365	1.429
Schleichera oleosa	1	1	5	0.5	20	0.20	244.484	1.596
Mangifera indica	3	2	10	1	20	0.30	411.42	1.771
Acacia auriculiformis	1289	89	144	44.5	62	8.95	7654.41	14.677
Phyllanthus emblica	67	12	30	6	40	2.23	212.02	4.107
Terminalia arjuna	5	1	5	0.5	20	1.00	20.30	1.924
Terminalia tomentosa	1790	149	209	74.5	71	8.56	10398.85	16.945
Saraca asoca	1	1	5	0.5	20	0.20	2.62	1.430
Vachellia nilotica	1	5	5	2.5	100	0.20	6.79	6.665
Terminalia bellirica	19	14	44	7	32	0.43	150.41	2.444
Butea monosperma	378	61	125	30.5	49	3.02	6526.64	9.484
Ziziphus mauritiana	1	1	5	0.5	20	0.20	3.91	1.431
Semecarpus anacardium	9	7	25	3.5	28	0.36	94.03	2.113
Ficus benghalensis	8	6	25	3	24	0.32	958.22	2.419
Cassia fistula	215	7	20	3.5	35	10.75	964.33	9.425
Anogeissus latifolia	47	23	70	11.5	33	0.67	215.44	2.701
Cannea cormandalica	31	8	20	4	40	1.55	200.55	3.687
Eucalyptus globulus	83	21	35	10.5	60	2.37	336.09	5.583
Cochlospermum religiosum	693	34	45	17	76	15.40	2745.43	16.099
Gmeina arborea	14	6	25	3	24	0.56	113.07	1.984
Terminalia chebula	3	2	5	1	40	0.60	10.73	2.985
Syzygium cumini	58	26	70	13	37	0.83	809.92	3.483
Dalbergia sissoo	461	50	90	25	56	5.12	4375.55	9.716
Diospyros melanoxylon	163	62	149	31	42	1.09	576.34	3.775
Acacia catechu	491	131	224	65.5	58	2.19	4185.48	8.012
Holarrhena antidysentrica	15	4	10	2	40	1.50	23.62	3.536
Madhuca indica	4013	235	274	117.5	86	14.65	45111.75	45.331
Azadirachta indica	10	7	30	3.5	23	0.33	318.50	1.945
Buchanania latifolia	1605	34	54	17	63	29.72	6286.08	26.328
Soyemida febrifuga	517	49	109	24.5	45	4.74	2957.42	7.823
Shorea robusta	4614	106	119	53	89	38.77	48451.42	62.369
Lagerstroemia parviflora	2	1	5	0.5	20	0.40	7.95	1.554
Bombax ceiba	4	2	5	1	40	0.80	10.54	3.105
Albizia lebbeck	71	4	15	2	27	4.73	758.98	5.115
Tectona grandis	3	1	5	0.5	20	0.60	256.84	1.845
Total	**16704**	**1167**	**2036**	**584**	**1529**	**166.28**	**145998**	**300.145**

*TNI= Total Number of Individuals, NQO= Number of Quadrat Occurrence, TQS= Total number of Quadrat Studied, VEA= Vegetation Enumeration Area, F= Frequency (%), D= Density, BA= Basal Area (cm^2), IVI= Importance Value Index

Table 2: Phytosociological Attributes of Katoria Beat

Name of Species	TNI	NQO	TQS	VEA	F (%)	D	BA (cm^2)	IVI
Mangifera indica	4	1	5	2.5	20	0.80	18.605	1.798
Acacia auroculiformis	3769	170	215	107.5	79	17.53	36530.610	23.844
Phyllanthus emblica	26	3	10	5	30	2.60	98.150	3.284
Terminalia arjuna	17	5	20	10	25	0.85	182.050	2.234
Terminalia tomentosa	4219	80	100	50	80	42.19	29622.800	31.821
Vachellia nilitica	1	1	5	2.5	20	0.20	4.651	1.551
Terminalia bellirica	445	7	30	15	23	14.83	1739.090	8.236
Melia azedarach	2	1	5	2.5	20	0.40	2.745	1.631
Agele marmelos	4	3	15	7.5	20	0.27	48.270	1.591
Ziziphus mauritiana	11	3	10	5	30	1.1	38.292	2.659
Semecarpus anacardium	107	10	45	22.5	22	2.38	1352.540	2.999
Ficus benghalensis	31	11	55	27.5	20	0.56	5163.060	3.244
Cassia fistula	491	20	50	25	40	9.82	984.410	7.205
Anogeissus latifolia	216	5	10	5	50	21.60	740.610	12.633
Lannea grandis	129	16	40	20	40	3.23	813.010	4.485
Eucalyptus globulus	160	24	55	27.5	44	2.91	2639.450	5.172
Cochlospermum religiosum	655	36	90	45	40	7.28	5037.920	7.391
Gmelina arborea	2	2	10	5	20	0.20	7.470	1.552
Syzygium cumini	19	10	40	20	25	0.48	568.390	2.198
Feronia limonia	3	3	15	7.5	20	0.20	34.634	1.560
Anacardium occidentale	21	4	10	5	40	2.10	1274.650	4.169
Artocarpus heterophyllus	5	2	10	5	20	0.50	32.227	1.680
Dalbergia sissoo	288	48	120	60	40	2.40	4645.160	5.300
Diospyros melanoxylon	422	33	90	45	37	4.69	1410.980	5.012
Acacia catechu	2914	184	270	135	68	10.79	22982.560	16.257
Holarrhena antidysentrica	5	1	5	2.5	20	1.00	18.675	1.879
Schleichera oleosa	17	1	5	2.5	20	3.40	21.040	2.850
Madhuca indica	3920	166	275	137.5	60	14.25	65867.740	29.936
Azadirachta indica	12	11	50	25	22	0.24	180.980	1.767
Butea monosperma	236	32	90	45	36	2.62	4987.640	5.166
Pterocarpus marsupium	21	6	25	12.5	24	0.84	277.950	2.185
Buchanania latifolia	1142	25	55	27.5	45	20.76	4623.300	13.124
Soyemida febrifuga	962	50	120	60	42	8.02	5070.360	7.822
Shorea robusta	11559	259	290	145	89	39.86	135871.350	63.396
Bombax ceiba	62	10	30	15	33	2.07	122.440	3.320
Albizia lebbeck	127	23	40	20	58	3.18	707.620	5.718
Tectona grandis	5	2	5	2.5	40	1.00	23.529	3.349
Total	**32029**	**1268**	**2315**	**1157.5**	**1362**	**247.14**	**333744.958**	**300.000**

*TNI= Total Number of Individuals, NQO= Number of Quadrat Occurrence, TQS= Total number of Quadrat Studied, VEA= Vegetation Enumeration Area, F= Frequency (%), D= Density, BA= Basal Area (cm^2), IVI= Importance Value Index

Table 3: Phytosociological Attributes of Suiya Beat

Name of Species	TNI	NQO	TQS	VEA	F (%)	D	BA (cm2)	IVI
Acacia auriculiformis	5049	118	150	75	79	33.66	31913.230	48.821
Phyllanthus emblica	107	8	15	7.5	53	7.13	350.920	7.823
Annona reticulata	2	2	5	2.5	40	0.40	2.530	3.470
Terminalia arjuna	8	3	15	7.5	20	0.53	41.470	1.916
Terminaia tomentosa	245	28	60	30	47	4.08	4071.360	9.151
Vachellia nilotica	1	1	5	2.5	20	0.20	1.582	1.735
Terminalia bellirica	17	5	20	10	25	0.85	93.680	2.512
Agele marmelos	14	2	10	5	20	1.40	65.240	2.317
Ziziphus mauritiana	10	1	5	2.5	20	2.00	1.360	2.525
Semecarpus anacardium	29	6	15	7.5	40	1.93	223.230	4.333
Butea monosperma	115	22	65	32.5	34	1.77	118.280	3.664
Ficus benhgalensis	4	4	20	10	20	0.20	1265.560	2.827
Cassia fistula	11	2	5	2.5	40	2.20	35.732	4.288
Anogeissus latifolia	98	21	50	25	42	1.96	1103.080	5.270
Lannea grandis	29	7	15	7.5	47	1.93	869.590	5.441
Ficus racemosa	1	1	5	2.5	20	0.20	30.050	1.760
Eucalyptus globulus	68	7	25	12.5	28	2.72	578.700	3.998
Cochlospermum religiosum	113	24	35	17.5	69	3.23	2407.940	9.141
Syzygium cumini	25	7	25	12.5	28	1.00	89.770	2.821
Feronia limonia	1	1	5	2.5	20	0.20	261.635	1.960
Diospyros melanoxylon	36	12	50	25	24	0.72	186.340	2.452
Acacia catechu	661	79	149	74.5	53	4.44	6194.870	11.663
Holarrhena antidysentrica	3	3	10	5	30	0.30	24.240	2.622
Schleichera oleosa	12	5	20	10	25	0.60	72.600	2.384
Madhuca indica	436	63	105	52.5	60	4.15	15185.570	19.882
Azadirachta indica	2	2	10	5	20	0.20	28.460	1.758
Buchanania latifolia	460	30	65	32.5	46	7.08	3306.080	9.761
Soyemida febrifuga	76	18	50	25	36	1.52	433.840	4.005
Shorea robusta	2730	76	120	60	63	22.75	39486.610	49.315
Dalbergia sisoo	4	3	15	7.5	20	0.27	527.412	2.219
Bombax ceiba	4	4	15	7.5	27	0.27	1373.110	3.498
Albizia lebbeck	3	3	15	7.5	20	0.20	28.440	1.758
Tectona grandis	1178	8	10	5	80	117.80	5357.000	62.905
Total	**11552**	**576**	**1184**	**592**	**1215**	**227.89**	**115729.511**	**300.000**

*TNI= Total Number of Individuals, NQO= Number of Quadrat Occurrence, TQS= Total number of Quadrat Studied, VEA= Vegetation Enumeration Area, F= Frequency (%), D= Density, BA= Basal Area (cm^2), IVI= Importance Value Index

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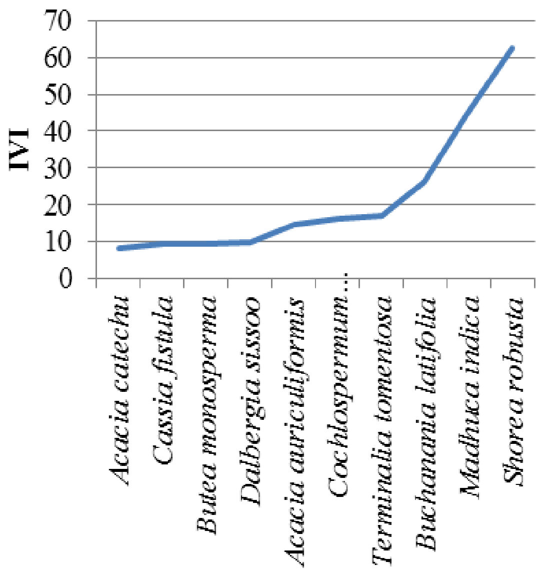
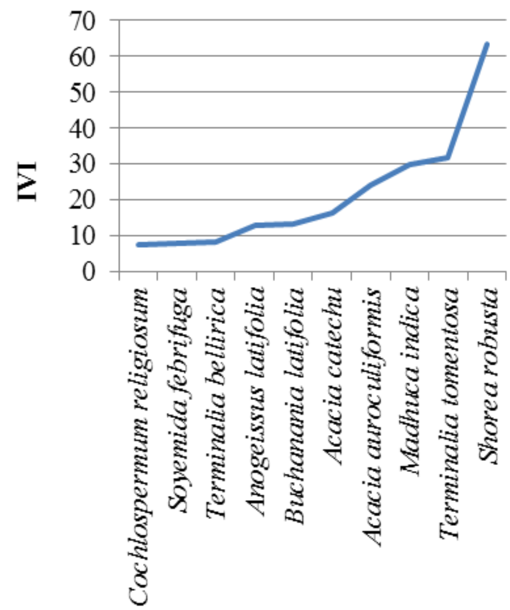
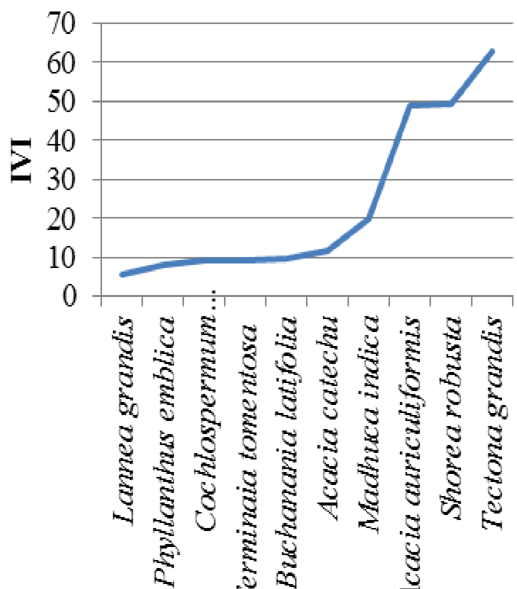


D-D Curve at Chandan Beat (CB)



D-D Curve at Katoria Beat (KB)



D-D Curve at Suiya Beat (SB)

Figure 1: Dominance Diversity Curve at Three Beats of Katoria Forest Range

Table 4: Similarity Index of Katoria Forest Range

	Chandan Beat	**Katoria Beat**	**Suiya Beat**
Chandan Beat	-	0.892	0.771
Katoria Beat	-	-	0.857
Suiya Beat	-	-	-

Table 5: Specific Gravity, Volume, Above Ground Biomass, Below Ground Biomass and Carbon Stock of Dominant and Co-dominant Tree Species

Species	SG	V	AGB	BGB	TB	C
Acacia auriculiformis	0.6000	0.0060	0.0057	0.0013	0.0070	0.0035
Acacia catechu	0.8750	0.0022	0.0030	0.0007	0.0037	0.0019
Anogeissus latifolia	0.7570	0.0013	0.0016	0.0004	0.0019	0.0010
Buchanania latifolia	0.4580	0.0030	0.0022	0.0005	0.0027	0.0013
Butea monosperma	0.4650	0.0019	0.0014	0.0003	0.0018	0.0009
Cassia fistula	0.7460	0.0074	0.0087	0.0020	0.0108	0.0054
Cochlospermum religiosum	0.2700	0.0014	0.0006	0.0001	0.0007	0.0004
Dalbergia sissoo	0.6690	0.0025	0.0027	0.0006	0.0033	0.0016
Lannea grandis	0.4970	0.0018	0.0014	0.0003	0.0018	0.0009
Madhuca indica	0.6190	0.0087	0.0085	0.0020	0.0105	0.0053
Phyllanthus emblica	0.6190	0.0006	0.0006	0.0001	0.0007	0.0003
Shorea robusta	0.7000	0.0279	0.0307	0.0072	0.0379	0.0190
Soyemida febrifuga	0.6500	0.0019	0.0019	0.0005	0.0024	0.0012
Tectona grandis	0.5770	0.0304	0.0277	0.0065	0.0341	0.0171
Terminalia bellirica	0.6280	0.0013	0.0013	0.0003	0.0016	0.0008
Terminalia tomentosa	0.6940	0.0046	0.0050	0.0012	0.0061	0.0031
Total	-	0.103	0.103	0.024	0.127	0.064

*SG- Specific Gravity (kg m^{-3}); V- Volume (m^3 ha^{-1}); ABG- Above Ground Biomass (kg ha^{-1}); BGB- Below Ground Biomass (kg ha^{-1}); TB- Total Biomass (kg ha^{-1}); C- Carbon stock (kg ha^{-1})

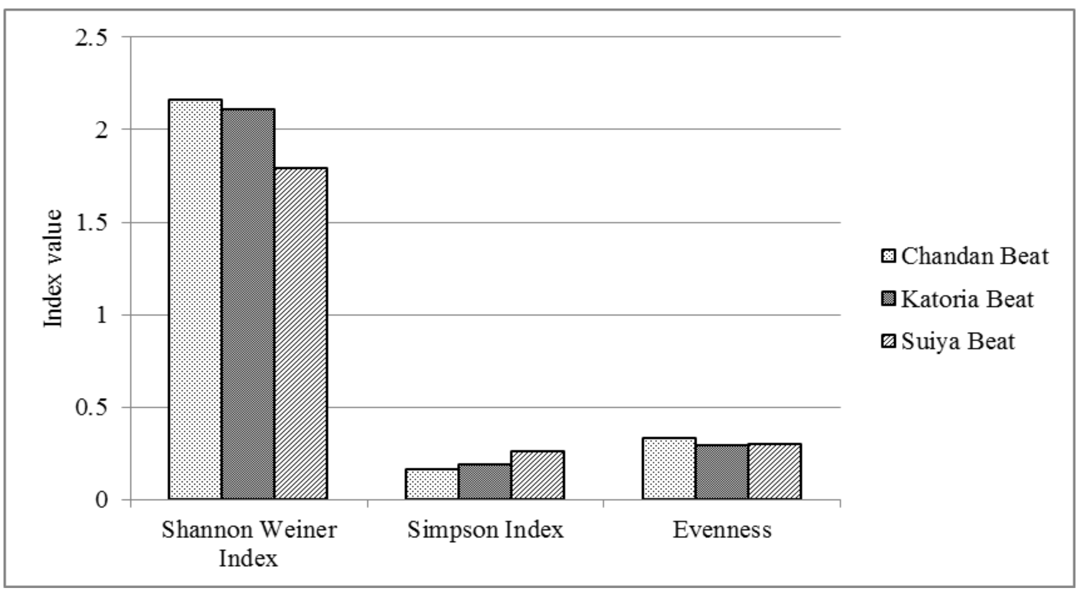


Figure 2: Species Diversity Index at Katoria Forest Range

Carbon Stock

For assessment of carbon stock, dominant and co-dominant tree species according to IVI were selected (Table 4). However, most of the trees fall under dbh class 0-10 cm. however good number of trees is also recorded in dbh class 11-20 cm and the height of trees range between 1.5m to maximum of 12m. The forest trees are mostly coppice crop and therefore, the volume of trees are much lower than compared to other forests. The volume of *Shorea robusta* (0.0279 m^3 ha^{-1}) and *Tectona grandis* (is 0.0304 m^3 ha^{-1}) is higher compared to the other tree species. Consequently, the amount of above ground biomass (AGB), below ground biomass (BGB) and total biomass (TB) is higher for these two species. AGB and BGB for

Shorea robusta are 0.0307 kg ha^{-1} and 0.0072 kg ha^{-1} while for *Tectona grandis* are 0.0277 kg ha^{-1} and 0.0065 kg ha^{-1} respectively. However, the total biomass for the selected tree species is 0.127 kg ha^{-1}. Total carbon stock is found to be 0.064 kg ha^{-1} where contribution of *Shorea robusta* and *Tectona grandis* are higher than other tree species. It is revealed from the study that tree height and dbh is important indicators for carbon sequestration determining the net crop volume, greater the volume greater its total biomass, consequently contributing to carbon stock in large amount.

Conclusion

During the study it was observed that biotic factors as well as edaphic factors prevail in the area that directly and indirectly affects the forest structure causing degradation and loss of biodiversity. In our present study, it is depicted that the forest is under successional stage, most of the crops are coppice crop. About 60287 individual trees were recorded during enumeration at where 42534 individual trees fall under dbh class of 0-10cm which is contributing to 70% of the total number of trees recorded. The height of immature trees is hardly 3 m tall. Therefore, the volume of growing stock is lowered with decreased carbon stock value in comparison to the other tropical forests. Indeed, these forests are considered as producers and could potentially act as carbon sink in future. Protection and proper management strategies are required to develop in the area to conserve biodiversity and restore the forested land to mitigate and adapt climate change effects.

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