Project Update: April 2013
Results

Stand structure of Woody plant species.

Hosthota area

A total of 1503 woody plants belonging to 57 genera and 71species spread over 32 families were recorded from 132 circular plots (10m radius) in Hosthota area as indicated in Table 1 and 2. The woody plants community parameters computed from the data are as presented in Table 1. Among these *Knema attenuata* was represented by maximum number of individuals (n=238) followed by *Diospyros sylvetrica* (n=185), *Hopea ponga* (n=158) and *Holigarna arnottiana* (n= 111). The highest Important Value Index (IVI) was recorded for *Knema attenuata* (28.6) followed by *Diospyros sylvatrica* (23.94), *Hopea ponga* (19.76) and *Olea dioca* (14.21) as shown in Table 1 and Fig. 1.

Table 1. Table showing details of species, family, frequency, abundance, density, basal area and IVI present in Hosthota area.

Name of the species	Family	N	No. of plots	GBH (m)	F	A	D	RF	RA	RD	BA	IVI
Olea dioca	Oleaceae	97	54	90.94	40.91	1.80	0.73	5.71	2.05	6.46	9.02	14.22
Nathopegia racemosa	Anacardiaceae	20	15	10.81	11.36	1.33	0.15	1.59	1.52	1.33	0.55	4.44
Carallia brachiata	Rhizophoraceae	3	3	1.32	2.27	1.00	0.02	0.32	1.14	0.20	0.04	1.66
Memecylon malabaricum	Melastomaceae	12	11	5.42	8.33	1.09	0.09	1.16	1.25	0.80	0.20	3.21
Garcinia morella	Clusiaceae	87	59	39.43	44.70	1.47	0.66	6.24	1.69	5.79	1.49	13.71
Drypetes confertifolius	Euphorbiaceae	1	1	1.04	0.76	1.00	0.01	0.11	1.14	0.07	0.08	1.32
Callophylum apetalum	Clusiaceae	1	1	0.09	0.76	1.00	0.01	0.11	1.14	0.07	0.00	1.32
Caryota urens	Aracaceae	3	2	2.59	1.52	1.50	0.02	0.21	1.71	0.20	0.18	2.13
Diospyros montana	Ebanaceae	3	3	2.37	2.27	1.00	0.02	0.32	1.14	0.20	0.16	1.66
Vitex altissema	Verbenaceae	20	18	32.02	13.64	1.11	0.15	1.90	1.27	1.33	5.17	4.50
Lopopetalum whitianum	Celastraceae	12	8	18.35	6.06	1.50	0.09	0.85	1.71	0.80	3.66	3.36
Sterculia guttata	Sterculiaceae	1	1	0.80	0.76	1.00	0.01	0.11	1.14	0.07	0.05	1.32
Ficus microcarpa	Moraceae	1	1	4.70	0.76	1.00	0.01	0.11	1.14	0.07	1.75	1.32
Neolitsia zeylanica	Lauraceae	4	5	2.74	3.79	0.80	0.03	0.53	0.91	0.27	0.17	1.71
Steriospermum personatum	Bignonianaceae	1	1	1.65	0.76	1.00	0.01	0.11	1.14	0.07	0.21	1.32
Eleocarpus serratus	Urticaceae	12	11	5.98	8.33	1.09	0.09	1.16	1.25	0.80	0.22	3.21
Actinodaphne hookeri	Lauraceae	10	8	6.76	6.06	1.25	0.08	0.85	1.43	0.67	0.40	2.94
Litsea stocksii	Lauraceae	19	16	13.28	12.12	1.19	0.14	1.69	1.36	1.26	0.83	4.31
Aparosa lindelana	Euphorbiaceae	26	21	16.40	15.91	1.24	0.20	2.22	1.41	1.73	0.90	5.37
Macarange peltata	Euphorbiaceae	9	7	5.37	5.30	1.29	0.07	0.74	1.47	0.60	0.26	2.81
Cinnamomum malabathrum	Lauraceae	4	4	2.15	3.03	1.00	0.03	0.42	1.14	0.27	0.09	1.83

Euodia lunu-ankenda	Rutaceae	1	1	0.48	0.76	1.00	0.01	0.11	1.14	0.07	0.01	1.32
Canerium strictum	Burseraceae	2	2	1.99	1.52	1.00	0.02	0.21	1.14	0.13	0.17	1.49
Chukrasia tabularis	Liliaceae	2	2	4.03	1.52	1.00	0.02	0.21	1.14	0.13	0.65	1.49
Ixora brachiata	Rubiaceae	38	36	17.07	27.27	1.06	0.29	3.81	1.21	2.53	0.65	7.54
Cassine glauca	Celastraceae	12	12	16.97	9.09	1.00	0.09	1.27	1.14	0.80	3.43	3.21
Xantolis tomentosa	Sapotaceae	4	2	2.15	1.52	2.00	0.03	0.21	2.29	0.27	0.05	2.76
Persia macarantha	Lauraceae	11	10	17.98	7.58	1.10	0.08	1.06	1.26	0.73	2.92	3.05
Hopea ponga	Dipterocarpaceae	158	58	116.22	43.94	2.72	1.20	6.13	3.11	10.52	9.09	19.76
Chrysophyllum roxburghii	Sapotaceae	6	5	4.70	3.79	1.20	0.05	0.53	1.37	0.40	0.34	2.30
Artocarpus heterophyllus	Moraceae	2	2	1.65	1.52	1.00	0.02	0.21	1.14	0.13	0.10	1.49
Tabernamontana heyinana	Apocynaceae	8	8	3.34	6.06	1.00	0.06	0.85	1.14	0.53	0.10	2.52
Canthium dicoccum	Rubiaceae	4	5	1.96	3.79	0.80	0.03	0.53	0.91	0.27	0.07	1.71
Syzygium sp.	Myrtaceae	1	1	1.42	0.76	1.00	0.01	0.11	1.14	0.07	0.16	1.32
Flacourtia montana	Flacortiaceae	20	18	16.08	13.64	1.11	0.15	1.90	1.27	1.33	0.90	4.50
Artocarpus hirsutus	Moraceae	16	14	13.16	10.61	1.14	0.12	1.48	1.31	1.07	1.26	3.85
Knema attenuata	Myristicaceae	238	93	153.16	70.45	2.56	1.80	9.83	2.92	15.84	8.87	28.60
Diospyros sylvetrica	Ebanaceae	185	87	154.65	65.91	2.13	1.40	9.20	2.43	12.32	12.43	23.94
Symplocos racemosa	Symplocaceae	19	14	13.37	10.61	1.36	0.14	1.48	1.55	1.26	0.89	4.30
Garcinia talbotti	Clusiaceae	4	4	4.24	3.03	1.00	0.03	0.42	1.14	0.27	0.84	1.83
Alsea daphni	Lauraceae	2	1	2.99	0.76	2.00	0.02	0.11	2.29	0.13	0.37	2.52
Albizia lebbeck	Mimosaceae	1	1	1.85	0.76	1.00	0.01	0.11	1.14	0.07	0.21	1.32
Belsmedia whitii	Lauraceae	10	9	7.59	6.82	1.11	0.08	0.95	1.27	0.67	0.70	2.89
Aglaia roxburghiana	Meliaceae	39	25	25.27	18.94	1.56	0.30	2.64	1.78	2.60	1.33	7.02
Syzizium laetum	Myrtaceae	2	2	0.86	1.52	1.00	0.02	0.21	1.14	0.13	0.02	1.49
Syzygium cumini	Myrtaceae	2	2	4.13	1.52	1.00	0.02	0.21	1.14	0.13	0.68	1.49
Prunus ceylanica	Rosaceae	1	1	1.55	0.76	1.00	0.01	0.11	1.14	0.07	0.19	1.32
Diospyros candolliana	Ebanaceae	10	9	6.58	6.82	1.11	0.08	0.95	1.27	0.67	0.43	2.89
Dimocarpus longan	Sapindaceae	10	8	5.77	6.06	1.25	0.08	0.85	1.43	0.67	0.29	2.94
Homelium zeylanicum	Flacortiaceae	3	3	1.17	2.27	1.00	0.02	0.32	1.14	0.20	0.03	1.66
Careya arborea	Aracaceae	3	2	1.55	1.52	1.50	0.02	0.21	1.71	0.20	0.08	2.13
Pterospermum reticulatum	Sterculiaceae	25	14	18.28	10.61	1.79	0.19	1.48	2.04	1.66	1.57	5.19
Mangefera indica	Anacardiaceae	12	12	8.15	9.09	1.00	0.09	1.27	1.14	0.80	0.50	3.21
Holigarna arnottiana	Anacardiaceae	111	70	100.83	53.03	1.59	0.84	7.40	1.81	7.39	9.74	16.60
Syzizium hemispermicum	Myrtaceae	3	2	3.67	1.52	1.50	0.02	0.21	1.71	0.20	0.40	2.13
Polyanthia fragrens	Anonaceae	1	2	0.89	1.52	0.50	0.01	0.21	0.57	0.07	0.06	0.85
Diospyros buxifolia	Ebanaceae	32	27	36.61	20.45	1.19	0.24	2.85	1.35	2.13	4.38	6.34
Lageostromia microcarpa	Lythraceae	5	4	7.32	3.03	1.25	0.04	0.42	1.43	0.33	0.92	2.18

Glochidion velutinum	Euphorbiaceae	1	1	0.38	0.76	1.00	0.01	0.11	1.14	0.07	0.01	1.32
Maduca longifolia	Sapotaceae	4	4	3.28	3.03	1.00	0.03	0.42	1.14	0.27	0.21	1.83
Syzigium gardneri	Myrtaceae	28	25	44.04	18.94	1.12	0.21	2.64	1.28	1.86	10.69	5.79
Myristica malabarica	Myristicaceae	7	7	4.45	5.30	1.00	0.05	0.74	1.14	0.47	0.26	2.35
Mimusops elengi	Sapotaceae	10	9	9.07	6.82	1.11	0.08	0.95	1.27	0.67	0.74	2.89
Myristica dactyloides	Myristicaceae	9	8	6.11	6.06	1.13	0.07	0.85	1.29	0.60	0.46	2.73
Diospyros angustfolia	Ebanaceae	6	5	2.43	3.79	1.20	0.05	0.53	1.37	0.40	0.08	2.30
Callophylum tomentasum	Clusiaceae	6	5	9.21	3.79	1.20	0.05	0.53	1.37	0.40	1.41	2.30
Callicarpa tomentosa	Verbenaceae	2	2	0.83	1.52	1.00	0.02	0.21	1.14	0.13	0.02	1.49
Holigarna grahmi	Anacardiaceae	8	7	7.36	5.30	1.14	0.06	0.74	1.31	0.53	0.65	2.58
Litsea floribonda	Lauraceae	12	11	9.58	8.33	1.09	0.09	1.16	1.25	0.80	0.80	3.21
Hydnocarpus pentandra	Flacortiaceae	1	1	1.78	0.76	1.00	0.01	0.11	1.14	0.07	0.21	1.32
Garcinia gummi-gutta	Clusiaceae	59	42	38.53	31.82	1.40	0.45	4.44	1.61	3.93	2.70	9.97
Artocarpus lakoocha	Moraceae	1	1	0.66	0.76	1.00	0.01	0.11	1.14	0.07	0.03	1.32

*N-Number of individuals, F-Frequency, A-Abundence, D-Density, RF-Relative Frequency, RA-Relative Abundence, RD- Relative Density, BA- Basal Area, IVI- Importance Value Index

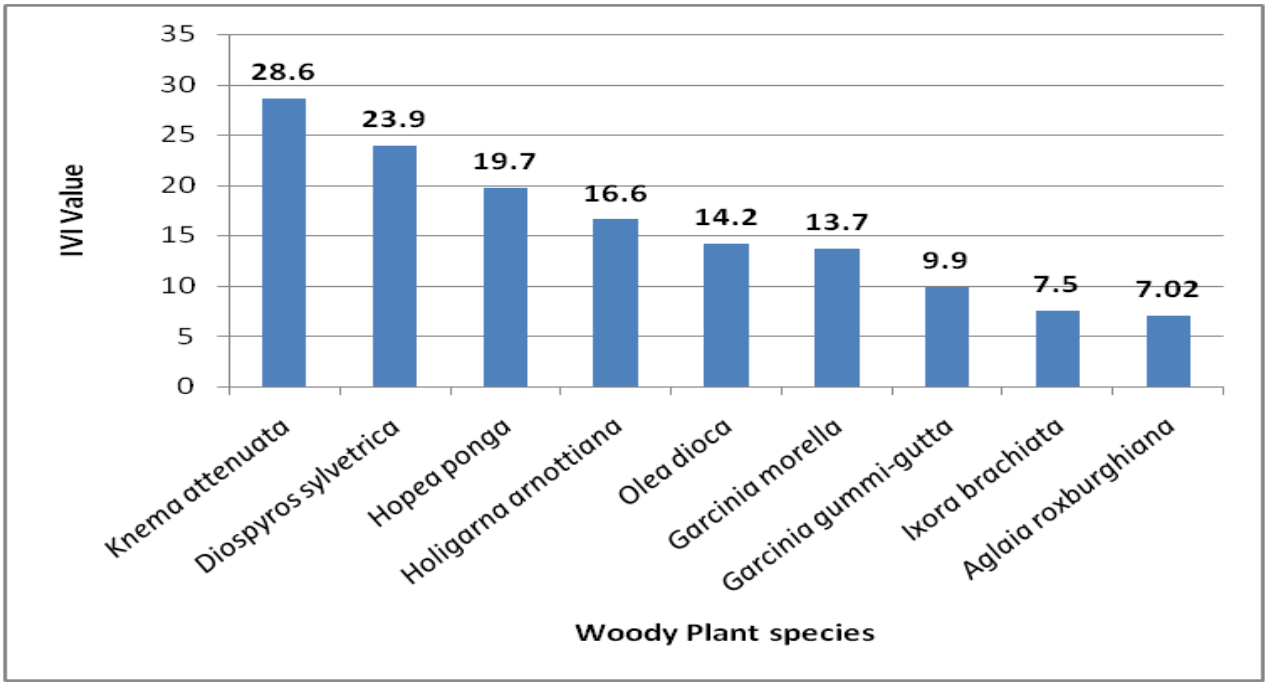

Fig. 1. Figure showing plant species against IVI value in Hosthota area

The number of woody plant families in the samples area of the study site was 32 (Table 2). Among them, Lauraceae was well represented with 8 species followed by Clusiaceae , Ebanaceae and Myristicaceae having 5 species each and Anacardiaceae, Euphorbiaceae, Moraceae and Sapotaceae having represented by 4 species each. At the generic level, the most

represented was Lauraceae (n=7), Euphorbiaceae (n=4) and Sapotaceae (n=4). Based on density, the family Myristicaceae represented highest number of individuals (n= 254) followed by Ebanaceae (n=236), Dipterocarpaceae (n=158) and Clusiaceae (n=157). The maximum basal area was recorded for family Ebanaceae (17.48) followed by Myrtaceae (11.59) and Anacardiaceae (11.44). Of this, Myristicaceae was the densest family (16.89%) followed by Ebanaceae (15.7%), Dipterocarpaceae (10.51%) and Clusiaceae (10.44%). A total of 18 families were represented by single species at the study site.

Table 2. Showing details of family, species richness, generic richness, basal area and family importance value.

Family	Species Richness	Generic richness	No. of individuals	Family Relative density	Family Relative diversity	Basal area	Family Relative dominance	Family ImportanceValue
Anacardiaceae	4	3	151	10.05	5.63	11.44	10.54	26.22
Anonaceae	1	1	1	0.07	1.41	0.06	0.06	1.53
Apocynaceae	1	1	8	0.53	1.41	0.10	0.09	2.03
Aracaceae	2	2	6	0.40	2.82	0.26	0.24	3.46
Bignonianaceae	1	1	1	0.07	1.41	0.21	0.19	1.67
Burseraceae	1	2	2	0.13	1.41	0.17	0.16	1.70
Celastraceae	2	2	24	1.60	2.82	7.09	6.53	10.95
Clusiaceae	5	2	157	10.45	7.04	6.44	5.93	23.42
Dipterocarpaceae	1	1	158	10.51	1.41	9.09	8.38	20.30
Ebanaceae	5	1	236	15.70	7.04	17.48	16.11	38.85
Euphorbiaceae	4	4	37	2.46	5.63	1.25	1.15	9.25
Flacortiaceae	3	3	24	1.60	4.23	1.14	1.05	6.87
Lauraceae	8	7	72	4.79	11.27	6.28	5.79	21.84
Liliaceae	1	1	2	0.13	1.41	0.65	0.60	2.14
Lythraceae	1	1	5	0.33	1.41	0.92	0.85	2.59
Melastomaceae	1	1	12	0.80	1.41	0.20	0.18	2.39
Meliaceae	1	1	39	2.59	1.41	1.33	1.23	5.23
Mimosaceae	1	1	1	0.07	1.41	0.21	0.19	1.67
Moraceae	4	2	20	1.33	5.63	3.14	2.89	9.86
Myristicaceae	3	2	254	16.90	4.23	9.59	8.84	29.96
Myrtaceae	5	1	36	2.40	7.04	11.95	11.01	20.45
Oleaceae	1	1	97	6.45	1.41	9.02	8.31	16.17
Rhizophoraceae	1	1	3	0.20	1.41	0.04	0.04	1.64
Rosaceae	1	1	1	0.07	1.41	0.19	0.18	1.65
Rubiaceae	2	2	42	2.79	2.82	0.72	0.66	6.27
Rutaceae	1	1	1	0.07	1.41	0.01	0.01	1.48
Sapindaceae	1	1	10	0.67	1.41	0.29	0.27	2.34
Sapotaceae	4	4	24	1.60	5.63	1.34	1.23	8.47
Sterculiaceae	1	2	26	1.73	1.41	1.62	1.49	4.63
Symplocaceae	1	1	19	1.26	1.41	0.89	0.82	3.49

Urticaceae	1	1	12	0.80	1.41	0.22	0.20	2.41
Verbenaceae	2	2	22	1.46	2.82	5.19	4.78	9.06

Chiksuli area-

A total of 1383 woody plant belonging to 73 species, 54 genera spread over 31 families were recorded from 128 circular plots (10 m radius) in the study site of Chiksuli of Group 2 range (Table 3 and 4). The woody plant community paramaters are as computed in the Table 3. Among them *Olea dioca* was represented by maximum number of individuals (n=128) followed by *Knema attenuata* (n=100), *Aglaia roxburghiana* (n=92) and *Garcenia talbotti* (n=89). The highest Important Value Index (IVI) was recorded for *Olea dioca* (17.89) followed by *Knema attenuata* (15.61), *Aglaia roxburghiana* (14.41) and *Garcenia talbotti* (13.00) as shown in Table 3 and Fig. 2.

Table 3. Table showing details of species, family, frequency, abundance, basal area and importance value index of species present in Chiksuli.

Name of the species	**Family**	**N**	**No. of occur-ednce plots**	**GBH (m)**	**F**	**A**	**D**	**RF**	**RA**	**RD**	**BA**	**IVI**
Olea dioca	Oleaceae	128	57	135.7	44.53	2.24	1	6.36	2.39	9.14	15.39	17.8
Nathopegia racemosa	Anacardiaceae	27	23	13.6	17.96	1.17	0.21	2.56	1.25	1.92	0.58	5.74
Memecylon malabaricum	Melastomaceae	7	7	2.71	5.46	1	0.05	0.78	1.06	0.49	0.08	2.34
Garcinia morella	Clusiaceae	73	37	37.03	28.90	1.97	0.57	4.12	2.10	5.21	1.61	11.44
Caryota urens	Aracaceae	2	2	1.80	1.56	1	0.01	0.22	1.06	0.14	0.12	1.43
Callophylum apetalum	Clusiaceae	3	3	2.13	2.34	1	0.02	0.33	1.06	0.21	0.14	1.61
Vitex altissema	Verbenaceae	14	9	19.77	7.03	1.55	0.10	1.01	1.65	0.99	2.8	3.66
Ficus microcarpa	Moraceae	1	1	0.57	0.78	1	0.007	0.11	1.06	0.07	0.02	1.24
Sterculia guttata	Sterculiaceae	4	3	3.65	2.34	1.33	0.03	0.33	1.41	0.28	0.34	2.04
Neolitsia zeylanica	Lauraceae	6	5	3.009	3.90	1.2	0.04	0.55	1.27	0.42	0.13	2.26
Steriospermu-m personatum	Bignonianaceae	2	1	1.1	0.78	2	0.01	0.11	2.12	0.14	0.05	2.38
Eleocarpus serratus	Urticaceae	13	12	6.47	9.37	1.08	0.10	1.33	1.15	0.92	0.27	3.42
Actinodaphne hookeri	Lauraceae	6	6	3.12	4.68	1	0.04	0.66	1.06	0.42	0.15	2.16
Litsea stocksii	Lauraceae	52	33	34.40	25.78	1.57	0.40	3.68	1.67	3.71	2.01	9.07
Aparosa lindelana	Euphorbiaceae	4	4	2.22	3.12	1	0.03	0.44	1.06	0.28	0.1	1.79
Macarange peltata	Euphorbiaceae	14	10	7.69	7.81	1.4	0.10	1.11	1.49	0.99	0.38	3.60
Cinnamomum malabathrum	Lauraceae	7	7	3.30	5.46	1	0.05	0.78	1.06	0.49	0.13	2.34
Canerium strictum	Burseraceae	3	3	4.22	2.34	1	0.02	0.33	1.06	0.21	0.51	1.61
Euodia lunu-ankenda	Rutaceae	15	11	1.26	8.59	1.36	0.11	1.22	1.45	1.07	1.26	3.75
Ficus asperima	Moraceae	1	2	0.82	1.56	0.5	0.007	0.22	0.53	0.07	0.05	0.82

Xantolis tomentosa	Sapotaceae	14	12	10.19	9.37	1.16	0.10	1.33	1.24	0.99	0.74	3.58
Ixora brachiata	Rubiaceae	21	17	9.46	13.28	1.23	0.16	1.89	1.31	1.49	0.36	4.71
Cassine glauca	Celastraceae	4	3	11.35	2.34	1.33	0.03	0.33	1.41	0.28	5.41	2.04
Persia macarantha	Lauraceae	5	5	5.19	3.90	1	0.03	0.55	1.06	0.35	0.71	1.97
Hopea ponga	Dipterocarpaceae	79	34	59.19	26.56	2.32	0.61	3.79	2.47	5.64	4.4	11.91
Chrysophyllum roxburghii	Sapotaceae	1	1	1.57	0.78	1	0.007	0.11	1.06	0.07	0.19	1.24
Tabernamontana heyinana	Apocynaceae	6	6	2.24	4.68	1	0.04	0.66	1.06	0.42	0.06	2.16
Canthium dicoccum	Rubiaceae	2	2	1.32	1.56	1	0.01	0.22	1.06	0.14	0.06	1.43
Flacourtia montana	Flacortiaceae	6	4	3.07	3.12	1.5	0.04	0.44	1.59	0.42	0.14	2.47
Artocarpus hirsutus	Moraceae	8	7	5.62	5.46	1.14	0.06	0.78	1.22	0.57	0.4	2.56
Knema attenuata	Myristicaceae	100	60	76.32	46.87	1.66	0.78	6.69	1.77	7.14	5.38	15.61
Celtis tetandra	Ulmaceae	1	1	0.63	0.78	1	0.007	0.11	1.06	0.07	0.03	1.24
Diospyros sylvetrica	Ebanaceae	2	2	0.97	1.56	1	0.01	0.22	1.06	0.14	0.03	1.43
Terminalia paniculata	Combretaceae	1	1	1.6	0.78	1	0.007	0.11	1.06	0.07	0.2	1.24
Casearia beddomi	Flacortiaceae	6	6	3.12	4.68	1	0.04	0.66	1.06	0.42	0.15	2.16
Symplocos racemosa	Symplocaceae	23	15	11.02	11.71	1.53	0.17	1.67	1.63	1.64	0.48	4.94
Alsea daphni	Lauraceae	3	3	3.20	2.34	1	0.02	0.33	1.06	0.21	0.31	1.61
Xylia xylocarpa	Fabaceae	54	18	38.03	14.06	3	0.42	2	3.19	3.85	2.75	9.05
Garcinia talbotti	Clusiaceae	89	36	72.63	28.12	2.47	0.69	4.01	2.63	6.35	5.57	13.00
Belsmedia whitii	Lauraceae	24	23	21.3	17.96	1.04	0.18	2.56	1.11	1.71	1.86	5.39
Aglaia roxburghiana	Meliaceae	92	54	67.28	42.18	1.70	0.71	6.02	1.81	6.56	4.97	14.41
Syzizium laetum	Myrtaceae	7	7	2.57	5.46	1	0.05	0.78	1.06	0.49	0.07	2.34
Syzygium cumini	Myrtaceae	2	2	3.12	1.56	1	0.01	0.22	1.06	0.14	0.43	1.43
Diospyros candolliana	Ebanaceae	51	31	37.12	24.21	1.64	0.39	3.45	1.75	3.64	2.57	8.85
Careya arborea	Aracaceae	1	1	0.76	0.78	1	0.007	0.11	1.06	0.07	0.04	1.24
Dimocarpus longan	Sapindaceae	72	43	43.54	33.59	1.67	0.56	4.79	1.78	5.14	2.6	11.72
Homelium zeylanicum	Flacortiaceae	5	4	2.78	3.12	1.25	0.03	0.44	1.33	0.35	0.14	2.13
Syzygium caryphyllatum	Myrtaceae	1	1	1.19	0.78	1	0.007	0.11	1.06	0.07	0.11	1.24
Sapium insigne	Euphorbiaceae	1	1	1.19	0.78	1	0.007	0.11	1.06	0.07	0.72	1.24
Pterospermum reticulatum	Sterculiaceae	37	20	21.22	15.62	1.85	0.28	2.23	1.96	2.64	1.1	6.84
Mangefera indica	Anacardiaceae	8	8	3.17	6.25	1	0.06	0.89	1.06	0.57	0.1	2.52
Alstonia scolaris	Apocynaceae	1	1	0.45	0.78	1	0.007	0.11	1.06	0.07	0.01	1.24

Holigarna arnottiana	Anacardiaceae	64	44	45.17	34.37	1.45	0.5	4.91	1.54	4.57	2.99	11.02
Syzizium hemispermicum	Myrtaceae	12	10	9	7.81	1.2	0.09	1.11	1.27	0.85	0.79	3.25
Diospyros buxifolia	Ebanaceae	4	4	6.68	3.12	1	0.03	0.44	1.06	0.28	1.2	1.79
Lageostromia microcarpa	Lythraceae	3	3	6.01	2.34	1	0.02	0.33	1.06	0.21	0.98	1.61
Ficus nervosa	Moraceae	9	8	22.86	6.25	1.12	0.07	0.89	1.19	0.64	17.65	2.73
Glochidion velutinum	Euphorbiaceae	5	3	4.26	2.34	1.66	0.03	0.33	1.77	0.35	0.35	2.46
Maduca longifolia	Sapotaceae	3	1	2.62	0.78	3	0.02	0.11	3.19	0.21	0.19	3.52
Syzigium gardneri	Myrtaceae	6	6	10.8	4.68	1	0.04	0.66	1.06	0.42	2.75	2.16
Myristica malabarica	Myristicaceae	1	1	0.48	0.78	1	0.007	0.11	1.06	0.07	0.01	1.24
Mimusops elengi	Sapotaceae	21	17	16.23	13.28	1.23	0.16	1.89	1.31	1.49	1.61	4.71
Diospyros angustfolia	Ebanaceae	16	16	8.3	12.5	1	0.12	1.78	1.06	1.14	0.39	3.99
Myristica dactyloides	Myristicaceae	17	13	11.69	10.15	1.30	0.13	1.45	1.39	1.21	0.8	4.05
Callophylum tomentasum	Clusiaceae	11	11	21.39	8.59	1	0.08	1.22	1.06	0.78	3.56	3.07
Callicarpa tomentosa	Verbinaceae	12	11	5.1	8.59	1.09	0.09	1.22	1.16	0.85	0.18	3.24
Terminelia bellarica	Combretaceae	2	2	3.68	1.56	1	0.01	0.22	1.06	0.14	0.54	1.43
Holigarna grahmi	Anacardiaceae	16	16	11.35	12.5	1	0.12	1.78	1.06	1.14	0.76	3.99
Hydnocarpus pentandra	Flacortiaceae	1	1	0.86	0.78	1	0.007	0.11	1.06	0.07	0.05	1.24
Litsea floribonda	Lauraceae	40	25	31.47	19.53	1.6	0.31	2.79	1.70	2.85	2.66	7.35
Garcinia gummi-gutta	Clusiaceae	45	35	34.65	27.34	1.28	0.35	3.90	1.36	3.21	2.8	8.48
Artocarpus lakoocha	Moraceae	1	1	0.60	0.78	1	0.007	0.11	1.06	0.07	0.02	1.24
Nothapodytes nimmoniana	Icaciniceae	3	3	1.11	2.34	1	0.02	0.33	1.06	0.21	0.03	1.61

*N-Number of individuals, F-Frequency, A-Abundence, D-Density, RF-Relative Frequency, RA-Relative Abundance, RD- Relative Density, BA- Basal Area, IVI- Importance Value Index

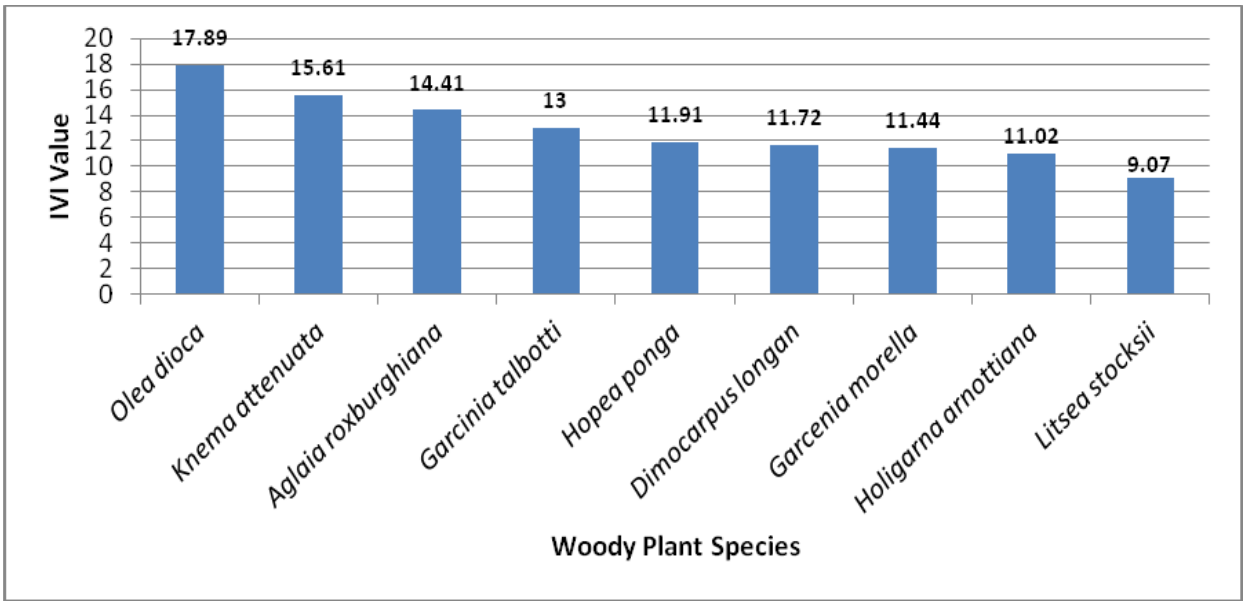

Fig. 2. Figure showing plant species against IVI value in Chiksuli area.

The number of woody plant families recorded in the sampled area of the study site was 31 (Table 4). The family Lauraceae represented by 8 species, Moraceae, Clusiaceae, Myrtaceae represented 5 species each. At the generic level, family Lauraceae (n=7) dominated followed by Euphorbiaceae (n=4), Flacortiaceae (n=4) and Anacardiaceae (n=3). Based on density, family Clusiaceae was well represented(n=221) followed by Lauraceae (n= 143), Oleaceae (n=128) and Myristicaceae (n=118). Of this Clusiaceae was the densest family (15.97%) followed by Lauraceae (10.33%), Oleaceae (9.25%) and Myristicaceae (8.53%). In the study site, 15 families were represented by only a single species.

Table 4. Showing details of family, species richness, generic richness, basal area and family importance value.

Family	Species Richness	Generic richness	No. of individuals	Family Relative density	Family Relative diversity	Basal area	Family Relative dominance	Family Importance Value
Anacardiaceae	4	3	115	8.32	5.48	4.43	4.08	17.88
Apocynaceae	2	2	7	0.51	2.74	0.07	0.06	3.31
Aracaceae	2	2	3	0.22	2.74	0.16	0.15	3.10
Bignonianaceae	1	1	2	0.14	1.37	0.05	0.05	1.56
Burseraceae	1	1	3	0.22	1.37	0.51	0.47	2.06
Celastraceae	1	1	4	0.29	1.37	5.41	4.99	6.64
Clusiaceae	5	2	221	15.98	6.85	13.68	12.61	35.44
Combretaceae	2	2	3	0.22	2.74	0.74	0.68	3.64
Dipterocarpaceae	1	1	79	5.71	1.37	4.40	4.05	11.14
Ebanaceae	4	1	73	5.28	5.48	4.19	3.86	14.62
Euphorbiaceae	4	4	24	1.74	5.48	1.55	1.43	8.64
Fabaceae	1	1	54	3.90	1.37	2.75	2.53	7.81
Flacortiaceae	4	4	18	1.30	5.48	0.48	0.44	7.22
Icaciniceae	1	1	3	0.22	1.37	0.03	0.03	1.61
Lauraceae	8	7	143	10.34	10.96	7.96	7.34	28.63
Lythraceae	1	1	3	0.22	1.37	0.98	0.90	2.49
Melastomaceae	1	1	7	0.51	1.37	0.08	0.07	1.95
Meliaceae	1	1	92	6.65	1.37	4.97	4.58	12.60

Moraceae	5	2	20	1.45	6.85	18.14	16.72	25.01
Myristicaceae	3	2	118	8.53	4.11	6.19	5.70	18.35
Myrtaceae	5	1	28	2.02	6.85	4.15	3.82	12.70
Oleaceae	1	1	128	9.26	1.37	15.39	14.18	24.81
Rubiaceae	2	2	23	1.66	2.74	0.42	0.39	4.79
Rutaceae	1	1	15	1.08	1.37	1.26	1.16	3.62
Sapindaceae	1	1	72	5.21	1.37	2.60	2.40	8.97
Sapotaceae	4	1	21	1.52	5.48	2.73	2.52	9.51
Sterculiaceae	2	2	41	2.96	2.74	1.44	1.33	7.03
Symplocaceae	1	1	23	1.66	1.37	0.48	0.44	3.48
Ulmaceae	1	1	1	0.07	1.37	0.03	0.03	1.47
Urticaceae	1	1	13	0.94	1.37	0.27	0.25	2.56
Verbenaceae	2	2	26	1.88	2.74	2.98	2.75	7.37

NTFP trees harvest quantification.

The continuous monitoring of changes in land use, agricultural pattern, agricultural income and NTFP collection dynamics have been collected season-wise. In addition to this some specific NTFP trees have been tagged for quantification of fruiting and harvesting by people. The trends for the first harvest season have been indicated in the Table 5.

Table 5. Showing the details of tagged trees on fruiting and harvests of NTFP species.

NTFP	Sl.no.	GBH (cm)	Height (feet)	No. of fruiting branches	No. of Unripe fruits	No. of Ripe fruits	No. of fruits during Harvest
Garcenia gummi-gutta							
	1	64	25	56	860	165	110
	2	49	18	60	1180	1250	1050
	3	136	20	92	7000	1400	1200
	4	45	18	40	825	0	0
	5	58	15	49	2530	976	750
	6	46	15	32	825	1021	995
	7	37	12	39	1500	150	150
	8	38	20	19	143	0	0
	9	41	20	47	1380	300	300
	10	44	20	35	161	379	360
	11	56	30	38	3348	677	620
	12	99	22	63	1100	376	360
	13	62	25	64	560	115	115
	14	45	20	21	300	16	16
	15	47	15	36	42	0	0
	16	114	55	22	5500	1266	1698
	17	71	25	67	2300	23	20
	18	47	18	29	400	14	14
	19	67	20	74	4230	560	560
	20	60	15	55	3250	1288	1200
Myristica malabarica							
	1	112	65	15	294	-	250
	2	73	46	21	0	-	0
	3	64	35	10	10	5	0
Myristica dactyloides							
	1	68	22	7	4	4	4
	2	96	30	14	10	5	5
	3	73	32	23	0	0	0
	4	88	42	27	136	25	25
	5	116	28	30	0	0	0
	6	65	20	14	25	25	0
	7	71	25	15	330	80	80
	8	78	30	16	2	0	0
	9	81	25	8	1	0	0
	10	48	21	17	102	0	0

	11	91	45	26	0	0	0
	12	56	30	10	0	0	0
	13	49	22	35	0	0	0
	14	64	30	13	0	0	0
	15	40	15	15	7	0	0
	16	77	32	22	400	400	400
	17	82	32	18	20	0	0
	18	78	38	26	0	0	0
	19	102	40	35	30	20	0
Artocarpus lakoocha							
	1	108	12	22	6500	0	1000
	2	150	35	18	0	0	0
	3	100	40	14	2600	0	129
	4	73	42	7	2200	0	34
	5	176	35	10	7000	0	514
	6	110	31	9	3600	0	425
	7	162	15	6	0	0	0
	8	135	80	5	0	0	0
	9	135	25	9	0	0	0
	10	92	20	18	0	0	0
Garcenia indica							
	1	15	141		6500	4446	4446
	2	20	75		7898	4741	4741

The study on stand structure and density of NTFP trees is indicated in Table 6. *Garcenia gummi-gutta* showed the highest density in Hosthota(14.2) followed by Chiksuli(11.2) and Devgaar (13.1). *Myristica dactyloides* showed highest density in Devgaar(13.1) followed by Chiksuli(4.2) and Kodgi (2.6). Hosthota showed highest density of *Mangefera indica*(2.8) while the density of *Myristica malabarica* being high in Devgaar(2.2) and *Garcenia morella* being high in Hosthota(21.0). Densities of *Piper nigrum*, *Entada scandens*, and *Canerium strictum* remained negligible in all the areas while Kodgi showed comparatively higher density of *Artocarpus lakoocha* (0.6).

Table 6. Showing densities of specific NTFP in different areas of ACR

Sl.no.	**NTFP**	**Hosthota**	**Chiksuli**	**Devgar**	**Kanthota**	**Kodgi**	**Kuldeep et.al. (2010)**
1	*Garcenia gummi-gutta*	14.2	11.2	11.1	9.2	5.8	5.7
2	*Myristica dactyloides*	2.1	4.2	13.1	1.4	2.6	1.2
3	*Mangefera indica*	2.8	1.9	2.5	2.7	0.9	0.9
4	*Cinnamommum malabatrum*	0.9	1.7	0	0.7	0	1.3
5	*Myristica malabarica*	1.6	0.2	2.2	0.4	0.9	1.1
6	*Artocarpus lakoocha*	0.2	0.2	0	0	0.6	0
7	*Canerium strictum*	0.2	0	0	0	0	0.2
8	*Calophyllum apetalum*	0.2	0.7	0.7	0	0	0
9	*Entada scandens*	0	0	0	0	0	0
10	*Piper nigrum*	0	0	0.2	0.2	0	0
11	*Garcenia morella*	21.0	18.2	19.2	14.7	13.6	2.4

Firewood Monitoring

It was seen that 4 types of ovens were used for processing of *Garcenia gummi-gutta* (*Uppage*) rind namely,

1. Open flame oven
2. 3 side closed oven
3. Modern oven
4. Community Driers.

Every household mostly used Open flame oven in the area for processing *Uppage.* The consumption of firewood was very high to process the rind of *Uppage.* The firewood consumption at every household was highly variable showing the average consumption to be 22kg/unit kg. dry rind.

The different types of oven used in adjacent areas, their firewood consumption and cost of production have been collected from different sources and the forest department as shown in Table 7. Modern ovens and community driers have been sporadically distributed sporadically by forest department and other governmental and non-governmental organizations under different schemes at a very small scale. The data collection on their effectiveness and suitability is ongoing. Suggestions to the forest department on addressing the drawbacks and limitations are in process. The major drawback of Community driers have been their high cost of production and high maintenance cost. However there are very notable advantages in Community driers such as less fuel consumption due to minimal loss of heat. Another major advantage of the community driers is that agricultural waste can be majorly used as fuel thereby reducing fuel wood consumption from the forest. There is also a very notable improvement in quantity and quality of the product and minimal fire accidents.

Table 7. Showing details of different types of oven used, its fuel efficiency and cost of production. (Source: Karnataka Forest Department)

Sl.no.	Oven type	Firewood consumption(kg)/kg dry rind	Cost of production of Oven (INR)
1	Open flame	22	Negligible
2	3 side closed oven	13.5	500
3	Modern oven	9	6000
4	Community drier	4	48,000

Possible Models

The feasibility of distribution of Community driers to individual households has been explored. Constant interaction with people, forest department and market has been established for

implementation of required steps for sustainable harvesting. In addition to interactions, effective patrolling by forest department during harvest season has decreased the rate of unripe fruit harvest marginally. Data collection is ongoing on the effectiveness of such attempts on harvesting by people.

Another possible model for processing of *Uppage* rind has been the liquefaction of raw rind using crushers during the harvesting period. Although the harvesters are keen on the idea of liquefaction due to less labour involvement and no firewood required, it is problematic for transportation of the same to processing firms. There is a need to find a way for bearing the transportation cost during the season. The market demand for the *Uppage* juice concentrate is to be explored in addition to concerns regarding its preservation. Some attempts in liquefaction and processing done by local people on experimental basis have not been viable in the market due to various reasons such as preservation. The attempts for the success of this model is been explored in parallels.

Installing of Governing body

A major outcome of the models to be implemented have been the elimination of middle men from trading of NTFP. The direct selling of NTFP collected by people to the market through Village Forest Committees (VFC) could be the most feasible and effective method to ensure better income to harvesters. Interactions with the respective administrative range officers of the forest department in installing additional VFC in required areas is under process. Decentralization of the tendering process from the present range and divisional level to the level of VFCs could be a major step for ensuring control over the extraction process ensuring higher income to harvesters in addition to sustainability. The address of issues of already installed VFC for NTFP tendering in terms of effectiveness and functioning is under scrutiny in all the 4 ranges of Aghanashini Lion-tailed macaque Conservation Reserve (ACR).

Marketing of NTFP.

The interactions with one of the major processing industry has been accomplished. The industry has ensured marginally better market price for the *Uppage* rind bypassing the middle men. However efforts are concentrated towards feasibility of marketing liquefied to the industry. A survey of other processing firms and industries that buy products have been accomplished. Further interactions need to be established subsequently.