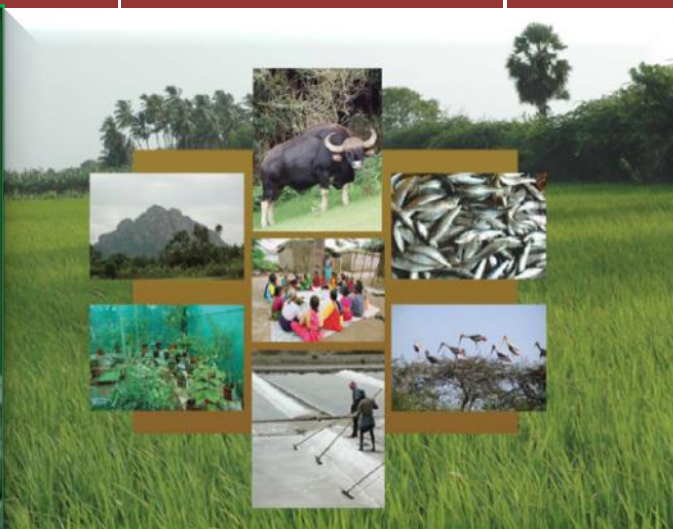
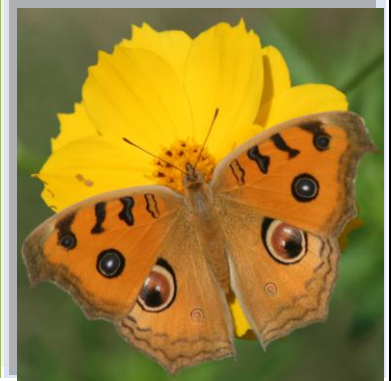


BIODIV News

Jan-Mar, 2010

Volume 1, Issue 2

A Quarterly e-Newsletter



A Quarterly e-Newsletter of U.P. State Biodiversity Board

Editorial

Esteemed Readers,

This year 2010 has been declared as International year of Biodiversity by the United Nations. It is a celebration of life on earth and of the value of biodiversity for our lives. In our continuing efforts to bring the issues related to promotion of biodiversity. we are handing over the Issue 2, Volume 1 of the BIODIV News- the e-quarterly e-Newsletter of the Uttar Pradesh State Biodiversity Board to the entire world to get benefit out of the foot print of knowledge embedded in it.

This issue has incorporated the list of biological resources treated as commodities (which are exempted from the Provision of Biological Diversity Act, 2002) declared by Ministry of Environment and Forests, Govt. of India in consultation with the National Biodiversity Authority, besides, the forest cover of U.P. State as per the report of Forest Survey of India 2009.

A book entitled "Biodiversity and Aquatic of Semi-Aquatic Plants of U.P." has just been released by the U.P. State Biodiversity Board which is the first of its type in colored flora which will be highly useful for the persons engaged in identifying the flora around them.

This year we are going to celebrate International Biodiversity Day on 22nd May 2010 with a theme on "Biodiversity for Development and Poverty Alleviation". Readers are requested to send their contribution related to the theme. An appeal in this regard is also available in this e-Newsletter.

Hope, you will enjoy reading it. The valuable comments/suggestions by the readers are solicited in view of improving the quality of e-Newsletter.

Editors

In this Issue

<i>Editorial</i>	2
<i>The Gazette of India, List of Biological Resources treated as commodities (which are exempted from the Provision of Biological Diversity Act, 2002) declared by Ministry of Environment and Forests, Govt. of India</i>	3-8
<i>India State of Forest Report 2009 - Uttar Pradesh</i>	9-14
<i>Floristic Diversity Of Uttar Pradesh</i>	15-25
<i>Recent Publication of U.P. State Biodiversity Board</i>	27



***Indopiptadenia oudhensis* in fruiting**

The Gazette of India

असाधारण

EXTRORDINARY

भाग II-खण्ड 3- उप-खण्ड (ii)

PART II-Section 3- Sub-Section (ii)

प्राधिकार से प्रकाशित

PUBLISHED BY AUTHORITY

सं 1764]

नई दिल्ली, शुक्रवार, अक्टूबर 30, 2009/ कार्तिक 8, 1931

No. 1764]

NEW DELHI, FRIDAY, OCTOBER 30, 2009/ KARTIKA 8, 1931

पर्यावरण एवं वन मंत्रालय

अधिसूचना

नई दिल्ली, 26 अक्टूबर, 2009

का.आ. 2726 (अ).-केन्द्रीय सरकार, जैव विविधता अधिनियम, 2002 (2003 का 18) की धारा 40 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए राष्ट्रीय जैव विविधता प्राधिकरण के परामर्श से यह घोषित करती है कि अधिनियम के उपबंध नीचे सारणी के स्तंभ (2) में विनिर्दिष्ट निम्नलिखित जैव संसाधनों को लागू नहीं होंगे बशर्ते उनका वस्तु के रूप में व्यापार होता हो :

सारणी

क्रम संख्या	जातियों के नाम
(1)	(2)

I. औषधीय पौधा

1. अबेलमोशचस मोशचैट्टस
2. अकोरस कालामस
3. अधाटोडा जाइलैनिका
4. ऐलो बारबेडिनिस
5. अल्पीनिया कैलकेरेटा
6. अजादीरचता इंडिका
7. कैसेलपीनिया सपन
8. कैसिया अंगुस्टिफोलिया
9. कैथारनथस रोसस
10. क्रोटोन टिगलियम
11. सीचोरियम इंटीबस
12. करकुमा अंगुस्टिफोलिया
13. करकुमा जैरमबेट
14. फिकस बैंगालेनसिस

(1)	(2)
15.	फिकस रैलीजियोसा
16.	ग्लोरियोसा सुपरबा
17.	इंडिगोफेरा टिक्कटोरिया
18.	इनुला रेसिमोसा
19.	जैट्रोफा कुरकास
20.	कैपफीरिया गैलगा
21.	लासोनिया इंटरमिस
22.	लैपिडियम सेटीवम
23.	ओसीमम बेसिलीकम
24.	ओसीमम टेनयुफलोरम
25.	पाइपर लांगम
26.	प्लान्टैगो ओवाटा
27.	प्लैक्ट्रान्टस बारबेटस
28.	पोंगामिया पिनाटा
29.	प्रुमुस आर्मीनियाका
30.	सिलिबम मारियानम
31.	सिमोनडसिया चिनेनसिस
32.	ट्रैचीस्पर्मम ऐमी
33.	वाइटैक्स निगुंडो
34.	विधानिया सोमनिफेरा
35.	जिजीफस जुजुबा
36.	अल्पीनिया गालांगल
37.	अमोमम सुबुंलाटम
38.	कैपसीकम ऐनम

(1)	(2)	(1)	(2)
39.	कैपसीकम फ्रुटससेंस	79.	एंबलिका ऑफिशिनियलस
40.	सिनामोमम अरोमाटिकम	80.	फिकस कैरिका
41.	सिनामोमम टामाला	81.	कैरिसा केरेनडास
42.	सिनामोमम जिलानीकम	82.	टामारिन्डस इंडिका
43.	करकुमा लांगा	83.	ऐगले मारमिलोस
44.	ऐलीटेरिया कारडामोम	84.	आरटोकैरपस इनसाइजा
45.	गारसिनिया कैंबोजिया	85.	ऐवरहो कैरमबोला
46.	गारसिनिया इंडिका	86.	प्रुनस ऐवियम
47.	मुराया कोइनिगी	87.	फोनिक्स डैक्टीलिफेरा
48.	मिरिसटिका फ्रैंगरेंस	88.	सिजियम क्युमिनी
49.	पिमेंटा डायोआइका	89.	इरियोबोत्रा जैपिनोका
50.	पाइपर निगरम	90.	बेसिया लैटिफोलिया
51.	सिजीगियम अरोमाटिकम	91.	गारसिनिया मँगोसटाना
52.	ट्रामैरिनडस इंडिका	92.	ग्रविया सुबिनइक्वैलिस
53.	वनिला प्लानिफोलिया सिन. वनिला फ्रैंगरेंस	93.	नैफिलियम लैपाशियम
54.	जिंगीबर आफिशिनेल	94.	ऐनानास कोमोसस
55.	कोरयिनड्रम सेटीवम	95.	सिजीयम जेंबोस
56.	क्यूमीनम सिमिनम एल.सिन. क्युमिनम ओडरोम	96.	फेरोनिया लिमोनिया
57.	फोइनीकुलम बलगैरे	97.	मेलस डोमेसटिका
58.	ट्रिगोनिला फोनम-ग्रेकम	98.	पाइरस क्यूमिनस
59.	कैरम कोपटीकम	99.	प्रुनस परसिका
60.	ऐनेथम ग्रेवोलेंस	100.	प्रुनस ऐमीगडेलस
61.	निगेला सेटीवा	101.	प्रुनस आर्मीनिका
62.	पिपीनेला ऐनीसम	102.	जुगलंस रीजिया
63.	ऐपियम ग्रेवालेंस	103.	एक्टीनिडिया चाइननसिस
II.	उद्यान फसल	ख	सब्जियां
क.	फल	104.	लाइकोपरसिकोन एस्क्यूलेनटम
64.	मैंगीफेरा इन्डिका	105.	सोलानम मेलोंगेना
65.	कैरिका पपैया	106.	अबेलमोशस एस्क्यूलेनटम
66.	विटिस विनिफेरा	ख. 1	कद्दू
67.	पुनिका ग्रेनेटम	111.	कुकुमिस मेलो
68.	सोडियम गोजावा	112.	सरट्रयूलस लेनेटस
69.	साइट्रस लिमोन	113.	बेनिनकासा हिसपीडा
70.	साइट्रस ओरंटीफोलिया	114.	कुकुमिस सेटीवस
71.	साइट्रस लैटीफोलिया	115.	कुकुमिस मेलो एल.वर युटीलिसीमस
72.	मनिलकारा जापोटा सिन. अचरस सैपोटा	116.	ट्रिचोसानथिस डियोइका
73.	परसिया अमेरीकाना	117.	कोकिनिया इंडिका
74.	पैसीफलोरा इडुलिस	118.	लुफा एक््यूटेनगुला
75.	लिची चिनेनसिस	119.	लुफा सिलींड्रीकल
76.	अनोना रेटीकुलेट	120.	प्रेसीडुलस फिस्टुलोसस
77.	आरटोकैरपस हैट्रोफाइलस	121.	ट्रिचोसानथिस कुकुमेरीना
78.	जिजीफस मॉरिशोनिया	122.	कुकुमिस मेलो वर. मोमोरडिका

(1)	(2)	(1)	(2)
123.	कुकुमिस कैलोसस	163.	केमेलिया साइननसिस
ख. 2	कूसीफेरी और शीतोष्ण सब्जियाँ	164.	कोफिया अरेबिका
124.	ब्रैसिका ओलेराशिया सब्सप. कैपिटटा	165.	कोफिया रोबसटा
125.	ब्रैसिका ओलेराशिया एल वर. बोट्रीटिस	166.	हेविया ब्रासिलीनसिस
126.	ब्रैसिका ओलेराशिया वर. इटेलिका	167.	इलेकिस गिनीनसिस
127.	ब्रैसिका ओलेराशिया वर गोंगीलोड्स	168.	बोरोसस फलेबेलीफर
128.	डाकूस कैरोटा	च. औषधीय फसलें	
129.	बेटा बलगेरिस	169.	पापावर सोमनीफेरम
130.	रैफेनस सैटीवस	170.	क्लोरोफाइडम बोरीविलेनम
131.	ब्रासिका ओलेराशिया वर. जेमिफेरा	171.	डाइयोस्कोरिया फलोरीबंडा
132.	लैक्टुका सटीवा	172.	डिजिटेलिस लेनेटा
133.	बेटा वलगेरिस वर. बंगेलीनसिस	173.	ग्लेशियम फलेवम
134.	पैट्रोसेलिनम होर्टेन्स	174.	गलाइकेरिजा गलेब्रा
135.	स्पीनेशिया ओलेराशिया	175.	राओवोलफिया सरपेंटीना
ख. 3	छीमीदार और पत्तेदार सब्जियाँ	176.	सोलानम लेसीनेटम
136.	फैजोलस वुगैरसिस	177.	सोलानम वायरम
137.	विगना अनग्युलाता	178.	पाइपर बेटली
138.	डालीचोस लबलब	179.	हियोस्काइमस म्यूटीकस
139.	पिसीयम सैटीवम	180.	थाइमस वलगेरिस
140.	साइमोपसिस टेट्रागोनोलोबस	छ. सुगंधित फसलें	
141.	मोरिंगा ओलेफेरा	181.	सिंबोपोगोन फलैक्सयूसस
142.	सेसबेनिया ग्रांडीफलोरा	182.	सिंबोपोगोन मारटीनी वर. मोशिया
ग.	जड़, कंद और कंदीय फसलें	183.	मेंथा स्पाइकेटा
143.	सोलानम ट्यूबरोसम	184.	वैलिरियना जटामानसी
144.	मैनीहोट एस्क्यूलेंटा	185.	पेलरगोनियम ग्रवोलंस
145.	इपोमेइया बटाटास	186.	आर्टीमिशिया पैलंस
146.	डाइयोस्कोरिया अलाटा	187.	सिंबोपोगोन विंटेरियन्स
147.	डाइयोस्कोरिया एरक्यूलेंटा	188.	मेंथा अरवेंसिस
148.	डाइयोस्कोरिया रोटनडाटा	189.	पोगोस्टेमोन पैटचोली
149.	अमोरफोफालस पायोनीफालियस	190.	वैटीविरिया जिजेनीआइडीस
150.	सोलेनोस्टमोन रोटंडीफोलिया		
151.	पैचीरजियस इरोसस		
152.	ऐलियम सीपा		
153.	ऐलियम सैटीवम		
154.	मोरेंटा अरुंडीनेशिया		
घ.	पुष्प फसलें		
155.	पोलिसनथेस ट्यूबरोज		
156.	डाइनथस कैरियोफाइलस		
157.	कैलीस्टेफस चाइनिनसिस		
158.	सिमबीडीयम एंड डैड्रोबियम		
ङ	बागान फसलें		
159.	कोकोस न्यूसीफेरा		
160.	अरेका कैटेकू		
161.	थियोब्रोमा कैकू		
162.	ऐनाकारडियम आक्सीडेंटेल		

[फा.सं.28-13 / 2008-सीएस. III]
ए.के. गोयल, संयुक्त सचिव



(*Gloriosa superba*)

(1) (2)
MINISTRY OF ENVIRONMENT AND FORESTS

NOTIFICATION

New Delhi, the 26 th October, 2009

S.O.2726(E).-In exercise of the powers conferred by Section 40 of the Biological Diversity Act, 2002 (18 of 2003), the Central Government, in consultation with the National Biodiversity Authority, hereby declares that the provisions of the Act shall not apply to the following biological resources specified in column (2) of the Table below provided they are treated as commodities.

SI.No.	Biological Resources
(1)	(2)
I.	Medicinal Plants
1.	<i>Abelmoschus moschatus</i>
2.	<i>Acorus calamus</i>
3.	<i>Adhatoda zeylanica</i>
4.	<i>Aloe barbadensis</i>
5.	<i>Alpinia calcarata</i>
6.	<i>Azadirachta indica</i>
7.	<i>Caesalpinia sappan</i>
8.	<i>Cassia angustifolia</i>
9.	<i>Catharanthus roseus</i>
10.	<i>Cichorium intybus</i>
11.	<i>Croton tiglium</i>
12.	<i>Curcuma angustifolia</i>
13.	<i>Curcuma zerumbet</i>
14.	<i>Ficus benghalensis</i>
15.	<i>Ficus religiosa</i>
16.	<i>Gloriosa superba</i>
17.	<i>Indigofera tinctoria</i>
18.	<i>Inula racemosa</i>
19.	<i>Jatropha curcas</i>
20.	<i>Kaempferia galanga</i>
21.	<i>Lawsonia inermis</i>
22.	<i>Lepidium sativum</i>
23.	<i>Ocimum basilicum</i>
24.	<i>Ocimum tenuiflorum</i>
25.	<i>Piper longum</i>
26.	<i>Plantago ovata</i>
27.	<i>Plectranthus barbatus</i>
28.	<i>Pongamia pinnata</i>
29.	<i>Prunus armeniaca</i>

(1)	(2)
30.	<i>Silybum marianum</i>
31.	<i>Simmondsia chinensis</i>
32.	<i>Trachyspermum ammi</i>
33.	<i>Vitex negundo</i>
34.	<i>Withania somnifera</i>
35.	<i>Ziziphus jujuba</i>
II.	Spices
36.	<i>Alpinia galangal</i>
37.	<i>Amomum subulatum</i>
38.	<i>Capsicum annum</i>
39.	<i>Capsicum frutescens</i>
40.	<i>Cinnamomum aromaticum</i>
41.	<i>Cinnamomum tamala</i>
42.	<i>Cinnamomum zelaynicum</i>
43.	<i>Curcuma longa</i>
44.	<i>Elettaria cardamomum</i>
45.	<i>Garcinia cambogia</i>
46.	<i>Garcinia indica</i>
47.	<i>Murraya koenigii</i>
48.	<i>Myristica fragrans</i>
49.	<i>Pimenta dioica</i>
50.	<i>Piper nigrum</i>
51.	<i>Syzygium aromaticum</i>
52.	<i>Tramarindus indica</i>
53.	<i>Vanilla planifolia</i> syn. <i>Vanilla fragrans</i>
54.	<i>Zingiber officinale</i>
55.	<i>Coriandrum sativum</i>
56.	<i>Cuminum cyminum</i> L.Syn. <i>Cuminum odorum</i>
57.	<i>Foeniculum vulgare</i>
58.	<i>Trigonella foenum-graecum</i>
59.	<i>Carum copticum</i>
60.	<i>Anethum graveolens</i>
61.	<i>Nigella sativa</i>
62.	<i>Pimpinella anisum</i>
63.	<i>Apium graveolens</i>
III.	Horticultural crops
A.	Fruits
64.	<i>Mangifera indica</i>
65.	<i>Carica papaya</i>
66.	<i>Vitis vinifera</i>
67.	<i>Punica granatum</i>
68.	<i>Psidium guajava</i>
69.	<i>Citrus limon</i>
70.	<i>Citrus aurantifolia</i>
71.	<i>Citrus latifolia</i>

(1)	(2)	(1)	(2)
72.	<i>Manikara zapota</i> syn. <i>Achras sapota</i>	115.	<i>Cucumis melo</i> L. var. <i>utilissimus</i>
73.	<i>Persea Americana</i>	116.	<i>Trichosanthes dioica</i>
74.	<i>Passiflora edulis</i>	117.	<i>Coccinia indica</i>
75.	<i>Litchi chinensis</i>	118.	<i>Luffa acutangula</i>
76.	<i>Annona reticulate</i>	119.	<i>Luffa cylindrical</i>
77.	<i>Artocarpus heterophyllus</i>	120.	<i>Praecitrullus fistulosus</i>
78.	<i>Ziziphus mauritiana</i>	121.	<i>Trichosanthes cucumerina</i>
79.	<i>Emblica officinalis</i>	122.	<i>Cucumis melo</i> var. <i>momordica</i>
80.	<i>Ficus carica</i>	123.	<i>Cucumis callosus</i>
81.	<i>Carissa carandas</i>	B.2 Crucifers and Temperate Vegetables	
82.	<i>Tamarindus indica</i>	124.	<i>Brassica oleracea</i> subsp. <i>Capitata</i>
83.	<i>Aegle marmelos</i>	125.	<i>Brassica oleracea</i> L. var. <i>botrytis</i>
84.	<i>Artocarpus incisa</i>	126.	<i>Brassica oleracea</i> var. <i>Italica</i>
85.	<i>Averrhoa carambola</i>	127.	<i>Brassica oleracea</i> var. <i>gongylodes</i>
86.	<i>Prunus avium</i>	128.	<i>Daucus carota</i>
87.	<i>Phoenix dactylifera</i>	129.	<i>Beta vulgaris</i>
88.	<i>Syzygium cuminii</i>	130.	<i>Raphanus sativus</i>
89.	<i>Eriobotrya japonica</i>	131.	<i>Brassica oleracea</i> var. <i>gemmaifera</i>
90.	<i>Bassia latifolia</i>	132.	<i>Lactuca sativa</i>
91.	<i>Garcinia mangostana</i>	133.	<i>Beta vulgaris</i> var. <i>bengalensis</i>
92.	<i>Grewia subinequalis</i>	134.	<i>Petroselinum hortense</i>
93.	<i>Nephelium lappaceum</i>	135.	<i>Spinaceae oleracea</i>
94.	<i>Ananas comosus</i>	B.3 Leguminous and Leafy Vegetables	
95.	<i>Syzygium jambos</i>	136.	<i>Phaseolus vulgaris</i>
96.	<i>Feronia limonia</i>	137.	<i>Vigna unguiculata</i>
97.	<i>Malus domestica</i>	138.	<i>Dolichos lablab</i>
98.	<i>Pyrus communis</i>	139.	<i>Pisum sativum</i>
99.	<i>Prunus persica</i>	140.	<i>Cyamopsis tetragonolobus</i>
100.	<i>Prunus amygdalus</i>	141.	<i>Moringa oleifera</i>
101.	<i>Prunus armeniaca</i>	142.	<i>Sesbania grandiflora</i>
102.	<i>Juglans regia</i>	C. Root, Tuber and Bulbous Crops	
103.	<i>Actinidia chinensis</i>	143.	<i>Solanum tuberosum</i>
B. Vegetables		144.	<i>Manihot esculenta</i>
104.	<i>Lycopersicon esculentum</i>	145.	<i>Ipomoea batatas</i>
105.	<i>Solanum melongena</i>	146.	<i>Dioscorea alata</i>
106.	<i>Abelmoschus esculentus</i>	147.	<i>Dioscorea esculenta</i>
B.1 Cucurbits		148.	<i>Dioscorea rotundata</i>
107.	<i>Momordica charantia</i>	149.	<i>Amorphophallus paeoniifolius</i>
108.	<i>Cucurbita moschata</i>	150.	<i>Solenostmon rotundifolius</i>
109.	<i>Cucurbita pepo</i>	151.	<i>Pachyrrhizus erosus</i>
110.	<i>Lagenaria siceraria</i>	152.	<i>Allium cepa</i>
111.	<i>Cucumis melo</i>	153.	<i>Allium sativum</i>
112.	<i>Citrullus lanatus</i>	154.	<i>Maranta arundinaceae</i>
113.	<i>Benincasa hispida</i>	D. Flower Crops	
114.	<i>Cucumis sativus</i>	155.	<i>Polianthes tuberosa</i>

(1)	(2)
156.	<i>Dianthus caryophyllus</i>
157.	<i>Callistephus chinensis</i>
158.	<i>Cymbidium and Dendrobium</i>
E. Plantation Crops	
159.	<i>Cocos nucifera</i>
160.	<i>Areca catechu</i>
161.	<i>Theobroma cacao</i>
162.	<i>Anacardium occidentale</i>
163.	<i>Camelia sinensis</i>
164.	<i>Coffea Arabica</i>
165.	<i>Coffea robusta</i>
166.	<i>Hevia brasiliensis</i>
167.	<i>Elacis guineensis</i>
168.	<i>Borassus flabellifer</i>
F. Medicinal Crops	
169.	<i>Papaver somniferum</i>
170.	<i>Chlorophytum borivilianum</i>
171.	<i>Dioscoria floribunda</i>
172.	<i>Digitalis lanata</i>
173.	<i>Glaucium flavum</i>
174.	<i>Glycyrrhiza glabra</i>
175.	<i>Rauwolfia serpentina</i>
176.	<i>Solanum lacinatedum</i>
177.	<i>Solanum viarum</i>
178.	<i>Piper betle</i>
179.	<i>Hyoscyamus muticus</i>
180.	<i>Thymus vulgaris</i>
G. Aromatic Crops	
181.	<i>Cymbologon flexuosus</i>
182.	<i>Cymbopogon martini var. motia</i>
183.	<i>Mentha spicata</i>
184.	<i>Valeriana jatamansi</i>
185.	<i>Pelargonium graveolens</i>
186.	<i>Artemisia pallens</i>
187.	<i>Cympopogon winterianus</i>
188.	<i>Mentha arvensis</i>
189.	<i>Pogostemon patchouli</i>
190.	<i>Vetiveria zizanioides</i>

[F.No.28-13/2008-CS-III]

A.K.GOYAL, Jt. Secy.

Source: State of Forest Report 2009 (India)

UTTAR PRADESH

1 Introduction

Uttar Pradesh, the most populous State of the country, is situated between 23°52' and 30°24' N latitude and 77°05' and 84°38' E longitude. The State shares international border with Nepal and is bounded by the States of Uttarakhand, Himachal Pradesh, Haryana, Delhi, Rajasthan, Madhya Pradesh, Chhattisgarh, Bihar and Jharkhand. Geographical area of the State is 240,928 km² which constitutes 7.3% of the total area of the country. The State can be divided into two physiographic zones namely; the vast Gangetic plains having highly fertile alluvial soil and the smaller Southern Hill Plateau having predominantly rocky strata. The major rivers flowing through the State are Ganga, Yamuna, Ramganga, Gomti and Ghaghra.

The climate of Uttar Pradesh is characterized by temperatures ranging from 5°C during winter to 45°C in summer. Annual rainfall varies from 1,000 mm to 1,200 mm of which about 90% occurs during June to September by the southwest monsoon.

Population of the State is 166.05 million (Census 2001) constituting 16.2% of country's population. Rural and Urban population is 79.22% and 20.78% respectively. Population density is 689 persons per km². The projected population of the State by the Office of RGI, for the year 2009 is 193.76 million. Population of the Scheduled Tribes in the State is negligible and is confined to a few districts. The livestock population of the State is 58.53 million (Livestock Census 2003), which is the largest in the country and constitutes nearly 12% of the country's total livestock.

Land use pattern of the State is given in Table

2 Recorded Forests Area

The recorded forest area of the State is 16,583 km² which is 6.88 % of its geographical area. Reserved Forests constitute 70.31%, Protected Forests 8.56% and U classed Forests 21.12% of the total forest area.

3 Protected Areas

Uttar Pradesh has one National Park and 23 Wildlife Sanctuaries covering an area of 5,712 km² which constitutes 2.37% of the State's geographical area. The oldest Wildlife Sanctuary of the country, the Chandraprabha Wildlife Sanctuary is located in Uttar Pradesh.

Uttar Pradesh has 1 Tiger Reserve namely, Dudhwa Katerniaghat (extension) which is also famous for swamp deer and rhinoceros.

4 Joint Forest Management

Joint Forest Management started in the State in 1992. There are 1,892 JFM Committees managing about 80,000 ha of forest area. More than 0.8 million families are involved in this programme, of which around 83,000 families belong to the Scheduled Tribes.

Source: MoEF, 2005.

Table 1 Land use pattern

Land Use	Area in '000ha	Percentage
Total geographical area	24,093	
Reporting area for land utilization	24,201	100.00
Forests	1,654	6.83
Not available for cultivation	3,215	13.28
Permanent pastures and other grazing lands	65	0.27
Land under misc. tree crops & groves	376	1.55
Culturable wasteland	439	1.81
Fallow lands other than current fallows	550	2.27
Current fallows	1,270	5.25
Net area sown	16,633	68.73

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2006

5 Forest Cover

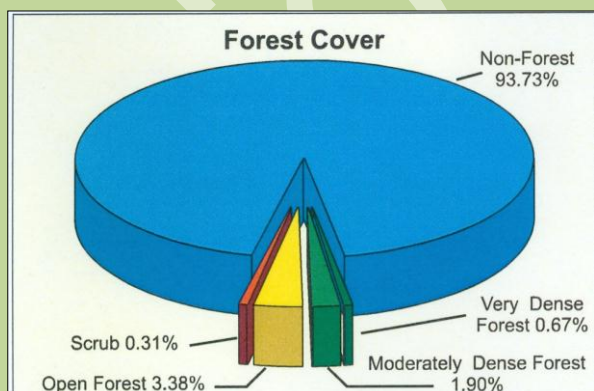


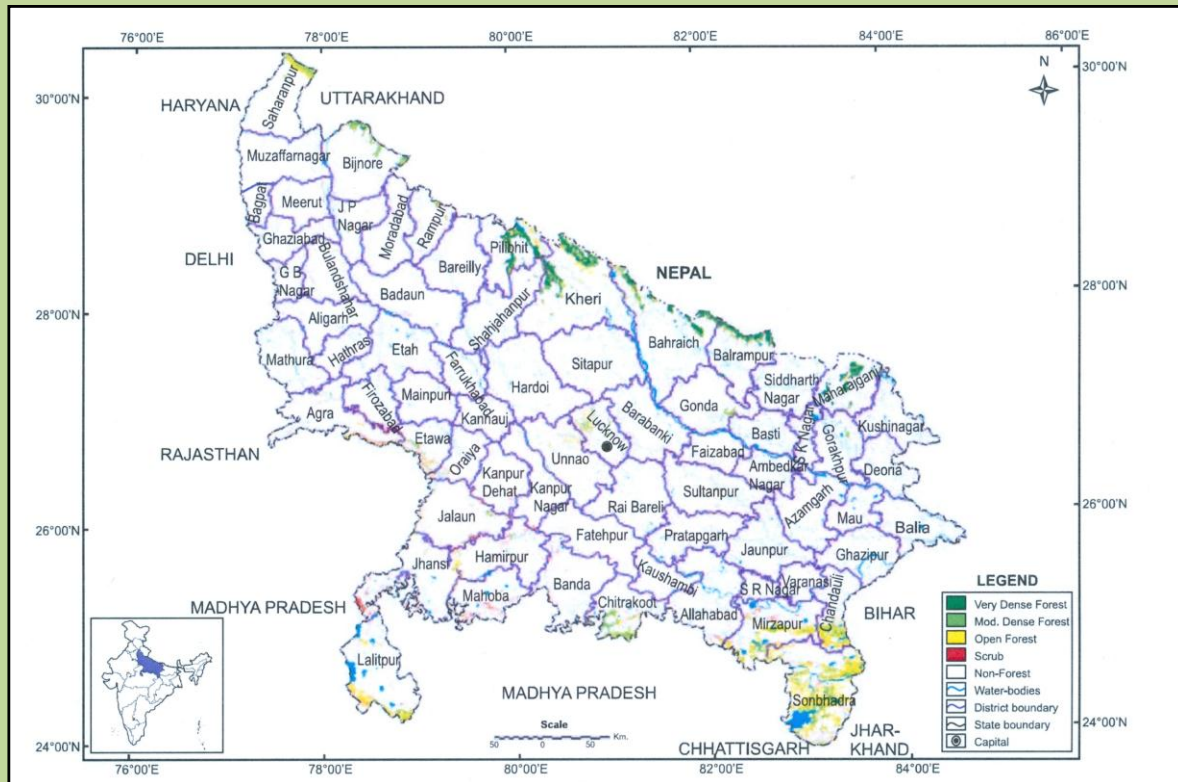
figure.

The forest cover in the State, based on interpretation of satellite data of Oct - Dec 2006, is 14,341 km², which is 5.95% of the State's geographical area. In terms of forest canopy density classes, the State has 1,626 km² very dense forest, 4,563 km² moderately dense forest and 8,152 km² open forest. The distribution of forest cover of the State is shown in the adjoining

Comparison of the current forest cover (satellite data of Oct - Dec 2006) with the previous assessment (satellite data of Oct - Dec 2004) shows that there is decrease of 5 km² in forest cover.

The change matrix, given in Table 2 reveals that there has been a decrease of 6 km² in the moderately dense forest and increase of 1 km² in open forest.

District wise forest cover in different canopy density classes and scrub is given in the Table 3



Forest cover map of Uttar Pradesh

Table 2 Forest cover change matrix

(area in Km²)

2005 Assessment (Data of Oct-Dec 2004)	2007(Data of Oct-Dec 2006)					Total of 2005
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	1626	0	0	0	0	1,626
Moderately Dense Forest	0	4,563	2	0	4	4,569
Open Forest	0	0	8,149	0	2	8151
Scrub	0	0	0	745	5	750
Non-Forest	0	0	1	0	225,831	225,832
Total of 2007	1626	4,563	8,152	745	225,842	240,928
Net Charge	0	-6	1	-5	10	

Table 3 District-wise forest cover in 2007
Number of districts: 70

Distict	Geographical area	Very dense forest	Mod. dense forest	Open forest	Total	% of G.A.	Change*	Scrub
Agra	4,027	0	67	209	276	6.85	1	74
Aligarh	3,650	0	7	59	66	1.81	0	2
Allahabad	5,137	0	27	68	95	1.85	-1	23
Ambedkar Nagar	2,337	0	2	32	34	1.45	0	0
Azamgarh	4,234	0	1	26	27	0.64	-2	0
Bagpat	1,321	0	5	12	17	1.29	1	0
Bahraich & Shravasti	6,878	290	315	243	848	12.33	0	4
Ballia	3,349	0	0	25	25	0.75	0	0
Balrampur	2,981	225	188	116	529	17.75	-2	3
Banda	4,532	0	26	77	103	2.27	-1	29
Baranbanki	4,402	0	4	79	83	1.89	-2	2
Bareilly	4,120	0	7	37	44	1.07	1	0
Basti	2,688	0	5	13	18	0.67	0	0
Bijnor	4,561	45	238	140	423	9.27	0	3
Budaun	5,168	0	12	30	42	0.81	1	8
Bulandshahr	2,910	0	33	82	115	3.95	-1	0
Chandauli	2,549	6	194	365	565	22.17	0	11
Chitrakoot	3,092	0	358	203	561	18.14	0	15
Deoria	2,538	0	1	14	15	0.59	0	0
Etah	4,446	0	9	90	99	2.23	-1	0
Etawah	2,311	0	44	142	186	8.05	0	42
Faizabad	2,174	0	5	50	55	2.53	0	0
Farrukhabad	2,181	0	13	33	46	2.11	0	0
Fatehpur	4,152	0	7	38	45	1.08	1	14
Firozabad	2,361	0	4	43	47	1.99	3	26
Gautam Budh Nagar	1,442	0	12	23	35	2.43	0	0
Ghaziabad	2,590	0	18	31	49	1.89	1	0
Ghazipur	3,377	0	1	30	31	0.92	0	0
Distict	Geographical area	Very dense forest	Mod. dense forest	Open forest	Total	% of G.A.	Change*	Scrub
Gonda	4,003	0	60	47	107	2.67	0	0
Gorakhpur	3,321	0	40	24	64	1.93	0	0
Hamirpur	4,282	0	66	108	174	4.06	-2	39
Hardoi	5,986	0	7	114	121	2.02	1	0
Hathras	1,840	0	1	22	23	1.25	-2	0
Jyotiba Phule Nagar	2,249	0	24	61	85	3.78	2	0
Jalaun	4,565	0	65	179	244	5.35	1	48
Jaunpur	4,038	0	11	40	51	1.26	-1	0
Jhansi	5,024	0	33	167	200	3.98	0	121

Kannauj	2,093	0	0	28	28	1.34	0	0
Kanpur Nagar & Dehat	6,176	0	12	97	109	1.76	-1	37
Kaushambi	2,124	0	7	20	27	1.27	-1	0
Kheri	7,680	409	475	436	1,320	17.19	-1	1
Kushinagar	2,906	0	3	32	35	1.20	0	0
Lalitpur	5,039	0	128	442	570	11.31	0	41
Lucknow	2,528	0	116	185	301	11.91	-1	0
Maharajganj	2,952	239	113	109	461	15.62	0	2
Mahoba	2,884	0	22	73	95	3.29	1	96
Mainpuri	2,760	0	1	13	14	0.51	-1	0
Mathura	3,340	0	5	55	60	1.80	-2	6
Mau	1,713	0	0	7	7	0.41	0	0
Meerut	2,590	0	34	32	66	2.55	1	0
Mirzapur	4,521	0	323	543	866	19.16	-1	44
Moradabad	3,718	0	5	21	26	0.70	0	0
Muzaffarnagar	4,008	0	14	27	41	1.02	0	0
Oraiya	2,015	0	8	61	69	3.42	0	11
Pilibhit	3,499	340	158	200	698	19.95	0	0
Pratapgarh	3,717	0	25	68	93	2.50		2
Rae Bareli	4,609	0	5	93	98	2.13	-1	1
Rampur	2,367	0	26	47	77	3.25	1	0
Saharanpur	3,689	0	175	200	375	10.17	2	0
Sant Kabir Nagar	1,646	0	0	2	2	0.12	2	0
Sand Ravidas Nagar	1,015	0	0	1	1	0.10	0	0
Shahjahanpur	4,575	23	63	36	122	2.67	0	0
Siddharth Nagar	2,895	0	9	30	39	1.35	1	0
Sitapur	5,743	0	14	199	213	3.71	-2	2
Sonbhadra	6,788	45	870	1,626	2541	37.43	1	38
Sultanpur	4,436	0	15	162	177	3.99	-1	0
Unnao	4,558	0	26	224	250	5.48	-1	0
Varanasi	1,528	0	1	11	12	0.79	0	0
Total	240,928	1,626	4,563	8,152	14,341	5.95	-5	745

*Change compared to 2005 assessment (revised)

4 Altitude Zone wise Forest Cover

Forest cover of the State in different altitude zones is given in Table 1.4

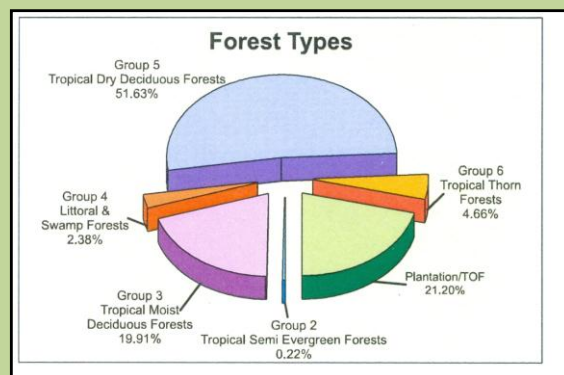
Table 4 Altitude Zone wise Forest Cover

Altitude Zone	VDF	MDF	OF	Total
0-500m	1,625	4,355	7,948	13,928
500-1000m	1	208	204	413
Total	1,626	4,563	8,152	14,341

(based on SRTM Digital Elevation Model)

6 Forest Cover in different Forest Types

As per Champion & Seth Classification System (1968), the State has 27 forest types which belong to 5 forest type groups viz Tropical Semi Evergreen, Tropical Moist Deciduous, Littoral & Swamp, Tropical Dry Deciduous and Tropical Thorn Forests.



Distribution of forest cover in different forest type groups found in the State is given in the pie diagram.

7 Tree Cover

Tree cover of the State has been estimated using sample data of TOF inventory collected over a period of six years i.e. 2002-08. The estimated tree cover in the State is 7,381 km² which is 3.06% of the geographical area of the State. Seventeen districts I Agra, Allahabad, Azamgarh, Bahraich, Balia, Bijnore, Etah, Gautam Buddh Nagar, Gorakhpur, Jhansi, Kheri, Maharajganj, Mirzapur, Rai Bareli, Rampur, Shahjahanpur and Unnaol of the State have been inventoried. The forest and tree cover of the State is presented in the Table 5.

1.5 Forest & Tree cover

Category	Area	(area in km ²) % of Geographical area
Tree Cover	7,381	3.06
Forest Cover	14,341	5.95
Forest & Tree Cover	21,722	9.01

FLORISTIC DIVERSITY OF UTTAR PRADESH

D.C.SAINI

Birbal Sahni Institute of Palaeobotany, 53, University Road, Lucknow - 226007,
INDIA.

INTRODUCTION

The flora of India is more varied than that of any other country of equal area in Eastern hemisphere, if not the globe. This is due to its geographical extension, embracing so many degree of latitude, temperate and tropical; to its surface rising from the level from the sea to height above the limits of the vegetation; to its climates varying from torrid to arctic and from almost aridity to a maximum of humidity to the immigration of plants from widely different bordering countries, notably Chinese and Malayan on the east and south, of Oriental, European and African on the west and the Tibetan on the north. Later on after critical analysis of flora by different phytogeographers it has been convincingly concluded that India has a flora of its own and in fact as many as 5,000 species are endemic to this region. Due to the unique, rich and diverse floristic composition on various habitats, India is considered as twelve mega centers of origin and diversity of several plant species in the world. It is estimated that out of total 46,214 plant species of all groups of plant kingdom, more than 17,500 flowering plants, gymnosperm and pteridophytes are accounted for in this region.

It was the dawn of Indian botanical studies, when plants of India were scientifically studied and identified by ancient people during 4,000 B.C., mainly for their medicinal, agricultural witan horticultural purpose. Linnaean nomenclature was introduced into India during the eighteenth century, setting the stage for more floristic studies. In 1787 the Indian Botanical Garden was established, and the first half of the nineteenth century was a ferment of floristic exploration, collection and publication by Europeans. The publication of Flora of British India (1872-1897), gave impetus to taxonomic studies in our country and several floras pertaining to different regions were published within sort span of time.

Unfortunately the taxonomic studies sharply declined after the first quarter of the present century and a clear gap in the knowledge of systematic studies can be marked till the revival of interest in the late fifties after the re-establishment of Botanical Survey of India. This was perhaps due to tendency of botanists who were unduly influenced by modern branches of Biology and considered taxonomy to be of little significance and a dead subject. Negligence of interest in taxonomy gradually led to the development of taxophobic symptoms among the students. However, the forest departments of various states and some workers in Universities kept alive their interest in taxonomy and published a few floristic accounts. All such contributions have no doubt enriched our knowledge of the floristics of our country but the quantum of work with reference to the area of our sub-continent is rather meager as to be helpful in preparation of modern flora of India.

Reduction of forests and scrub land due to indiscriminate felling of forest tree to fulfill the requirement of mounting population, it is necessary that each Universities should establish a Herbarium in their Botany department and take up the intensive exploration of respective town and neighboring areas in order to have thorough knowledge of plants with reference to their occurrence, distribution, ecological associations and pheological notes. The local herbaria maintaining the collections of wild plants with their fruits and seeds, medicinal plants, economic crop and ornamental plants will be of immense value not only for the collection of data and preparation of useful monograph on respective group of vegetables wealth pertaining to various areas but also for the dissemination of knowledge of plants among the people. Herbarium specimens provide a valuable record of the previously occurred flora of a specific area that has

been devastated during developmental activities in the past. Thus, developing herbaria in various Universities, colleges and Research Institutes all over India is an utmost need. It is unfortunate that our Universities did not pay attention to this. However, few works on floras of University town were compiled during recent past. Delhi University took a lead in and produced a Flora of Delhi.

In order to assess the actual status of floristic diversity of any specific area, the revision of local, regional and state flora and other monographs based on modern collections is very essential, each after ten years. The modern collections here mean collection with all possible field data, photographs depicting type of vegetation, ecological features, and variations of species under different habitats; special collection of delicate plant parts and carpological collection. Hence, it has become essential to workout the existing flora of Uttar Pradesh.

Uttar Pradesh state is situated in north central part of India. The northwestern section of the state was carved in 2000 by creation of a new state of Uttaranchal. The climate of the state is tropical monsoon. The moderate rainfall is supplemented by an extensive system of canal irrigation. Forests constitute about 12.8% of the total geographical area of the state. The northern part of the state, formed by the Yamuna, Ganges, and Ghaghara rivers is known as Gangetic Plain. This region has highly fertile alluvial soils and flat topography broken by numerous ponds, lakes and rivers. The tarai and bhabhar areas in the Gangetic Plain have rich forests of moist deciduous type. The Vindhyan Hill and plateau in the southern region bears hard rock strata; varied topography of hills and plains; valleys and plateau and limited water availability. The Vindhyan forests consist mostly of scrub. Having unique geographical position, topography, sufficient rain and moisture the state harbours a very rich and diverse flora.

Recently due to decline in forest cover and unsustainable exploitation of plant resources for meeting the multifarious requirement of explosive human population, the natural vegetation of the state has been continuously and increasingly under threat. This is fuelling an unprecedented decline in plant species. Keeping these points in view, an attempt has been made to document the detailed account of floristic diversity exist in Uttar Pradesh. Duthie may be regarded as pioneer plant collector of this area and his work "Flora of Upper Gangetic Plain and of the adjacent Siwalik and Sub-Himalayan tract" (1903-1929) is an important reference book for the floristics of entire province. In this flora he has not referred to the district even ones and only casual reference to the plants of the neighboring areas have been mentioned.

CLIMATE AND VEGETATION

The region enjoys monsoon type of climate. The climate is markedly periodic and is divided into three seasons i.e. rainy season, winter season and summer season. The monsoon rains commence during June (3rd week) and come to an end in September but may persist till October. From October to May there is the usually long dry weather with only scanty winter rains. The hot weather commences in March and lasts till the rains set in. The minimum temperature goes down to 3°C in month of January and maximum rises up to 43°C in the month of June.

The vegetation of any area comprises tree, shrubs and herbs along with fruit orchards. The trees, shrubs and woody climbers have long life. They survive for many years. Therefore, they may be called the permanent vegetation. The general vegetation, other than forests in the area is mainly characterized by large number of herbaceous plants growing on variety of habitats with scattered occurrence of many indigenous and exotic species of tree and shrubs in open areas or cultivated in public and private gardens and along road sides. Almost all the herbaceous plants are seasonal. Their life is for three or four months. They germinate in the beginning of season as at the end of outgoing season died after completing their life cycle at the end of season. Every season has their own herbaceous vegetation along with some intermixing of plants of preceding season which are biennials. Therefore, this vegetation may be described as seasonal vegetation.

Thus the vegetation of the district may be divided in two categories.

1. Permanent Vegetation.
2. Seasonal Vegetation.

PERMANENT VEGETATION

The general vegetation of the area is **Sub-tropical deciduous type**. However, some of the trees are evergreen and semi evergreen. The area is under the influence of human and their domestic animals. Thus, the vegetation of this area is being damaged by, cutting down of plants for fodder, fuel, grazing, fire and various developmental projects. The vegetation of these areas is mainly characterized by large number of herbaceous plants growing on variety of habitats along with scattered occurrence of many indigenous and exotic species of trees and shrubs in open areas or cultivated in gardens and along road sides. Orchards of mango and guava are common in the area.

The vegetation under this category is mainly represented by trees, shrubs and woody climbers. Though members of permanent vegetation are scattered on variety of habitats in the area, but to study the vegetation of this category, forests of the district have been taken into consideration, because forest are, such a place where we can find all members of permanent vegetation in their natural habitats along with their characteristic associates.

FOREST TYPES AND VEGETATION

The temperature and rainfall data given above indicate that vegetation of the district comes under Sub-tropical deciduous type by mixture of trees particularly all of which are deciduous during the dry season, usually for several months. Sal and miscellaneous forests are found in almost entire area. The Sal forests are in the climax stage of the plant succession. The miscellaneous forest is of preclimax stage. The medium quality bamboo forests are also found at several places. According to Champion and Seth (1968) the forests of the area can be classified as under:

SUB-TROPICAL DECIDUOUS FORESTS

A. CLIMATIC TYPE:

1. Moist Sub-tropical (Peninsular) Low level Sal forests
2. Dry Sub-tropical (Peninsular) Sal forests
3. West Gangetic Moist Mixed Deciduous Forests
4. Southern Dry Mixed Deciduous Forests
5. Northern Dry Mixed Deciduous Forests
6. Riverain or Riparian Fringing Forests

B. GENERAL EDAPHIC TYPE:

7. Salai (*Boswellia*) Forests
8. Butea forests
9. Khair (*Acacia catechu*) Forests
10. Bamboo forests

A. CLIMATIC TYPE

1. MOIST SUB-TROPICAL (PENINSULAR) LOW LEVEL SAL FORESTS

The better quality sal occur on well drained and sandy loam soil along water courses and plain areas with moisture and deep soil and along lower hill slopes. The forests occur in these areas as of two types, one with sal as dominant species and other with many dominant species intimately mixed with each other. Thus this type of forest is further subdivided into two types.

A large tract of the area having plains topography, where the moisture and soil conditions are favourable, carry pure sal forest with profuse bamboo. Sal forests have dense top canopy. The chief associates of *Shorea robusta* forming top story are: *Lagerstroemia parviflora*, *Terminalia bellerica*, *Terminalia chebula*, *Diospros melanoxylon*, *Adina cordifolia*, *Sterospermum suaveolens*, *Pterocarpus marsupium*, *Schleichera oleosa*, *Ficus racemosa*. The middle stories have less canopy. A shrubby undergrowth is usual and mostly semievergreen, *Mallotus philippensis*, *Miliusa velutina*, *Pogostemon benghalensis*, *Murraya koenigii*, *Glycosmis mauritiana*, *Desmodium pulchellum* may occur gregariously. Heavy grass like *Themeda sp.*, *Sacharum benghalensis*, and *Saccharum spontaneum* are also seen in open areas on very stiff soils. Few large and common species of climbers are: *Bauhinia vahlii*, *Tiliacora acuminata*.

Mixed forests are also found in the area having medium and good height trees with many dominant species intimately mixed with many trees of middle story, forming upper canopy. No single species is dominant in this mixed type of forests. The chief associates forming top canopy are: *Diospyros melanoxylon*, *Terminalia chibula*, *Pterocarpus marsupium*, *Terminalia bellerica*, *Terminalia tomentosa*, *Boswellia serrata*, *Madhuca indica*, *Schleichera oleosa* (Kusum), *Lannea coromandelica* (Gurja), *Dalbergia paniculata* (Dhobain), *Adina cordifolia*, *Anogeissus latifolia*, *Embllica officinalis*, *Buchanania lanzan*, *Butea monosperma*, *Albizia procera*, *Semicarpus anacardium*, *Ficus racemosa*, *Mitragyna Parvifolia*, *Terminalia alata* etc.

Other trees, shrubs and woody climbs forming middle story are: *Kydia Calycina*, *Buchanania lanzan*, *Careya arborea*, *Syzigium cerasoidium* (Badam), *Casearia graveolens*, *Milusa tomentosa*, *Eugenia heyneana*, *Cochlospermum religiosum*, *Bauchinia retusa*, *Holorrhena antidyenterica*, *Hymenodictyon excelsa*, *Aacacia catechu*, *Xeromphis spinosa*, *Embellica tsjaram-cotton*, *Woodfordia fruticosa*, *Dalbergia lanceolaria*, *Butea Monosperma*, *Soymida febrifuga*, *Semicarpus anacardium*, *Bauhinia racemosa*, *Mimosa himalayana*, *Millettia auriculata*, *Ziziphus mauritiana*, *Ziziphus oenoplea*, *Carissa opaca*, *Indigofera cassioides*, *Phoenix acaulis*, *Moghania chappar*, *Helicters isara*, *Wendlandia heynei*, *Celastrus paniculatus*, *Vallaris solanacea*.

The third story forming ground vegetation, composed of shrubs, herbs, grasses and climbers. The common species are:

Desmodium gangeticum, *Asparagus racemosa*, *Calotropis gigantea*, *Flemingia chappar*, *Grewia hirsuta*, *Indigofera pulchella*, *Phyllanthus fraternus*, *Triumfetta pentandra*, *Caryretia trifolia*, *Woodfordia fruticosa*, *Carissa carandas*, *Tephrosia purpurea*, *Bidens biternata*, *Ampelocissus tomentosa*, *Indigofera echinata*, *Ziziphus xylopyrus*, *Cassia tora*, *Tribulus terrestris*, *Euphorbia thymifolia*, *dioscorea bulbifera*, *Urena lobata*, *Adinalum lepulatum*, *Achyranthes aspera*, *Saccharum bengalensis*, *Rungea pectinata*, *Calotropis procera*, *Hekiotropium strigosum*, *Vernonia cinerea*, *Hetropogon contortus*, *Themeda triandra*, *Eragrostis tenella*, *Tridax promcubens*, *Dipteracanthus Sp.*, *Sacharyn spontaneum*, *Imperata cyndriea*, *Bauhinia vahlii*, *Smilax zeylanica*, *Butea parviflora*, *Ziziphusoenoplea*, *Ventilago calyculata*. The epiphytic plant and *tesellata* and *dendrophthoea falcata* are commonly seen on several trees and shrubs.

2. DRY SUB-TROPICAL (PENISULAR) SAL FOREST

The southern and western dry hill slopes are occupied by dry deciduous Sal, dry mixed forests and scrubby vegetation. The main components of vegetation forming top canopy present on dry hill slopes are: *Dillenia aurea*, *Cochlospermum religiosum*, *Nyctanthes arbor-tristis*, *Stereulia urens*, *Boswellia serrata*, *Diospyros melanoxylon*, *Caryuga pinnata*, *Terminalia bellerica*, *Ficus tomentosa*, *Ougeinia ougeinensis*, *Wrightia tinctoria*, *Euphorbia nivulea*, *Gardenia latifolia*, *Zizyphus xylopyros*, *Lannea coromendelica*, *Embllica officinalis*, *Anogeissus latifolia*, *Lagerstroemia parviflora*, along with some frequent species like *Helicteres isora*, *Pavetta tomentosa*, *Bauhinia racemosa*, *Dndroealanus strictus*, *Flacourtia indica*, *Carissa opaca*, *Holarrhena antidysenterica*, *Phoenix acaulis*. The commonly occurring herbaceous and climbing plants are: *Heteropogon controtus*, *Capilipedium assimile*, *Rungea pectinata*, *Oldenlandia offinis*, *Crotalaria lmedicagenia*, *Crotaria mysorensis*, *Micromeria biflora*, *Calotropis procera*, *Ruellia tuberosa*, *Blumea oxyodonta*, *Crepis japonica*, *Vernonia cineria*, *Indigofera trifoliata*, *Phyllanthus maderaspatana*, *Phyllanthus debilis*, *Cleome monophylla*, *Indigofera hirsuta*, *Milletia auriculata*, *Vallaris solanacea*, *Ampelocissus latifolia*, *Cissus adnata*, *Smilex zeylanica*, *Vigna trilobata*, *vigna aconitifolia*, *teramnus labialis*, *Dioscorea pentaphylla*, *Dioscorea belophylla*, *Dioscorea bulbifera*, *Asparagus racemosus*, *Alylosia scaraboeoides*, *Hemidesmus indicus*, *Ichnocarpus frutescens*, *Abrus precatorious*. Some epiphytic plants such as *Vanda tesellata* and *Dendrophthoea falcata* are also seen on varieties of trees and shrubs.

3. WEST GANGETIC MOIST MIXED DECIDUOUS FOREST

A large tract of the area in having plains topography, where the moisture and soil conditions are favourable, carry pure sal forest with profuse bamboo. Sal forests have dense top canopy. The chief associates of *Shorea robusta* forming top story are: *Lagerstroemia parviflora*, *Terminalia bellerica*, *Terminalia chebula*, *Diospros melanoxylon*, *Adina cordifolia*, *Sterospermum suaveolens*, *Pterocarpus marsupium*, *Schleichera oleosa*, *Ficus racemosa*. The middle stories have less canopy. A shrubby undergrowth is usual and mostly semievergreen, *Mallotus philippensis*, *Miliusa velutina*, *Pogostemon benghalensis*, *Murraya koenigii*, *Glycosmis mauritiana*, *Desmodium pulchellum* may occur gregariously. Heavy grass like *Themeda sp.*, *Sacharum benghalensis*, and *Saccharum spontanaeum* are also seen in open areas on very stiff soils. Few large and common species of climbers are: *Bauhinia vahlii*, *Tiliacora acuminata*.

This forest has also medium and good height trees with many dominant species intimately mixed with many trees of middle story, forming upper canopy. No single species is dominant in this mixed type of forests. The chief associates forming top canopy are: *Diospyros melanoxylon*, *Terminalia chibula*, *Pterocarpus marsupium*, *Terminalia bellerica*, *Terminalia tomentosa*, *Boswellia serrata*, *Madhuca indica*, *Schleichera oleosa* (Kusum), *Lannea coromendelica* (Gurja), *Dalbergia paniculata* (Dhobain), *Adina cordifolia*, *Anogeissus latifolia*, *Embllica officinalis*, *Buchanania lanzan*, *Butea monosperma*, *Albizia procera*, *Semicarpus anacardium*, *Ficus racemosa*, *Mitragyna Parvifolia*, *Terminalia alata* etc.

Other trees, shrubs and woody climbs forming middle story are: *Kydia Calycina*, *Buchanauia lanzan*, *Careya arborea*, *Syzigium cerasoidium* (Badam), *Casearia graveolens*, *Milusa tomentosa*, *Eugenia heyneana*, *Cochlospermum religiosum*, *Bauchinia retusa*, *Holorrhena antidysenterica*, *Hymenodictyon excelsa*,

Aacacia catechu, *Xeromphis spinosa*, *Embelica tsjaram-cotton*, *Woodfordia fruticosa*, *Dlabergia lanceolaria*, *Butea Manosperma*, *Soymida febrifuga*, *Semicarpus anacardium*, *Bauhinia racemosa*, *Mimosa himalayana*, *Millettia auriculata*, *Ziziphus mauritiana*, *Zizphus oenoplea*, *Carissa opaca*, *Indigofera cassioides*, *Phoenix acaulis*, *Moghania chappar*, *Helicters isara*, *Wendlandia heynei*, *Celastrus paniculatus*, *Vallaris solanacea*.

The third story forming ground vegetation composed of shrubs, herbs, grasses and climbers. The common species are:

Desmodium gangeticum, Asparagus racemosa, Calotropis gigantea, Flemingia chappar, Grewia hirsuta, Indigofera pulchella, Phyllanthus fraternus, Triumfetta pentandra, Caryretia trifolia, Woodfordia fruticosa, Carissa carandas, Tephrosia purpurea, Bidens biternata, Ampelocissus tomentosa, Indigofera echinata, Zizphus xylopyrus, Cassia tora, Tribulus terrestris, Euphorbia thymifolia, dioscorea bulbifera, Urena lobata, Adinalum lepulatum, Achyranthes aspera, Saccharum bengalensis, Rungea pectinata, Calotropis procera, Hekiotropium strigosum, Vernonia cinerea, Hetropogon contortus, Themeda triandra, Eragrostis tenella, Tridax promcubens, Dipteracanthus Sp., Sacharyn spontaneum, Imperata cyindriea, Bauhinia vahlli, Smilax zeylanica, Butea parviflora, Ziziphusoenoplea, Ventilago calyculata. The epiphytic plant and tesellata and dendrophthoea falcata are commonly seen on several trees and shrubs.

4. SOUTHERN DRY MIXED DECIDUOUS FOREST

This subgroup is differing from dry teak forest Mainly by presence of *Boswellia serrata* and increased proportion of theorny species. Bamboos are occasionally seen. Very few, woody climbers are present. This subgroup is prevalent in drier localities and sites.

The most characteristic tree is *Anogeissus latifolia*, whilst *Terminalia tomentosa* is very typical associate. *Diospyros tomentosa* is also very common. *Chloroxylon swietenia, Hardwickia binata, Boswellia serrata and Soyimida febrifuga* are very widespread and useful indicators as they are absent from moist deciduous forests, but their occurrence is rather sporadic. *Acacia catechu* is often present in thorn forest. The undergrowth is usually thin with fairly dense growth of grass during monsoon.

5. NORTHERN TROPICAL DRY MIXED DECIDUOUS FOREST

Sal is the most important and common species in the area. The pure crop of Sal occurs over extensive areas. Profuse and better type of sal forest occur on the Gondwana system and basal bed type of geological formation. Lower Vindhyan type of geological formation also contain Sal forest which are confined mostly to cool valley and along lower slopes of northern aspects. These are commonly met in Churhat, Sidhi, Behara and part of Madwas ranges.

The physical condition of the soil, its drainage capacity to hold moisture, along with the underlying rock formation exercise marked effect with regard to the distribution and growth of sal. Sal generally favours acidic soil. The proportion of the sal in the area varies from 20 to 90%. Better quality sal is found along water courses and plain areas. Bamboo is generally absent in better quality areas. Regeneration of Sal is quite inadequate and nearly absent. The water courses normally have more percentage of natural sal trees. Sal favours a sandstone, gneiss and lateritic soil in stages of decomposition. In schistic and calcareous soil on higher slopes. Sal crops is open, stunted and unhealthy with heavy infestation of *Bandha (Dendrophthoe falcata)* and heart rot. Sal generally avoids hard lateritic soil. Better quality sal occur in Mahadeva series of Gondwana system on well drained and sandy loam soil along water courses and plain areas with moisture and deep soil and along lower hill slopes. It progressively generates in quality and grows as it ascends the hills. Sal avoids the southern dry aspects in Lower Vindhyan system and is altogether absent in Upper Vindhyan system.

The quality is generally poor but along water courses, better quality stands are also met within. Regeneration of *Diospyros melanoxylon, Pterocarpus marsapium, Terminalia tomentosa* is satisfactory. Regeneration of *Ougeinia ougeinensis* and *Woodfordia fruticosa* is profuse.

The top canopy consist of *Anogeissus latifolia, Pterocarpus marsupium, Dalbergia latifolia, Dalbergia paniculata, Diospyros melanoxylon, Boswellia serrata, Garuga pinnata, Bauhinia variegata, Lagerstroemia parviflora, Lannea coromandalica, Schleicheria oleosa, Adina cordifolia, Madhuca indica, Terminalia tomentosa, Shorea robusta, Millusa tomentosa, Terminalia bellirica, Mitragyna parvifolia, Kydia ealycina.*

The middle story comprises *Emblica officinalis*, *Acacia catechu*, *Careya arborea*, *Casearia tomentosa*, *Semicarpus anacardium*, *Terminalia chibula*, *Flacaurtia indica*, *Eugenia heyniana*, *Butea monosperma*, *Aegle marmelos*, *Bauhinia retusa*, *Cassia fistula*.

The shrubby undergrowth are: *Woodfordia fruticosa*, *Nyctanthus arbor-tristis*, *Carissa opaca*, *Ziziphus xylopyrus*, *Helicteres isora*.

The ground vegetation is characterized by herbaceous and grossy plants, growing in different seasons. on varieties of habitats. Some common representatives are mentioned here such as: *Cassia tora*, *Cassia occidentalis*, *Indigofera tinctoria*, *Indigofera hirsuta*, *Tephrosia purpurea*, *Blumea membranacea*, *Blumia oxyodonta*, *Sida cordata*, *Sida acuta*, *Sida rhomboidea*, *Sida cordifolia*, *Rungia pectinata*, *Tridax procumbens*, *Indigofera echinata*, *Leucas mollissima*, *Leucas aspera*, *Leucas cephalotes*, *Cleome gynandra*, *C. viscosa*, *Cleome monophilla*, *Tribulus terrestris*, *Adinatum lepulatum*, *Crotalaria medicagenia*, *Crotalaria mysorensis*, *Crotalaria pallida*, *Crotalaria sericia*, *Crotalaria prostrata*, *Heteropogon contortus*, *Themeda triandra*, *Eragrostis tenella*, *Imperata cylindrica*, *Bothriocloa pertusa*, *Dichanthium annulatum*, *Chloris barbata*, *Cenchrus ciliaris*, *Sorghum halepans*. The epiphytic plant, *Dendrophthoe falcata* is commonly seen on *Madhuca indica*, *Shorea robusta*, *Mangifera indica*, and *albizia procera*. Thickets of *Dendrocalamus strictus* are also seen scattered in the area. *Chloroxylon sweitenia* is found in patches on gravelled soil in Mahwas, Pahai and doari blocks and on Mara-Jir road in mixed forests. Some of the plains in Jhurhi on the Sarai road near Karwahi and Tansar along Mahan river comprise open scrubby or low forests. The soil in these region are hard and lateritic. Due to sparse ground vegetation, the erosion caused by rain and wind can be easily seen, especially in tansar area.

The area is mainly abound by *Acacia catechu* in association with *Ziziphus xylopyrus*, *Soymida febrifuga*, *Aegle marmelos*, *Streblus asper*, *Butea monosperma*, *Lagerstroemia parviflora*, *Flacourtia indica*, *Bridelia retusa*, *Mallotus philippensis*, *Alangium salvifolium*, *Randia uliginosa*. The Son river basin near Jogdaha bride was previously good forested area but now a days it is cleared up and patches of *Lagerstroemia* with *Vitex negundo*, *Grewia hirsuta*, *Ziziphus xylopyrus* are seen here and these. *Zizyphus xyloprus* are seen here and there. *Ziziphus nummularia*, *Ziziphus rugosus* in association with *Woodfordia fruticosa*, *Ficus glomerata*, *Butea monosperma* are seen around Karwahi. The *Ziziphus oenoplea*, *Smilax zeylanica*, *Ichnocarpus frutescens*, *Ampelocissus latifolia*, *Dioscorea pentaphylla*, *Hemidesmus indica* are commonoy seen climbing over trees and shrubs in these areas.

6. RIVERAIN OR REPARIAN FRINGING FORESTS

The prevailing moist conditions in valley, ravines, riverain tracts and depressions scattered in the area very much responsible for grow of moist Sal forest. The water courses nromally have more percentage of natural sal trees.

The lower slopes in valleys, ravines and along rivers are inhabited by *Shorea robusta*, *Diospyros melanoxylon*, *Trena orientalis*, *Syzigium heyneanum*, *S. cumini*, *Emblica officinalis*, *Mallotus philippensis*, *Terminalia arjuna*, *Tamarix ericoides*, *Ixora arborea*, *Meliosma simplicifolia*, *Shorea robusta*, *Dendrocalamus strictus*, *Ficus semicordata*, *Bombax ceiba*. The shady habitats in the forests of Jir and Bhadaura are occupied by *Baliospermum montanum*, *Indigofera cassioides*, *Boehmeria platyphylla*, *Grewia rothii*, *Casearia graveolens*, *Perilepta auriculata*, *Colebrookia oppositifolia*, *Woodfordia fruticosa*, *Thyanolaena maxima*, *Saccharum spontaneum*, *Phragmitis Karka*, *Adenostema lavenia* var. *rugosa*, *Desmodium gangetium*, *Reinwardtia indica*, *Chlorophytum tuberosum*, *Perilepta auriculata*, *Leucas biflora*, *Piper longum*, *Companula colorata*, *Cythocline purpurea*, *Glochidion lanceolarium*, *Gloechidion zeylanica*, *Apluda mutica*. The common twiners and climbers growing at Mara are: *Ampelocissus latifolia*, *Cryptostegia grandiflora*, *Dragea voluvilis*, *Ventilago madersapatana*. *Cissus adnata*, *Smilax zeylanica*,

Dioscorea puber, *Dioscorea glabra*, *Dioscorea bulbifera*, *Combretum roxburghii*, and *Schefflera stellata* is recorded at Jir.

B. GENERAL EDAPHIC TYPE

The forest types associated with definite site factors. Many of the tree species of the mixed deciduous forests are capable of forming more or less pure associations. Due to harsh environmental conditions, greater demands are made on the specific adaptability of constituent elements leading to pure group and local dominance. The following edaphic types of forests are recognised in the area.

7. SALAI FOREST (*Boswellia serrata*)

The forest of *Boswellia serrata* are found overlapping in Sal and Mixed forests. They cover 2% of total forest area. 'Salai' forest generally tend to occupy high elevation on plateaus, ridged tops and slopes particularly on southern and south-western aspects of Kaimur hills, where shallow and drier soils with lot of skeletal material is in existence as derived from porcellanite and Upper and Lower Vindhyan formations. These forests are generally open. Its common associates are *Diospyros melanoxylon*, *Anogeissus latifolia*, *Lagerstroemia parviflora*, *Sterculia urens*, *Lannea coromendalica*, *Emblica officinalis*, *Ziziphus xyloprus*, *Acacia catechu*, *Holarrhena antidysenterica*, *Hardwickia binata* occurs on higher elevation in Jethula, Rani Satti, Harbaro and Tatpahar blocks of Sidhi ranges and in Kushanhiya. Scrubby vegetation comprises *Ziziphus xylopyrus*, *Carissa opaca*, *Flacourtia indica*, *Rosa involucrata*, *Mimosa himalayana*, *Woodfordia fruticosa*, *Nyctanthes arbor-tristis* are seen scattered here and these in Hanumangarh block on Kaimur hills and near Churhat. *Lagerstroemia parviflora* and *Madhuca indica* are found with stunted growth. *Cassia tora*, *Occinum americanum*, *Themeda triandra*, *Heteropogon contortus*, *Imperata cylindrica* are the common herbaceous and grasses occur in this areas. *Ziziphus oenoplea*, *Vallisneria spiralis*, *Ventilago maderaspatana* are the climbers of the area.

8. BUTEA FOREST (Dhak forest).

On flat ground this type presents a savannah appearance with scattered stunted and very malformed trees are thickets standing over short grass or bare ground. On lower hill slopes almost pure associations. The other associates occur along with *Butea* are: *Butea monosperma*, *Acacia leucophloea*, *Ziziphus mauritiana*, *Ziziphus numularia*, *Tephrosia purpurea*, *Mimosa rubicaulis*, *Indigofera cordifolia*, *Apluda mutica*, *Heteropogon contortus*, *Bolhriochloa pertusa*.

9. BAMBOO FOREST

Bamboos do not form pure forest but occur as understory in the Sal and Mixed forests. They cover 0.97% of the total forest area. *Dendrocalamus strictus* is the only species occurring as representative of bamboo. Bamboo has been rendered to a depleted condition during the last decade. What remains now are the scattered stunted, malformed and congested bamboo clumps, occupying occasionally here and there. Illicit fellings, unsystematic and over exploitation recurring annual fires and heavy logging of bamboo clumps by grazing have caused a great damage to these forests.

Several other plants found scattered in the area on waste lands, road sides, railway tracks, along river banks, in and around the village sides in shrubberies, orchards and boarder hedges around crop fields are: *Mangifera indica*, *Azadirachta indica*, *Madhuca longifolia*, *Ficus benghalensis*, *Tamarindus indica*, *Aegle marmelos*, *Lagerstroemia parviflora*, *Acacia nilotica ssp. indica*, *Diospyros melanoxylon*, *Syzgium cumini*, *Morus alba*, *Moringa oleifera*, *Lawsonia inermis*, *Cordia dichotoma*, *Ficus lucescens*, *Holoptelia integrifolia*, *Albizia procera*, *Anogeissus pendula*, *Erythrina indica*, *Melia azedarach*, *Butea monosperma*, *Procopis juliflora*, *Acacia leucophloea*, *Bombax ceiba*, *Pterospermum acerifolium*, *Toona ciliata*, *Terma orientalis*, *Streblus asper*, etc. Among shrubs *Euphorbia nivulia*, *Euphorbia nerifolia*, *Euphorbia tirucalli*,

Nopalia codhinelliformis, *cereus hexagonus*, *Cercus triangularis*, *Lawsonia inermis*, *Vitex negundo*, *Jatropha curcas*, *Jatropha gossypifolia*, *Adhatoda geylanica*, *Ipomoea fistulosa*, *Ricinus communis*, *Caesalpinia globulorum*, *Woodfordia fruticosa*, *comiphora mukul*, *Ziziphus mauritiana*, *Pandanus fruticosus* are commonly seen.

ECONOMIC ASPECT OF THE VEGETATION

Plants have a significant contribution towards the wealth of a country. During recent years exploration of our plant wealth and its economic utilization have rightly been given due importance. The contributions on the economic aspects of our plants are scattered over numerous literature. Under the present study the information regarding the economic use of plants has been mostly gathered from the local inhabitants as well as from the available literatures. For the sake of convenience the economic aspects of the vegetation of the area have been treated under the following categories.

1. **Food plants:** Besides cultivated plants, many wild plants are largely exploited for food in various forms by the local inhabitants. They may either be eaten raw or as vegetables after cooking or in the form of pickles:

VEGETABLES: Different parts of a number of plants used after cooking as vegetables are given below:

- (i) **Root tuber:** *Dioscorea oppositifolia*, *Dioscorea bulbifera*, *Potamogeton nodosus*
- (ii) **Rhizomes:** *Nelumbo nucifera*, *Nymphaea nouchal*, *Scirpus grossus*, *Scirpus tuberosus* .
- (iii) **Stem bulbils:** *Dioscorea bulbifera*.
- (iv) **Tender shoots and leaves:** *Amaranthus viridis*, *Basella alba*, *Cassia tora*, *Chenopodium album*, *Ipomoea aquatica*, *Portulaca oleraceae*, *Rumex dentatus*.
- (v) **Vegetative and floral buds:** *Bauhinia purpurea*, *Ficus virens*, *Moringa oleifera*.
- (vi) **Fruits:** *Coccinia grandis*, *Ficus racemosa*, *Ficus virens*, *Ipomoea alba*, *Luffa echinata*, *Nelumbo nucifer*, *Xeromphis uliginosa*.

EATEN RAW: Number of fruits, are collected and sold in the local markets. Although the fruits are inferior in quality, they are said to be rich in vitamins and minerals and form an important diet of local inhabitants. The common ones are:

Aegle marmelos, *Artocarpus lakoocha*, *Carissa opaca*, *Ficus hispida*, *Ficus racemosa*, *Grewia elastica*, *syzygium heyneanum*, *Zizyphus mauritiana*.

PICKLES AND PRESERVES: *Aegle marmelos*, *Carissa carandas*, *Cordia dichotoma*, *Spondias pinata*, *Terminalia chebula*.

2. **Fodder plants :** The common fodder plants are : *Bothriochloa pertusa*, *Cynodon dactylon*, *Desmodium triflorum*, *Echinochloa colonum*, *Ficus religiosa*, *Ficus racemosa*, *Flacourtia indica*, *Paspalidium flavidum*, *Phaseolus aconitifolius*.

3. **Timber, fuel and charcoal plants:** The area has a number of plants which provide valuable timber for building, furniture and other constructional work. Some of the important ones are:

- (i) **Timber :** *Adina cordifolia*, *Albizia procera*, *Elaeodendron roxburghii*. *Mitragyna parvifolia*.

- (ii) **Fuel and charcoal** : *Acacia nilotica*, *Emblca officinalis*, *Kydia calycina*, *Lagerstroemia parviflora*, *Tamarindus indica*.

4. **Fiber plants** : Fibers obtained from the different parts of the plants are used for making ropes, cordages, stuffing pillows and mattresses. Some of the common species yielding various types of fibers are:

- (i) Fibers obtained from bark: *Corchorus capsularis*, *Crotalaria pallida*, *Crotalaria retusa*, *Crotalaria spectabilis*, *Trema orientalis*, *Ventilago maderaspatana*.
- (ii) Fibre obtained from fruits: *Bombax ceiba*, *Calotropis gigantea*, *Calotropis procera*, *Gossypium herbaceum*.

5. **Dye, tannin, gum and resin bearing plants:**

(i) **Dye:** Various plants part used as colouring agent by local inhabitants for various purposes are given as under:

- (a) **Flowers:** *Butea monosperma*, *Nyctanthes arbortristis*, *Toona ciliata*, *Woodfordia fruticosa*.
- (b) **Fruits:** *Mallotus philippensis*.
- (c) **Leaves:** *Lawsonia inermis*.

(iii) **Tannin:** Bark of certain plants are collected and sent to various leather refineries for tanning. Some important plants are : *Acacia nilotica* subsp. *indica*, *Dendrophthoe falcata*, *Oroxylum indicum*.

(iv) **Gums and resins:** These are produced when the surface of the trunk is incised or wounded and used for various purposes. Some of the common plants producing gums and resins are : *Acacia* spp., *Azadirachta indica*, *Bombax ceiba*, *Butea monosperma*, *Cannabis sativa*, *Feronia limonia*, *Moringa oleifera*, *Semecarpus anacardium*, *Shorea robusta*, *Tamarindus indica*.

6. **Oil plants:** Locally various plant parts are exploited for their oils:

- (a) **Roots and rhizomes:** *Vetiveria zizanioides*.
- (b) **Flowers:** *Acacia farnesiana*, *Michelia champaca*, *Jasminum grandiflorum*.
- (c) **Seeds:** *Argemone mexicana*, *Carthamus tinctorius*, *Madhuca indica*, *Pongamia pinnata*, *Prunus persica*, *Ricinus communis*, *Sapindus emarginatus*, *Sesamum indicum*, *Shorea robusta*.

7. **Medicinal plants:** A variety of medicinal plants occur in the area which are used as native medicine by local inhabitants. Different parts of common plants used in medicine are given below.

(a) **Bark:** *Ailanthus excelsa*, *Alstonia scholaris*, *Azadirachta indica*, *Barringtonia acutangula*, *Holarrhena antidysenterica*, *Lannea coromandelica*, *Litsea glutinosa*, *Toona ciliata*.

(b) **Roots:** *Abrus precatorius*, *Alangium salvifolium* subsp. *decapetalum*, *Aristolochia indica*, *Boerhavia diffusa*, *Cissampelos pariera*, *Curculigo orchioides*, *Hemidesmus indicus*, *Hygrophila auriculata*, *Rauwolfia serpentina*, *Withania somnifera*.

(c) **Leaves:** *Abrus precatorius*, *Adhatoda vasica*, *Andrographis paniculata*, *Bacopa monnieri*, *Celastrus paniculatus*, *Centella asiatica*, *Paederia scandens*, *Pogostemon benghalensis*, *Sida cordata*, *Tinospora cordifolia*, *Vitex negundo*.

(d) **Flowers:** *Butea monosperma*, *Toona ciliata*.

(e) **Fruits and seeds:** *Butea monosperma*, *Caesalpinia bonduc*, *Cassia fistula*, *Emblica officinalis*, *Piper longum*, *Pongamia pinnata*, *Psoralea corylifolia*, *Semecarpus anacardium*, *Terminalia chebula*, *Tribulus terrestris*, *Xeromphis spinosa*.

8. **Ornamental plants:** There are a number of wild plants which possess beautiful flowers and can be introduced in garden for ornamental purposes. Some important one are: *Callicarpa macrophylla*, *Clitoria ternatea*, *Costus speciosus*, *Cyathocline purpurea*, *Eranthemum purpurascens*, *Gloriosa superba*, *Merremia dissecta*, *Nymphaea stellata*, *Oxystelma secamone*, *Porana paniculata*, *Tamarix dioica*, *Uraria picta*, *Woodfordia fruticosa*.

9. **Miscellaneous:** Besides, plants of the area exploited for various other minor resources are as follows:

(a) **Dish & plates:** *Butea monosperma*, *Nelumbo nucifera*, *Shorea robusta*.

(b) **Brooms:** *Phoenix sylvestris*, *Thysanolaena maxima*.

(c) **Mats and ropes:** *Borassus flabellifer*, *Phoenix sylvestris*, *Saccharum benghalense*, *Scirpus grossus*, *Sparganium ramosum*, *Typha angustata*.

(d) **Baskets, suit-cases and chairs:** *Bambusa arundinacea*, *Calamus tenuis*, *Celastrus paniculatus*, *Saccharum spontaneum*, *Tiliacora acuminata*, *Ventilago maderaspatana*.

(e) **Huts:** *Bambusa arundinacea*, *Saccharum bengalense*, *Saccharum spontaneum*.

Recent Publication of U.P. State Biodiversity Board

ABOUT THE BOOK

Biodiversity of aquatic and semi-aquatic plants constitutes an integral component of any aquatic ecosystem. They serve as a source of food and shelter for the aquatic fauna, thus forming the base of aquatic wildlife conservation practices. They are economically useful in providing medicinal and aesthetic values and may serve as a good source of fertilizer. An account of diversity of aquatic plants is necessary for preventing and controlling excessive erosion, turbidity of water, and source of oxygen for vegetation and provides protection against hot and cold weather to aquatic fauna. This book has been written with a hope that it will work as a reference to botanists, zoologists, forest, ecologists and viticulturists. The book includes introduction, geographical position, vegetational composition and key to the families in addition to the description of plants. Number of species described are 751. This includes phanerogams and the vascular cryptogams with illustrations and photographs to facilitate their easy identification. The families of angiosperms have been arranged according to Bentham and Hooker's system whereas families of vascular cryptogams to that of Smith system of classification (1956). Each species has its correct name, locality (if any), important symptoms, concise description, ecological association, ethnobotanical information and the phenological data. The work is of fundamental importance for the persons interested in further exhaustive studies on taxonomy, ecology, embryology of the plants including the ethnobotany, density and soil conservation.

ABOUT THE AUTHOR

Dr. D. C. Saini was born in November 1935 (excepted) B.A. Degree in Botany, under the guidance of Prof. S. K. Singh, former Head of the Department of Botany, D. D. U., Gorakhpur University, Gorakhpur. Presently he is working as Senior Scientist and Head, Herbarium, Botanical Survey of India, Lucknow. He has specialized in the field of taxonomy, floristics, biodiversity conservation and Phytobotany, Institute of Botany, Chinese Academy of Sciences, Beijing, China. He visited China for comparative study of vegetation between India and China. He is one of the investigators of various national and international projects relating to the herbarium (BIOS), to study the vegetation of China for comparative study of vegetation between China and India, under International Collaborative Project. He also visited Chinese University, Tokyo, Japan to learn some modern techniques on study of anatomy and morphology of seeds. His books and several papers of national and international recognition are to his credit.

To purchase the above book kindly contact the U P State Biodiversity Board

Editorial Board:

- Dr D C Saini, BSIP, Lucknow
- Prof. H B Singh, BHU, Varanasi
- Dr Rakesh Pandey, CIMAP, Lucknow
- R K Dubey, U.P.S.B.B., Lucknow

Published By:

Uttar Pradesh State Biodiversity Board
 East Wing IIIrd Floor 'A' Block
 Picup Bhawan, Gomti Nagar, Lucknow
 Ph: 0522-4006746, 2306491 Fax: 4006746
 E-mail: upstatebiodiversityboard@gmail.com
 web-site: <http://www.upsbdb.org>