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Significance of Tropical Woods of Western Ghats of Southern Gujarat, India

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Abstract: **The relation between forests and floral diversity is a very strong. It helps in the functioning of many biophysical and ecological processes such as hydrological cycles, carbon cycles, climatic regulation and others. Gujarat is one of the fastest developing State in India, the increasing state and national demands like fuel-wood, timber, Fodder, Gums, NTFP's and Bamboos for local and national civilization is degrading Gujarat forests. Information's were collected using secondary sources. The objective of present is article to enlist major tree species of Tropical Moist Deciduous Forests of Western Ghats in Southern Gujarat. Total 124 tree species belonging to 37 families of plants were record. Present paper is also informing about the ecological, economical and medicinal significance of tropical forests of Southern Gujarat.**

Keywords: **Forest, Tropical Moist Deciduous Forests (TMDF), Ecological, Medicinal Plants, Significance.**

I. INTRODUCTION TO ECOSYSTEM

The term ecosystem was coined by an English Ecologist, Tansley in the year 1935. He defined it as considering "not only the organism-complex, but the whole complex of physical factors forming what we the environment." There are quite a lot of definitions, all explained by American Ecologists. Lindeman in 1942 suggested that "an ecosystem is any system composed of physical, chemical and biological process active within any space-time unit." Whittaker in 1975 proposed that "an ecosystem is a functional system that includes an assemblage of interacting organisms (plants, animals and saprobes) and their environment, which acts on them and on which they act". Odum in 1971 recommended a longer but more precise definition: *"Any unit that includes all of the organisms (i.e., the community) in a given area interacting with the physical environment so that a flow of energy leads to a clearly defined trophic structure, biotic diversity and material cycles (i.e. exchange of materials between living and non-living parts within the system) is an ecological system or ecosystem."* An ecosystem is dominated by trees, in which the micro-climate, Soil, water or hydrology, nutrients cycles, biomass formation, sequestration, storage and turn-over, and food chain mechanisms are a sign of the dominance by large, mature woody plants is termed as forest ecosystem (Kimmins, 1997).

II. STUDY AREAS: WESTERN GHATS-SOUTHERN GUJARAT

Gujarat is situated between latitude 20^0 07' to 24^0 43' N and longitude 68^0 10' to 74^0 29' E. The geographical area of the state is 1,96022Km^2, which constitutes 5.96% of the country's total geographical area. The reported forest area in the state is 18, 927Km^2 which is 9.66% of the geographical area (India, State of Forest Report, **2009**). India's geographical area constitutes 2.4% of the whole over world's land and about 2% of the total forests, while sustaining 16% of the world's human population. India has covered 1, 26,188 species of bacteria, fungi, plants and animals and harbours about 45,000 plant species representing about 7% of the world's flora. These are categorized in different taxonomic divisions including over

15,000 flowering plants. Of the 15,000 flowering plants, about 315 families and 2250 genera are known to occur in India in different ecosystem from the humid tropics of Western Ghats to Alpine Zones of the Himalayas and Mangroves of Sunderbans to dry desert of Rajasthan. The Indian region has approximately half of the world's Aquatic plants (Nagar, **2005**). Gujarat state harbours 2,198 species of higher plants including 27 species of mangroves and their associates, which accounts for the almost 9.33% of the total floral wealth of India (Kumar *et al.,* 2007; 2005). On the basis of its geographical position and drainage characteristics, the state of Gujarat can be divided into three broad regions viz. (i) South Gujarat (ii) North and Central Gujarat (mainland), and (iii) Saurashtra and Kachchh. The Aravallis, the Vindhyas, the Satpudas, the Sahyadri/Western Ghats terminate in Gujarat and some of them converge and merge into the state. The northern part of the Western Ghats terminates in Valsad, Navsari and Dangs Districts in Southern Gujarat (Singh, **2011**).

1. ***Dangs District*:** The Dangs district is located between parallels of latitude 20^0 33' 53'' and 21^0 04' 52'' and the meridians of longitude 73^0 27' 58" and 73^0 56' 36". Forest area of the Dangs district is 1058.47 Sq. Km. Which is 60.0% of its total geographical area. The area is distributed in 311 forest villages; there are no non-forest villages in Dangs. The very dense, moderate dense, open forest cover details (Gujarat Forest Statistics, 2011) are shown in table-1.

a. ***Climate and Drainage*:** The area of the Dangs comprises of four main rivers Gira, Purna, Khapri, and Ambika. Ambika and Purna are important rivers in the drainage system of the tract. These rivers originate from the Dangs district and flow through the Valsad district to meet the Arabian Sea in West. Three distinct seasons viz. The summer, the rainy or monsoon and the winter season can be distinguished. The monsoon or rainy season starts from mid of June and last till the end of October. The average annual rainfall is observed 2219.42mm in the last few years (Gujarat Forest Statistics, **2010-11**). The month of October and November are warm and humid. These are followed by a pleasant spell of cold weather. Winter lasts up to February. The summer starts from March and continue upto middle of June. The climate is unbearably hot. May is the hottest month. Dew is very heavy in the months following monsoon and it persists in places till the end of February.

b. ***Soil:*** Black cotton soil is found in the valleys and lowlands and red soil in the uplands. Black cotton soil or regur is clayey to loamy. The soil is very fertile and is composed of largely of clay material. It is generally black and contains high alumina, lime and magnesia with variable amount of low nitrogen and phosphorous. The red soil is light and porous and contains no soluble salts. It is moderately fertile for agriculture purposes. The entire forest area is a mixture of different types of soils resulting in equally mixed type of vegetations throughout the tract.

2. ***Valsad & Navsari District*:** Valsad district is situated between latitude 20^0 7' 55" N and 20^0 27' 15" North and longitudes 72^0 43' 55" E and 73^0 52.9' 38" East. The forest area of Valsad district is 554.72km^2 which is 18.28% of its total geographical area. Major territorial forest of Vansda Taluka is conserved by the Valsad Forest Department. The forest area of Navsari district is 638.59 km^2 which is 28.91% of its total geographical area.

a. ***Climate and Drainage*:** The climate is tropical, dry and warm. In the coastal areas the climate is humid due to the sea. Monsoon is irregular and erratic. Generally monsoon sets by the middle of June and continues till the end of September. Average annual rainfall of the Year-2005 to Year-2011 was 2391.98mm observed. Winter is very short duration i.e. from November to February. A seasonal dip in temperature is around 20^0C in January. Frosts do not occur. The rains are not common during winter. Summer season begins by the end of March to the gradual rise in temperature and humidity. April, May and June are the hottest months. Dew is heavy in the months following the monsoon and persists up to February. It plays a significant role in the growth of plants when the rains are scanty.

b. ***Soil:*** The entire area is mostly covered by Deccan trap. The soil resulting from disintegration of the rocks is of two type viz. Red and shallow soil on slopes and dark brown and deep soil on plains and valleys. These soils gradually merge with the black cotton soil of the Valsad and Navsari plains. It becomes sandy and calcareous near the rivers. In the coastal

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areas there is sandy soil. In many places soil is so shallow and poor that is unable to support anything except grass. In places where the forest cover has been maintained for ages, the soil is several feet deep and rich in organic matter.

Table-1: Forest Cover & Forest Area distribution in Gujarat

Locality	Geo-Area Km^2	Forest Area Km^2	VD* Forest	MD* Forest	Open Forest	Scrub Forest	Total Forest Cover Km^2
Gujarat	196024	19145.83	114	6024	8577	8	14715
Dangs	1762	1058.47	78	995	339	0	1412
Valsad	3029	554.72	0	527	458	2	985
Navsari	2215	638.59	0	166	141	1	307
	VD*: Very Dense, **MD***: Moderate dense						

III. ECOLOGICAL SIGNIFICANCE OF TROPICAL WOODS

A review of earlier works is very significant for any type of research, which is related to the theme. It helps to decide the objectives of the any study and selecting the methodology and to analyze data with proofs. Here, some previous literatures were surveyed and their information was computed to understand the ecological, economical, and medicinal significance of forest ecosystem of Western Ghats.

Carbon Storage Potential of Forests of Gujarat: The C cycle of any forest ecosystem is recognized by a number of 'pools' and 'fluxes'. Pools are the top locations of carbon in the forest, i.e. AGB and BGB, litter layer, dead twigs and foliages and soil. Each pool possesses an amount of C that is referred to as the 'stock'. Carbon relocated and shifts between the various pools by photosynthesis, respiration and combustion mechanisms are known as 'fluxes'. The net switching of carbon between a forest ecosystem and the atmosphere is determined by two large fluxes. The first of these is C transformed as a result of photosynthesis. The second is the self utilization of C as a result of respiration by trees, in the form of biomass, and decomposition of soil organic matter in soil. If C transformation exceeds loss, the forest is a 'sink'. Conversely, if the loss or utilization exceeds uptake the forest is a 'source' (Pandya, 2013). From the secondary data, we found that Carbon storage potential in TMDF varies as forests densities vary. Maximum carbon stock in the TMDF was therefore recorded in Very Dense Forests i.e. Very Dense< Moderate dense<Open forests likewise 119.78tC/ha < 77.64tC/ha<57.32tC/ha in Southern Gujarat. But, if we give a close look on carbon stock of values Tropical Dry Deciduous Forests (TDDF), the carbon stock in forests is changing in all density classes. The reason is that, the forest area in respect to density class between TDDF and TMDF is different. The maximum carbon stock in Gujarat forests is as following: TDDF< TMDF< Plantation forests<Littoral and Swamp forests<TTF (FSI Inventory, 2008).

Table-2: Forest type and Density wise Carbon Stock under different Carbon Pools ('000 tons)

Forest types	Density	Area Km^2	AGB	BGB	Dead wood	Litter	SOM	Total	tC/ha
Tropical Moist Deciduous Forests	**VDF**	106.30	287.80	59.20	12.40	25.50	887.90	1272.80	119.78
	MDF	1572.10	3968.20	816.20	129.60	437.90	6853.60	12205.40	77.64
	OF	355.10	666.80	137.10	14.20	51.10	1165.80	2035.10	57.32
Littoral & Swamp Forests	**VDF**	0.00	-	-	-	-	-	-	-
	MDF	218.70	972.50	336.40	0.50	14.80	1242.00	2566.10	117.36
	OF	845.40	1209.70	418.50	1.80	32.00	2792.10	4454.10	52.69
Tropical Dry Deciduous	**VDF**	7.70	47.40	18.60	0.40	5.00	48.30	119.70	154.82
	MDF	3522.90	20434.50	8023.80	51.90	76.10	20699.80	49286.20	139.9

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Forests	**OF**	4476.30	6378.40	2504.50	58.90	97.80	23622.90	32662.40	72.97
Tropical Thorn Forests (TTF)	**VDF**	0.00	-	-	-	-	-	-	-
	MDF	440.90	356.90	140.10	10.90	33.20	1166.60	1707.70	38.73
	OF	1847.80	193.90	76.20	23.10	112.60	2057.50	2463.30	13.33
Plantation/TOF	**VDF**	Not known	0.00	0.00	0.00	0.00	0.10	0.10	128.18
	MDF	269.50	244.20	50.20	9.60	47.60	1048.80	1400.50	51.97
	OF	1052.40	81.90	16.90	0.00	48.40	3183.80	3331.00	31.65
5	**3**	**14715.10**	**34842.20**	**12597.70**	**313.30**	**982.00**	**64769.20**	**113504.40**	**81.26**
Note: AGB/BGB: Above/Below Ground Biomass, SOM-Soil Organic Matter, tC/ha-tons Carbon per Hectare									

Figure-1: Forests recharges Water

Figure-2: TMDF in Monsoon at Dangs District

IV. ECONOMICAL AND MEDICINAL SIGNIFICANCE OF TROPICAL WOODS

Gujarat is one of the fastest developing State in India. Increasing state and national demands like fuel-wood, timber, Paper and pulp industries for local and national civilization, has resulted the degradation of a number of plant species as well as changing the forest structure. The relation between forests and floral diversity is a very strong. It helps in the functioning of many biophysical and ecological processes such as hydrological cycles, carbon cycles, climatic regulation and others. Forests provide a lot of direct and indirect benefits to the human beings. Fuel wood and timber, fodder and grass for livestock, consisting thousands of medicinal properties, valuable Non-Timber Forest Products (NTFP's) and many more as direct advantages. Livelihood demands are high and supply is less from the forests due to higher anthropogenic pressure on forests. Successful floral diversity conservation of any forests requires a prior listing of plants in respective forest area. Following is the list of plants and their parts use as herbal medicines in against of various diseases (Pandey et al. 2005).

Table-3: List of Tropical woods and their medicinal significance

S.N.	Species	Family	Local Name	Parts use	Diseases
1	*Acacia auriculiformis A. Cunn.*	Mimosaceae	Baval	Whole plant	Amoebic dysentery
2	*Acacia chundra Willd.*	Mimosaceae	Kher	Roots, Gum, Bark	Antidote, diabetes
3	*Acacia ferruginea DC.*	Mimosaceae	Kanti khair	Bark, seeds	Astringent

4	*Acacia leucophloea Willd.*	Mimosaceae	Subaval	Bark, Roots	Bronchitis, Leprosy
5	*Acacia nilotica (L.) Del. Sub sp indica*	Mimosaceae	Deshibaval	Bark, Gum, Seeds	Leucoderma, Ulcer
6	*Acacia polycantha Willd.*	Mimosaceae	Gobita	Whole plant	Asthma, Cancer
7	*Adina cordifolia (Roxb.) Bth. & Hk.*	Rubiaceae	Haldu	Bark, Flowers	Antihelintic
8	*Aegle marmelos (L.) Corr.*	Rutaceae	Bili	Whole plant	Plague, Tonic, Antidote
9	*Ailanthus excelsa L.*	Simaroubaceae	Arduso	Bark, Leaves	Diarrhoea, Skin wound
10	*Alangium salvifolium (L) Wang.*	Alangiaceae	Ankol	Bark, Roots, Leaves	Lung diseases, Analgesic
11	*Albizia lebbeck (L.) Bth.*	Mimosaceae	Kalo Shiras	Bark, Flowers, Leaves	Diarrhoea, dysentery
12	*Albizia odoratissima (L. f.) Bth.*	Mimosaceae	Dholo shiras	Bark, Roots, Leaves	Leprosy, Hair care
13	*Albizia procera (Roxb.) Bth.*	Mimosaceae	Kilai	Whole plant	Hemorrhage, Rheumatism, Cancer
14	*Anacardium occidentale L.*	Anacardiaceae	Kaju	Whole plant	Anorexia, Leprosy, Alterative
15	*Annona squamosa L.*	Annonaceae	Sitaphal	Whole plant	Astringent, Wound, Purgative
16	*Anogeissus latifolia Wall. ex. Bedd.*	Combretaceae	Safed dhav	Whole plant	Opthalmia, Tumors, Swellings
17	*Artocarpus heterophyllus*	Moraceae	Fanas	Roots, Latex	Diarrhoea, Skin wound, Leprosy
18	*Azadirachta indica A. Juss.*	Meliaceae	Limdo	Whole plant	Malaria, Blood Purifier, Ulcer
19	*Balanites aegyptiaca (L.) Del.*	Balanitaceae	Ingorio	Bark, Flowers	Antihelintic, Blood Purifier, Skin
20	*Bauhinia racemosa Lam.*	Caesalpiniaceae	Asitro	Root, Bark	Intestinal and Urinal Problems
21	*Bridelia retusa*	Euphorbiaceae	Asan	Whole plant	Lumbago, Urinary Infection
22	*Buchanania lanzan*	Anacardiaceae	Charoli	Fruit, Leaves, Roots	Aphrodisiac, Cardio-Nervine tonic
23	*Butea monosperma*	Fabaceae	Khakhro, Polash	Whole plant	Night Blindness, Liver, Fractures
24	*Bombax ceiba*	Bombaceae	Savar,Shimlo	Bark, Flower, Root	Blisters, Menorrhagia, Sexual Dis.
25	*Casearia esculenta Roxb.*	Flacourtiaceae	Tandol	Roots, Bark	Diabetes, Hypoglycaemic
26	*Cassia fistula*	Fabaceae	Garmado	Whole plant	Rabid bite, Antidote, Leprosy
27	*Cordia monoica Roxb.*	Ehretiaceae	Gundi	Leaves	Diabetes

28	*Cordia dichotoma f.*	Ehretiaceae	Bokhar,Dahvesh	Fruit	Biliousness, Demulcent, Coolant
29	*Dalbergia sissoo Roxb.*	Fabaceae	Sisam	Bark, Leaves, Stem	Cholera, Eruptions, Leprosy
30	*Dalbergia latifolia Roxb.*	Fabaceae	Shisham	Whole plant	Eczema, Stimulant, Ulcer, Pimples
31	*Dalbergia lanceolaria L.f.*	Fabaceae	Dandoshi	Bark, Leaves, Seeds	Oil in Rheumatism, Diarrhoea, Skin wound
32	*Dalbergia paniculata*	Fabaceae	Patrali	Bark	Diarrhoea, Leprosy, Vermifuge
33	*Derris indica (Lam.) Bennet*	Fabaceae	Karanj	Whole plant	Stammering, Itching, Skin wound
34	*Dillenia pentagyna Roxb.*	Dilleniaceae	Karambal	Whole plant	Hypertension
35	*Diospyros melanoxylon Roxb.*	Ebenaceae	Timru	Leaves, Fruits	Astringent, Digestive Disorders
36	*Dolichandrone atrovirens (Heyne ex Roth)*	Bignoniaceae	Padad	Whole plant	Diarrhoea
37	*Dolichandrone falcata Sensu Cooke var.lawii*	Bignoniaceae	Medsingh	Whole plant	Diarrhoea
38	*Ehretia laevis Roxb.*	Ehretiaceae	Vadhavardi	Whole plant	Jaundice, Syphilis, Conjunctivitis, Ulcers
39	*Emblica officinalis Gaertn.*	Euphorbiaceae	Amla	Whole plant	Anaemia, Leprosy, Leucorrhoea, Tonic
40	*Eriolaena candollei*	Sterculiaceae	Bothi	Leaves	Skin wound
41	*Eriolaena stocksii Hk. F. & Th.*	Sterculiaceae	Bothi	Leaves	Skin wound
42	*Erythrina suberosa Roxb.*	Fabaceae	Pangaro	Bark, Leaves	Astringent, Antidote
43	*Eucalyptus hybrid*	Myrtaceae	Nilgiri	Leaves	Antiseptic, Colic, Headache
44	*Ficus amplissima Sm.*	Moraceae	Payar	Bark, Leaves	Abscesses, Colic, Skin Dis.
45	*Ficus arnottiana Miq.*	Moraceae	Khadak Payar	Bark, Leaves	Skin Dis.
46	*Ficus asperrima Roxb.*	Moraceae	Khorat,Karvat	Fruit, Latex, Leaves	Laxative, Corns, Stomachic, Piles, Warts
47	*Ficus benghalensis L.*	Moraceae	Vad	Whole plant	Aphrodisiac, Abscesses, Syphilis, Leprosy
48	*Ficus hispida L. f.*	Moraceae	BhoyUmaro	Bark, Fruits	Skin Dis.
49	*Ficus racemosa L.*	Moraceae	Umaro	Whole plant	Galactogogue, Leucoderma, Tumours
50	*Ficus religiosa L.*	Moraceae	Peepal	Whole plant	Jaundice, Skin Dis. Astringent, Antidote
51	*Ficus rumphii Blume.*	Moraceae	Payaro	Fruits	Asthma, Emetic, Anthelmintic,

					Vermifuge
52	*Ficus virens Ait.*	Moraceae	Pipri	Bark	Mouth fresheners, Mouth Ulcers
53	*Firmiania colorata (Roxb.) R. Br.*	Sterculiaceae	Indian almond	Gum	Astringent
54	*Flacourtia indica (Burn.f.) Merr.*	Flacourtiaceae	Chopdi ghat, Lodri	Bark, Fruits	Tonsilitis, Astringent
55	*Gardenia turgida Roxb. var. turgida*	Rubiaceae	Gangedi	Fruits	Hypertension, Cancer of Nasal Pharynx
56	*Garuga pinnata Roxb.*	Burseraceae	Kakad	Bark, Leaves	Asthma, Fracture
57	*Gliricidia sepium*	Fabaceae	Iron tree	Bark	Rheumatism, Ulcers, Tumor
58	*Gmelina arborea L.*	Verbenaceae	Sevan	Whole plant	Anemia, Leprosy, Antidote, Eczema, Gout
59	*Grewia tiliaefolia Vahl var.leptopetala*	Tiliaceae	Dhaman	Whole plant	Dysentery, Cough
60	*Heterophragma quadriloculare (Roxb.) K. Schum*	Bignoniaceae	Varas, Avarsu	Root	Antidote
61	*Holoptelea integrifolia (Roxb.) Planch.*	Ulmaceae	Papdo, Kanjo	Bark, Leaves, Seeds	Dyspepsia, Flatulence, Janundice, Diabetes
62	*Hymenodictyon excelsum (Roxb.) Wall.*	Rubiaceae	Bhammarchhal	Bark, Leaves	Sores, Febrifuge, Skin Dis.
63	*Ixora brachiata*	Rubiaceae	Lokhandi	Leaves, Roots, Bark	Dental Problem, Muscular pain, Ulcers
64	*Kydia calycina Roxb.*	Malvaceae	Varing, Bhindi	Leaves	Lumbago, Rheumatism
65	*Lagerstroemia lanceolata Wall. ex. W. & A.*	Lythraceae	Moto Bhondaro	Whole plant	Rheumatism
66	*Lagerstroemia parviflora Roxb.*	Lythraceae	Nano Bhondaro	Gum	Edible
67	*Lannea coromandelica (Houtt.) Herrill*	Anacardiaceae	Modad	Whole plant	Coma, Elephantiasis, Toothcache, Ulcers
68	*Limonia acidissima L.*	Rutaceae	Kotha	Fruits	Asthma, Leucorrhoea, Opthalmic, Tumours
69	*Madhuca indica J. F. Gmel.*	Sapotaceae	Mahua	Whole plant	Paralysis, Antidote, Joint Pain, Tonic
70	*Mallotus philippensis (Lam.) Muell. Arg.*	Euphorbiaceae	Kapil	Fruit, Seeds	Dysentery, Leprosy, Rheumatism, Skin
71	*Mangifera indica Linn.*	Anacardiaceae	Aambo	Bark, Leaves, Fruits	Antidote, Cancer, Diarrhoea, Tonic, Ulcers
72	*Manilkara hexandra (Roxb.) Dub.*	Sapotaceae	Rayan	Fruits, Latex, Seeds	Aphrodisiac, Antidote, Tonic, Dental Pain
73	*Melia azedarach L.*	Meliaceae	Bakan limdo	Whole plant	Alexipharmic, Diuretic,

					Leucoderma, B.P.
74	*Melia composita Willd.*	Meliaceae	Nimbaro	Fruits	Colic, Malaria, Scabies
75	*Meyna laxiflora Robyns*	Rubiaceae	Adav	Fruits	Boils, Dysentery
76	*Miliusa tomentosa (Roxb.) Sinclair*	Annonaceae	Umbh	Leaves	Febrifuge, Skin Dis.
77	*Mitragyna parvifolia (Roxb.) Korth.*	Rubiaceae	Kalam	Bark, Leaves, Roots	Antidote, Diabetes, Swelling, Colic
78	*Morinda tomentosa (Heyne ex Roth) Hk. f.*	Rubiaceae	Aledi	Leaves	Injury, Skin Dis.
79	*Moringa concanensis Nimmo*	Moringaceae	Jangli Sargavo	Whole plant	Abortifacient, Hysteria, Paralysis, Ear, Rheumatism, Epilepsy, Giddiness, Dental
80	*Moringa oleifera Lam.*	Moringaceae	Saragvo	Whole plant	Biliousness, Blood Purifier, Heart problem
81	*Murraya paniculata (L.) Jack.*	Rutaceae	Kamini	Leaves	Astringent, Diarrhoea, Dysentery
82	*Oroxylum indicum (L.) Vent.*	Bignoniaceae	Tetu	Stem, Root, Fruit	Post Delivery Pain, Heart Dis., Tonic, Gout
83	*Ougeinia oojeinensis (Roxb.) Hochreut.*	Fabaceae	Tanach	Stem, Leaves	Asthma, Bronchitis, Dysentery
84	*Phoenix sylvestris (L.) Roxb.*	Arecaceae	Khajuri	Roots	Stomachic after Child Birth
85	*Piliostigma foveolatum (Dalz.) Bth.*	Caesalpiniaceae	Chamoli	Bark	Astringent, Diarrhoea, Dysentery
86	*Piliostigma malabaricum (Roxb.) Bth.*	Caesalpiniaceae	Chamoli	Whole plant	Dysentery, Hypertension
87	*Pithecellobium dulce C. E. P. Mart.*	Mimosaceae	Goras amli	Leaves, Pods	Swelling, Cooling
88	*Plumeria rubra L.*	Apocynaceae	Khadchampo	Bark, Latex, Roots	Veneral Dis., Toothcache, Leprosy
89	*Polyalthia longifolia (Sonn.) Thw.*	Annonaceae	Asopalav	Bark	Febrifuge, Uterine Dis.
90	*Prosopis chilensis (Molina) Stuntze.*	Mimosaceae	Gando Baval	Leaves	Wounds
91	*Psidium guajava L.*	Myrtaceae	Jamphal	Fruit, Leaves	Astringent, Bronchitis, Bleeding Gums
92	*Pterocarpus marsupium Roxb.*	Fabaceae	Biyo	Stem, Roots, Gum	Intestinal, Diabetes, Gynaecological Dis.
93	*Punica granatum L.*	Punicaceae	Dadam	Bark, Fruit, Roots	Heart Dis., Astringent, Ulcers, Dysentery
94	*Radermachera xylocarpa (Roxb.) K. Schum.*	Bignoniaceae	Khad singi	Whole plant	Astringent,, Skin Dis., Antiseptic
95	*Samanea saman (Jacq.) Merr.*	Mimosaceae	Rato shirish	Roots	Stomach Cancer, Diarrhoea, Cold
96	*Sapindus emarginatus Vahl.*	Sapindaceae	Aritha	Fruits	Antidote, Epilepsy, Hair

					value, Emetic
97	*Sapindus laurifolius Vahl.*	Sapindaceae	Arithi	Fruits	Anthelmintic, Emetic
98	*Schleichera oleosa (Lour.) Oken*	Sapindaceae	Kusum	Bark	Abscesses, Backache, Scabies
99	*Schrebera swietenioides Roxb.*	Oleaceae	Mokho	Bark, Leaves, Roots	Anaemia, Diabetes, Leprosy, Rectal, Hydrocele, Rheumatism, Burns, Skin Dis.
100	*Semecarpus anacardium L. f.*	Anacardiaceae	Bhilva, Bhilamo	Whole Plant, Oil	Anthelmintic, Gynaecological Dis., Tonic
101	*Soymida febrifuga (Roxb.) A. Juss.*	Meliaceae	Rohan	Leaves, Bark	Astringent, Diabetes, Malaria
102	*Spermadictyon suaveolens Roxb.*	Rubiaceae	Gida, Mahabal	Whole plant	Diarrhoea, Contraceptive, Fever, Wounds
103	*Spondias pinnata (L. F.) Kurz.*	Anacardiaceae	Ambado	Bark, Fruit, Roots	Diarrhoea, Dysentery, Menorrhagia
104	*Sterculia urens Roxb.*	Sterculiaceae	Kadaya	Gum, Leaves, Bark	Analgesic, Throat Infection, Fractures, Eye
105	*Sterculia villosa Roxb.*	Sterculiaceae	Sardol, Udal	Whole Plant	Constipation, Hydrocele, Dysentery, Sores
106	*Stereospermum suaveolens*	Bignoniaceae	Padal	Flowers, Roots	Aphrodisiac, Asthma, Blood Dis., Cough
107	*Syzygium cumini (L.) Skeels*	Myrtaceae	Jamun	Fruit, Bark, Seed	Asthma, Diarrhoea, Dysentery, Diabetes
108	*Syzygium heyneanum Wall ex W. & A.*	Myrtaceae	Jal-Jamun	Bark,	Diabetes
109	*Tamarindus indica L.*	Caesalpiniaceae	Khati Amli	Fruit, Leaves, Seeds	Analgesic, Antidot, Laxative, Inflammation
110	*Tamarix dioica Roxb. ex. Roth.*	Tamaricaceae	Achhilaijopras	Whole Plant	Astringent
111	*Tectona grandis L.f.*	Verbenaceae	Sag	Wood, Flower, Bark	Contraceptive, Laxative, Diuretic, Leucoderma, Dyspepsia, Sedative
112	*Terminalia arjuna (Roxb.) W. & A.*	Combretaceae	Arjun Sadad	Bark, Fruit, Leaves	Cardiac tonic, Haemorrhage, Leprosy, Polyuria,Skin Dis.,Swelling
113	*Terminalia bellirica (Gaertn.) Roxb.*	Combretaceae	Bahedo	Fruit, Bark, Seeds	Astringent, Fever, Purgative, Hair care
114	*Terminalia chebula Retz.*	Combretaceae	Harde	Fruit, Bark	Astringent, Ulcers
115	*Terminalia crenulata Roth.*	Combretaceae	Sadad	Bark, Stem,	Astringent, Ulcers,

				Leaves	Diabetes
116	*Thespesia populnea (L.) Sol. ex Corr.*	Malvaceae	Paras piplo	Whole Plant	Astringent, Itching, Tonic, Skin Dis.
117	*Trema orientalis (L.) Bl.*	Ulmaceae	Kargol	Whole Plant	Analgesic, Epilepsy
118	*Trewia polycarpa Bth. & Hk.*	Euphorbiaceae	Karmadi, Petar	Bark, Root, Shoot	Diarrhoea, Rheumatism,Flatulence
119	*Wrightia tinctoria R. Br.*	Apocynaceae	Burai kudi	Stem, Bark	Antidote, Dysentery, Swelling, Fever
120	*Wrightia tomentosa R. & S.*	Apocynaceae	Kala Indrajau	Stem, Bark	Antidote, Fever, Menorrhagia
121	*Xeromphis spinosa (Thunb.) Keay*	Rubiaceae	Mindhal	Whole Plant	Astringent, Analgesic, Skin Dis. Diarrhoea
122	*Xeromphis uliginosa (Retz.) Mahesh.*	Rubiaceae	Mindhal	Fruits	Diarrhoea, Dysentery
123	*Zizyphus glabrata Heyne ex Roth*	Rhamnaceae	Jangli Bor	Leaves	Blood Purifier, Veneral Dis.
124	*Zizyphus xylopyra (Retz.) Willd.*	Rhamnaceae	Ghat bor	Roots	Boils

a. ***Fuel wood and Timber:*** Gujarat Forests Statistics (**2010-11**) Reported; the annual turnover of fuel wood by the Dangs, Valsad and Navsari districts forests of Southern Gujarat. Total fuel wood collection was 12890.01 MT was estimated with the value realization of 35.52 Lakhs INR. 4611.44 Cu.M timber was extracted with the value of 252.39 Lakhs INR. *Tectona grandis, Adina cordifolia, Mitragyna parvifolia, Anogeissus latifolia,* and *Ougeinia oojeinensis (Roxb.) Hochreut.* are major timber species used for the construction of houses in Southern Gujarat. *Wrightia tinctoria, Terminalia crenulata, Holarrahena antidycentrica* are used as fuel wood. Annual Administration Report, *MoEF* (**2007-08**) Reported; the annual turnover of fuel wood is 2387.45 MT which is less than 5081.35 MT Annual Administration Report, *MoEF* (**2008-09**).

b. ***NTFP's:*** According to FAO, Non Timber Forest Products (NTFPs) defined as "all goods for commercial, industrial or subsistence use derived from forest and their biomass". Non- Timber Forest Products play a vital role in livelihood of people in and around the forests. NTFPs comprise medicinal plants, dyes, mushrooms, fruits, Resins, bark, roots and tubers, leaves, flowers, seeds, honey and so on (Tejaswi P., 2008). In India, over 3,000 plant species are used as NTFP's and extracted from forests ecosystems. *Terminalia bellerica, Terminalia chebula, Emblica officinalis* fruits, *Madhuca indica* flowers and fruits, *Azadirachta indica, Derris indica Seeds, Buchanania lanzan* Seeds, *Tamarindus indica* fruits, *Anogeissus latifolia* Bark and Gum, *Acacia catechu* Bark and gum, *Butea monosperma Leaf and flowers, Diospyros melanoxylon* Leaf and fruits, *Garuga pinnata fruits, Cassia fistula pods and flowers, Bauhinia racemosa* leaf and flowers, *Agaricus spp., Zizyphus xylopyra* fruits, *Sterculia urens* gum, *Cordia dichotoma f.* Fruits, *Cassia tora* seeds, *Dendrocalamus strictus* and *Bambusa arundinaceae* (Bamboos), etc. are collected by tribals for their livelihood.

c. ***Ecotourism-Economical Significance of Forests:*** The Dangs is having rich forests, small and large waterfalls, beautiful landscapes and tribal culture which account for huge influx of tourists. Saputara located in Shamgahan Forest Range of Dangs South Forest Division, which is on Surat-Nasik high way also known as abode of serpents, is a hill resort on plateau of the Sahyadri range of mountains that offers rich wildlife for touristy.There are around 20 small and big water falls in Dangs. Gira fall at Waghai Forest Range of Dangs South Forest Division is 30 meter drop in to *Ambika River* and offers solace and relaxation. *Girmal* fall if the most scenic sight in the district. The Sunset point- *Ahwa, Naladana Dev (Borakhal), Shabaridham at Subir, Pampa Sarovar, Gira Falls, Botanical Garden (Waghai), Shiv Temple, the Forest of Mahalkot-Mahal, the Fort of Roop Gadh (Kalibel), Maya Devi (Bhenshkatri), Don hill of Piplaidevi, Ghoghli Ghat*

temple, Pandav Ghufa, Anjankund and many more spots have vast potentiality for ecotourism at Dangs. In one of the recent study, now the tourism in Dangs is gradually increasing. Number of tourists visited in the Year 2007-08 were 1, 19,983 and increased in the Year 2008-09 to 1, 54,739. After than in the Year-2009-10 the visitor's appearance was increased to 1, 86,944 (Patel, 2013). Tithal, Daman, Silvasa and Madhuban Dem etc. places are known popular in Valsad District of Gujarat.

V. DISCUSSION

Extractions of marketable NTFPs, if done sustainably, may represent a sound long-term approach to tropical forest conservation and can be integrated with other land uses and management practices (Sinha et al., 2005). Kant (1997) studied the role of NTFPs in three tribal villages of Gujarat and West Bengal states. The study revealed that NTFPs contributed significantly to the household income in tribal village economies. In the case of Gujarat, the contribution of NTFPs to the total house holds' income varied from 20.1 % to 34.1 % while in the case of West Bengal, it ranged from 26.5 to 55.5 %. It was also found that majority of the household employment was generated through collection of NTFPs (36.4 %), followed by settled cultivation (15.11 %) and agricultural labour (14.3 %).

Deforestation has resulted into the loss of soil moisture content and increased erosion of top soil layer. The collection of woods from pruning, thinning and lopping like agro-forestry activities has opened the forest cover in some areas. Soil Organic carbon reduces due to Slash burning *("Adar-burning or Dharu"* verbally called by Tribal communities) processes in agro-farms and emitting huge amount of carbon di-oxide in atmosphere. Rapid Industrialization, Anthropogenic pressure on forests, unregulated urbanization, Non-Sustainable tree removal from available resources, Unplanned Cultivation and encroachment on reserve forests, and infrastructure development etc. causing the Deforestation and therefore, Sustainable forest management is required.

Figure-3: Tree Loss- Dependenc e on Trees for Livelihood

Figure-4: Crop Cultivation after Slash burning

Figure-5: Loss of Tropical Woods and Expanding Cultivation in Western Ghats of Southern Gujarat

VI. CONCLUSION

There are lots of direct and indirect benefits of forests but, most of the human inducing activities in the forests have disturbed the natural cycles. Forest fire, unplanned cultivation and Encroachment, illicit cutting has resulted into the deforestation (Figure-3, 4, 5). It has resulted into definitive changes in the composition of TMDF's. From above all scenario's, we can conclude that, there is huge forests dependence and the demands from forests are high and supply is less which is generating lots of anthropogenic pressure on TMDF's.

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