NON-TIMBER FOREST PRODUCTS OF JALDAPARA WILDLIFE SANCTUARY : AN ASSESSMENT

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Introduction

Non-Timber Forest Products (NTFP) are now recognised as more important forest products than timber and are now regarded as commercially a more viable option in forest management (Anderson, 1990; Anon., 1990; Blay, 1996; Chakravarthi, 1990; Goday and Bawa, 1993; Peter *et al.,* 1989). Maintenance of forest ecosystem is very important for the survival of mankind itself. Clear-felling or removal of major trees of forests quickly changes the habitat structure of an area rendering numerous other species homeless. The present concept of suspending timber extraction and maintaining viable economics through the collection and marketing of NTFP is now well recognised by people worldwide (Agarwal, 1992; Chandrasekharan, 1996; FAO, 1990, 1993). National Parks or Wildlife Sanctuaries are not the places for timber extraction mainly to save the vegetation structure and its biodiversity. But a controlled and properly managed routine exploitation of NTFP will certainly increase the revenue collection without much disturbance to the vegetation.

Jaldapara Wildlife Sanctuary (JWLS) is situated in the foothills region of the Darjeeling part of Eastern Himalayas and falls in the district of Jalpaiguri of the State of West Bengal (India). The sanctuary is located between 25° 58' and 27° 45' North latitude and 89° 08' and 89° 55' East longitude. This trouser shaped sanctuary is covered with natural vegetation in most of its areas and is considered as one of the prestigious sanctuaries in the State and is famous mainly for its sizeable population of one-horned Rhinoceros and that is the main item of tourist interest.

Present area of the Sanctuary is 216.51 km^2 covering 7 Forest Ranges, 25 beats and 68 compartments. The sanctuary was established in the year 1941 as a game sanctuary with an area of only 99.5 km^2. The present area has been achieved with its two subsequent extensions in 1976 and in 1978 (Pandit, 1996; Anon., 1997; Das *et al.,* 2003).

General Configuration of JWLS

The Sanctuary is situated in the flood plains of the rivers Torsa and Malangi though there are some other small rivulets flowing in North - South direction which includes Hollong, Bhaluka, Sanjoy, Sissamara etc. During rainy season, a number of other seasonal water sources develop like Titi, Hawri, Dayamara etc. The shape of the Sanctuary is roughly like a trouser and the width of the legs vary from less than 1 km to 4.5 km. Most of the areas are slightly low lying with some

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permanent ditches and, apparently, there is no water stress in any part of the sanctuary. Also, there are some artificial ponds created for wildlife. Except for the Titi Reserve Forest part of the sanctuary, which is quite hilly with an altitude of 152 to 610 m, other parts of the sanctuary is quite flat and the altitude varies between 60 to 130 m above mean sea level. As for most of the areas in Duars, the direction of slope inside the park is prominently North to South.

Vegetation and Flora

The vegetation structure in this sanctuary is very variable and for this natural and anthropogenic factors are equally responsible. The basic vegetation structure of the region is mixed deciduous forest (Champion and Seth, 1968). But, there are also wide stretches of savannah covering a considerable part (18.24%) of the sanctuary developed mainly on flood plains, in elevated river beds, etc. (Pandit, 1996; Das *et al.*, 2003). These grasses are sometimes reaching 5.5 m in height and cover even the elephants moving inside. Shrublands are available in degraded forested areas where bushes of different heights are generally remain thatched with numerous species of climbers and represent an unstable type of vegetation. However, from recent observation, following types of vegetation are recognised in the sanctuary (Banerjee, 1993; Pandit, 1996; Anon., 1997; WII, 1997; Das *et al.*, 2003) :

1. Riverine Forests
2. Sal Forests
3. Wet Mixed Forests
4. Semi-evergreen Forests
5. Evergreen Forests
6. Savannah Grasslands (Moist Sal Savannah; Low Alluvium Savannah Woodland; Eastern Alluvial Grassland; Primary Grasslands)
7. Hydrophytic Vegetation.

All these type of vegetations in JWLS are quite rich in their floristic components except the savannah lands (Banerjee, 1993; Das *et al.*, 2003). This type is generally dominated by one or few species of grasses only (e.g. *Arundinella bengalensis, Saccharum arundinaceum, S. bengalense, S. longisetosum, S. narenga, S. spontaneum* etc.). However, all other types of vegetation support plants of wide habit groups to utilise resources of the habitat. Even though the herbivore population is quite high, the ground cover vegetation is nicely represented in the sanctuary.

Banerjee (1993) studied the flora of JWLS and has recorded 584 species (440 dicotyledonous and 144 monocotyledonous) covering 312 dicotyledonous and 99 monocotyledonous genera and 91 dicotyledonous and 21 monocotyledonous families. Recently Das *et al.* (2003) have provided an additional list of 224 species (141 dicotyledonous, 51 monocotyledonous and 32 pteridophytic) for the flora of this sanctuary.

Major Forest Products

Though quite a few species of good timber yielding plants are present in the forests of this small sanctuary (e.g. *Dalbergia sissoo, Drypetes assamica, Gmelina arborea, Michelia champaca, Shorea robusta, Toona ciliata*, etc.) but the timber-harvest is not possible under the present rules and also to maintain the utility or the purpose of this conservatory. In addition, a large number of other tree species are there those can produce wood suitable for paper and

plywood manufacture, packing boxes, charcoal etc. Also, there are some bamboos but their population is not encouraging. In fact, no wood is harvested from the sanctuary whatever may be its commercial value.

Minor Forest Products

Minor Forest Products (MFP) or Non-Timber Forest Products (NTFP) comprise numerous forest products other than timber and fuelwood like wild-edible, fodder, medicine, essential oil, gum, fibre, resin, colouring material, floss, decorative article etc. producing plants. This list is generally very long as numerous species of plants in any vegetation are supposed to produce a large variety of materials important for human utilisation. The extent of the varieties of Minor Forest Products are generally in proportion to the floristic richness of the vegetation. Beside plant products, it is expected that the large number of animals living in a vegetation will also produce numerous articles of commercial importance. Peacock feathers, ivory, lac, honey, horns, hoofs, meat, hides etc. produced by different animals living naturally in the vegetation are also to be considered as MFPs or NTFPs.

Though a small area, but the presence of a good number of forest villages around the sanctuary and the location of Totopara (only natural habitat for the endangered tribe Toto) inside the reserved area is certainly exerting much pressure on the vegetation of JWLS. Timber extraction is not permitted here but residents of these villages collect a wide range of products of plant origin for their own use and also for marketing. Many of these MFPs are also exported to many countries.

Collection of NTFP is a regular practice in the forests of this region, including JWLS, and one extremely fluid market is operating in this part of the country. Realising the situation, it was decided to survey the NTFPs available in JWLS.

Methods of Survey

The work is having a number of aspects like recognition, quantification and market survey.

(a) *Recognition of NTFPs* : This is recorded through the direct observation in the sanctuary area and also in local markets. Samples were procured either from the forest or from markets and then identified in the laboratory. The collected samples are now preserved in NTFP Museum at Sukna, Darjeeling.

(b) *Quantification* : This has been done using 20m x 20m quadrats. For leaves, flowers etc. of trees, the average of randomly selected ten trees have been considered for final calculation.

(c) *Market Survey* : It was a direct survey by questioning the collectors, middlemen, retailers and any other person who could have provide some reliable information.

Results and Discussion

The results of the survey of NTFP in JWLS have been summarised in Table 1 and are discussed below for further elaboration.

Taxonomic Distribution of NTFP Plants : Jaldapara Wildlife Sanctuary is a small sanctuary and its considerable part in South is covered with grasslands. And, for

Table 1

List of plants used as Non-Timber Forest Products growing in Jaldapara Wildlife Sanctuary, Jalpaiguri, West Bengal.

Plants	Family	Local Name	Mode of use	Parts used	Availability/ annum	Sale price to middle-man	Collection period	Remarks
1	2	3	4	5	6	7	8	9
Abroma augusta (L.) L.f.	Sterculiaceae	Ulat Kambal	Med	Rt, lf	NK	NK	Jan-Dec	C
Abrus precatorius L.	Papilionaceae	Kunch	Med	Sd, lf, rt	20,00,000 pcs	Rs. 10/ 1000 pcs	Jan-Dec	LC
Acacia catechu (L.f.) Willd.	Mimosaceae	Khayer	Masticator (katha), Med	Gum, bark, heartwood	2 MT	Rs. 6/ kg	Apr-June	Ab
Achyranthes arpera L.	Amaranthaceae	Apang	Med	Rt, sd	4 qtls	Rs. 70/ kg	Jan-Dec	Ab
Aegle marmelos (L.) Corr.	Rutaceae	Bel	Ed & Med	Frt, lf	50,000 frts	Frt= Re. 1/pc	Dec-May	Ab
						Lf= Rs. 6/ 20 twigs	Jan-Dec	
Aglaia hiernii Visal *et* Ramach.	Meliaceae	Lali	Decor, Fod	Dry frt, sd	1,00,000 pcs	Rs.40/ 1000 pcs	Mar-Apr	C
Alangium savifolium (L.f.) Wang	Alangiaceae	Ankurkanta	Ed & Med	Young & ripe frt	150 qtl	Rs. 4/ kg	Sept-Dec	VC
Albizia lebbek (L.) Benth.	Mimosaceae	Sirish	Med	Sd, lf, brk	NK	Sd : Rs. 10/ kg	Lf & brk= Jan-Dec Sd= Feb-Apr	VC

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1	2	3	4	5	6	7	8	9
Alchornea tiliifolia (Benth.) Muell.	Euphorbiaceae	Buddhanut	Decor, Fod	Frt, lf	20,000 pcs	Rs.500/ 1000 pcs	Dec.-Jan.	C
Alpinia nigra (Gaertn.) B.L. Burtt	Zingiberaceae	Purundigazi	Decor	Dry frt bearing sht	30,000 pcs	Rs.200/ 1000 pcs	Dec–Jan	C
Alstonia scholaris (L.) R. Br.	Apocynaceae	Chhatian	Med	Brk	NK	Rs. 450/ qtl	Jan–Dec	VC
Alternanthera sessilis (L.) DC.	Amaranthaceae	Sanchi	Med, Ed	Twig	25 qtls	Rs. 2/kg	Jan-Dec	VC
Amaranthus spinosa L.	Amaranthaceae	Kanta-noty	Med	WPl	50 qtls	Rs. 2/kg	Jan-Dec	Ab
Amorphophallus paeonii-folius (Dennst) Nicolson	Araceae	Ban-ol	Ed	Rhz	NK	Rs. 200/ qtl	Sept-Dec	C
Aristolochia indica L.	Aristolochiaceae	Ishermul	Med, snake repellent	Rt, lf	NK	Rs. 200/ qtl	Jan-Dec	Rare
Artocarpus chama Buch-Ham.	Moraceae	Latore	Fod	Lf	2.5 MT	Rs. 25/ qtl	Jan-Dec	VC
Artocarpus heterophyllus Lam.	Moraceae	Kanthal	Ed, Fod	Frt, lf, latex	40 MT	Frt. : Rs. 2/kg	Jan-Dec	VC
Artocarpus lakucha Buch-Ham.	Moraceae	Dahua	Ed, Fod, Med	Frt, brk, lf	NK	Frt : Rs. 40/ 100 pcs	Brk & Lf= Jan-Dec Frt= Jul-Aug	VC
Asparagus racemosus Willd.	Asparagaceae	Satamuli	Med	Fleshy rt	1000 kg	Rs. 10/ kg	Jan-Dec	VC
Azadirachta indica A. Juss.	Meliaceae	Neem	Med	Lf, sd	NK	Lf : 20p/ pkt Sd : Rs. 2/kg	Lf= Apr-Dec Sd= Jun	Rare
Baccaurea sapida Muel.-Arg.	Euphorbiaceae	Latka	Ed	Frt	NK	Rs. 2/kg		C

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1	2	3	4	5	6	7	8	9
Bamboo (spp. of *Bambusa* and *Dendrocalamus)*	Gramineae	Bans	Decor, Constr, Med	St, lf, infl	10,000	Rs. 5/pc	Jan-Dec	Ab
Bauhinia purpurea L.	Caesalpiniaceae	Devakanchan	Decor, Fod, Med	Lf, fl, brk, rt	50,000 pcs (fresh leaves)	Rs.10/ 1000 pcs	Jan-Dec (Fl : Mar-Apr)	VC
Bauhinia scandens L.	Caesalpiniaceae	Naglata	- do -	Old stem,	3,00,000 (old twisted stem)	Rs.40/ 100 pcs	Jan-Dec	LC
Bauhinia vahlii Wt. et Arn.	Caesalpiniaceae	Ghumpatta	Decor & plate making	Lf	2,00,000 pcs	Rs.12/ 1000 pcs	Apr-Nov	VC
Bauhinia variegata L.	Caesalpiniaceae	Raktokanchan	Med	Fl, brk, rt	NK	Fl : Rs. 4/kg	Jan-Dec	C
Boerhavia coccinea	Nyctaginaceae	Punarnava	Med	Sht	NK	NK	Jan-Dec	C
Bombax ceiba L.	Bombacaceae	Simul	Decor, floss, Med	Frt, rt	10-12,000 pcs Frt or 8-10 MT floss	Rs. 10/ 100 pcs or Rs.25-30/kg)	May-Jun (Rt : Jan-Dec)	Ab
Bridelia retusa (L.) Sprengl	Euphorbiaceae	Gayo	Fod	Lf	NK	NK	May-Nov	C
Butea monosperma (Lam.) O. Kuntze	Papilionaceae	Palash	Med	Sd, lf, fl	NK	Sd : Rs. 5/ 100 pcs Fl : Rs. 4/ 100 pcs	Lf= Apr-Dec Fl= Feb-Mar Sd= May-Jun	LC
Calamus rotang L.	Palmae	Bet	Decor, Fod	Lf. frt	Dry frt 10-12 qtl lf 10-15q	Rs.5/kg green Rs.3/kg dry	Jan-Dec (Frt= Oct -Nov)	C
Calotropis gigantea (L.) Dryander	Asclepiadaceae	Akanda	Med	Rt-brk, fl, latex	NK	Rt : Rs. 2/kg	Jan-Dec	C

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1	2	3	4	5	6	7	8	9
Canscora decussata Roem. *et* Schult.	Gentianaceae	Dankuni	Med	WPl	NK	NK	Oct-Feb	Ab
Careya arborea Roxb.	Lecythidaceae	Kumbhi	Med	Frt, fl, brk, lf	3,00,000 frts	Rs. 0.50/ frt	Brk & Lf= Jan-Dec Fl= May Frt=Jul-Aug	C
Cassia fistula L.	Caesalpiniaceae	Bandarlathi	Med, decor	Frt, fl, rt, brk	4,00,000 frts	Frt : Rs. 10/ 100 frts Rt : Rs. 2/kg	Rt=Jan-Dec Fl=May-Jul Frt=Oct-Jan	Ab
Cassia sophera L.	Caesalpiniaceae	Chhoto-kalkasunda	Med	Rt, sd	NK	Rt : Rs. 5/kg Sd : Rs. 8/kg	Jan-Dec	Ab
Cassia tora L.	Caesalpiniaceae	Chakunda	Med	Lf, sd	NK	Sd : Rs. 8/kg	Jul-Dec	Ab
Centella asiatica (L.) Urb.	Umbelliferae	Thankuni	Med	Lf	NK	Rs. 0.10/ bunch (± 25g)	Jan-Dec	Ab
Chukrasia tabularis Juss.	Meliaceae	Chikrashi	Decor	Dehisced & young frt	1,00,000 pcs	Rs.30/ 1000 pcs	Jun-Jan	C
Cinnamomum tamala (Ham.) Nees & Eberm.	Lauraceae	Tejpata	Spice, Med	Lf, brk	4000 sacs	Lf: Rs. 15/sac	Jan-Dec	LC
Cissus quadrangularis L.	Vitaceae	Harjora	Med	WPl	NK	Rs. 3/kg	Jan-Dec	C
Cissus reparida Vahl	Vitaceae	Panilahara	Fod	Twig	NK	NK	Jan-Dec	LC
Cleome gynandra L.	Capparaceae	Sada hurhure	Med	WPl	10,000 plants	Rs. 2/ bunch of 20 plants	Jul-Nov	LC
Cleome viscosa L.	Capparaceae	Halde-hurhure	Med	WPl	NK	NK	Jul-Feb	Ab

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1	2	3	4	5	6	7	8	9
Clerodendrum viscosum Vent.	Verbenaceae	Bhat, Ghentu	Brewing, Med	Lf, fl, rt	NK	NK	Jan-Dec (Fl=Mar-Apr)	Ab
Clitoria ternatea L.	Papilionaceae	Aparajita	Med	Rt, sd	NK	NK	Jan-Dec	C
Coccinia grandis (L.) Voigt	Cucurbitaceae	Telakucha	Med	Lf, frt	2,000 kg	Re. 1/kg	Jan-Dec	C
Colocasia esculenta (L.) Schott	Araceae	Ban-kachu	Ed	Rhz	25,000 kg	Rs. 2/kg	Jun-Nov	Ab
Costus speciosus (J. Koenig) Smith	Zingiberaceae	Bellauri	Med	Rhz	10,000 kg	Rs. 8/kg	Oct-Feb	Ab
Cynodon dactylon (L.) Pers.	Gramineae	Durba, Dubba	Med	Sht	NK	NK	Jan-Dec	Ab
Cyperus rotundus L.	Cyperaceae	Mutha	Med	Rhz	1,000 kg	Rs. 15/kg	May-Jan	Ab
Datura metel L.	Solanaceae	Dhutra	Worship, Med	Lf, fl, sd	NK	Sd : Rs. 18/kg	Jan-Dec	Ab
Delonix regia (Hook.) Raf.	Caesalpiniaceae	Gulmohar	Decor	Pods	3,00,000	Rs. 0.50/ frt	Dec-Feb	LC, planted
Dendrocnide sinuata (Blume) Chew	Urticaceae	Chotra	Eaten by Totos	Young sht	NK	Brk : Rs. 0.20/ bunch	Apr-Oct	C
Desmodium gangeticum (L.) DC.	Papilionaceae	Salpani	Med	WPl	NK	Rs. 2/ 10 plants	Sep-Dec	Ab
Dillenia indica L.	Dilleniaceae	Chalta	Ed, Med	Frt, lf, brk	2,00,000 pcs lf; 50,000 pcs frt	Rs. 10/ 1000 pcs Rs. 50/ 100 frts	Jan-Feb	C
Dillenia pentagyna Roxb.	Dilleniaceae	Tantari	Decor, Fod	Lf	3,00,000 pcs	Rs.10/ 1000 pcs	Sep-Nov	Ab
Dioscorea pentaphylla L. & *Dioscorea belophylla* Voigt *ex* Haines	Dioscoreaceae	Bhegur & Ghita torul	Ed, Med	Rhz	2,00,000 pcs lf; 50,000 pcs frt	Rs. 10/ 1000 pcs lf; Rs. 50/ 100 pcs frt	Jun-Jan	Ab

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1	2	3	4	5	6	7	8	9
Drymaria villosa Cham. & Schlecht	Caryophyllaceae	Abijalo	Med	Lf	NK	NK	Dec-Feb	Ab
Diplazium esculentum (Retz.) Sw.	Athyriaceae	Dhenki saag	Ed	Young fronds	5,00,000 bundles of 300g each	Rs.0.50/ bundle	Apr-Oct	Ab
Elaeocarpus sphaericus (Gaertn.) Schum.	Elaeocarpaceae	Rudraksha	Rel, Decor, Med	Frt, sd	NK	Rs. 25/ 100 pcs	May-Jul	Rare
Entada rheedii Sprengel	Mimosaceae	Gila, Pangra	Decor	Pods, sd, brk.	Pod: 20,000 pcs Sd: 10,000 pcs	Rs. 20/ 100 pcs Rs.10/ 100 pcs	Apr-May	VC
Erythrina stricta Roxb. (Gaertn.) Schum.	Papilionaceae	Mandar, Madar	Med	Brk, lf	NK	NK	Jan-Dec (Frt=Mar-Apr)	Ab
Euphorbia hirta L.	Euphorbiaceae	Bara Kerui	Med	WPl	NK	NK	Jan-Dec	Ab
Euphorbia heyneana Sprengel	Euphorbiaceae	Chhoto Kerui	Med	WPl	NK	NK	Jan-Dec	Ab
Euphorbia thymifolia L.	Euphorbiaceae	Swet Kerui	Med	WPl	NK	Rs. 0.50/ bunch of 10 plants	Jan-Dec	LC
Evoluulus alsinoides (L.) L.	Convolvulaceae	Vishnugandhi	Med	WPl	NK	NK	Jan-Dec	LC
Ficus semecordata J.E. Smith	Moraceae	Jogdumur	Med	Frt, brk, rt	NK	Frt : Rs. 3/kg Brk : Rs. 2/kg	Jan-Dec	C
Ficus racemosa L.	Moraceae	Dumur	Ed, Fod	Frt, lf	NK	Frt : Rs. 3/kg	May-Nov	C
Ficus hispida L.f.	Moraceae	Kakdumur	Med	Sd, brk	NK	NK	Jan-Dec	Ab
Ficus racemosa L.f.	Moraceae	Dumur	Ed, Fod	Frt, lf	NK	NK	May-Dec	VC
Ficus religiosa L.	Moraceae	Peepal	Decor, Fod	Lf	5,00,000 pcs	Rs.2/ 1000 pcs	May-Nov	Ab

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1	2	3	4	5	6	7	8	9
Ficus virens Ait.	Moraceae	Pakur	Med, Fod	Lf, brk	NK	NK	May-Nov	C
Gmelina arborea Roxb.	Verbenaceae	Gamari	Med, Fod	Lf, rt, frt	2,00,000	Rs. 4/ 100 frt	May-Oct	C; planted
Heliotropium indicum L.	Boraginaceae	Hatisund	Med	Rt	3,00,000	Rs. 2/ 20 plants	Jan-Dec	C
Hemidesmus indicus (L.) Schultes	Asclepiadaceae	Anantamul	Med	Rt	500 kg	Rs. 5/kg	Jan-Dec	LC
Holarrhena pubescens (Buch-Ham.) G. Don	Apocynaceae	Kurchi	Med	Brk, lf	NK	Brk : Rs. 1.50/kg	Jan-Dec	Ab
Justicia adhatoda L.	Acanthaceae	Vasak	Med	Lf, rt	NK	Lf : Rs. 2/kg	Jan-Dec	C
Lagerstroemia	Lythraceae	Jarul	Med, decor	Sht, fl, frt	4,00,000 frts	Frt : Rs. 80/ 1000 pcs	May-Feb	C
Lantana camara L.	Verbenaceae	Ban-tulshi	Med	Sht	NK	NK	Jan-Dec	Ab
Leucas indica (L.) Vatke	Labiatae	Danda-kalash	Med	WPl	10,00,000 plants	Rs. 0.20/ bunch of 10 plants	Jan-Dec	Ab
Litsea monopetala (Roxb.) Pers.	Lauraceae	Kutmero, Barakukur-chiti	Med, Fod	Twg, brk, rt	NK	Brk : Rs. 0.50/ kg	Jan-Dec	VC
Luffa aegyptiaca Mill.	Cucurbitaceae	Dhundhul	Decor, bath-sponge	Frt	2,00,000 pcs	Rs.50/ 1000 pcs	Jan-Feb	VC
Lycopodium cernuum L.	Lycopodiaceae	Lycopodium	Decor	Branched sht	5-6 qtls	Rs.5/ kg	Jan-Dec	Rare
Mallotus repandus (Willd.) Muel.	Euphorbiaceae	Sindure	Med	Sht, fl, frt	NK	NK	Mar-Apr	C
Mangifera indica L.	Anacardiaceae	Aam	Ed, Fod	Frt, lf	5,000 kg	Frt : Re. 1/kg Lf : Rs. 0.50/ bunch	May-Jul	C

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1	2	3	4	5	6	7	8	9
Melastoma malabathricum L.	Melastomataceae	Dantrangi	Med	Fl	NK	NK	Jan-Dec	VC
Michelia champaca L.	Magnoliaceae	Champ	Decor, Med	Lf, fl, sd	2,00,000 pcs lf	Lf Rs.2/ 1000 pcs	May-Dec	C
Mimosa pudica L.	Mimosaceae	Lajjabati	Med	Lf, rt	NK	Rt : Rs. 1.50/kg	Jun-Jan	Ab
Mucuna pruriens (L.) DC.	Papilionaceae	Alkusi	Med	Frt, sd, rt	1,000 kg	Frt : Rs. 0.80/kg	Oct-Dec	LC
Murraya koenigii (L.) Sprengel	Rutaceae	Karipata	Ed, Med	Lf	5,00,000	Rs. 0.10/ bunch	Apr-Dec	C
Oroxylum indicum (L.) Vent.	Bignoniaceae	Totola	Decor	Frt, sd	1,25,000 pcs frt	Re.1/ frt	Nov-Feb	Ab
Oxalis corniculata L.	Oxalidaceae	Amruli	Med	Lf	NK	NK	Jan-Dec	Ab
Pergularia daemia (Forssk.) Chiov.	Asclepiadaceae	Chhagalbati	Med	WPl, rt-brk	NK	WPl : Rs. 0.50/ bunch	Aug-Feb	LC
Phyla nodiflora (L.) Greene	Verbenaceae	Bhuiokra	Med	WPl	NK	NK	Jan-Dec	LC
Phyllanthus emblica L.	Euphorbiaceae	Amlaki	Ed, Med	Frt	10 MT	Rs. 2/kg	Aug-Feb	VC
Piper pedicellatum C. DC.	Piperaceae	Pipli	Chewing	Lf	NK	NK	Jun-Jan	LC
Plumbago zeylanica L.	Plumbaginaceae	Chita	Med	Rt, st-brk	NK	Rt : Rs. 0.80/kg	Jan-Dec	LC
Premna obtusifolia R. Br.	Verbenaceae	Gineri	Med	Lf, rt-brk	NK	NK	Oct-Jan	C
Pterospermum acerifolium (L.) Willd.	Sterculiaceae	Parari	Fod	Twig	NK	NK	May-Dec	LC
Pterygota alata (Roxb.) R.Br.	Sterculiaceae	Narkeli (Buddha Narkel)	Decor	Frt, lf	5,00,000	Frt : Rs. 40/ 100 pcs	Jan-Mar	LC; planted

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1	2	3	4	5	6	7	8	9
Pterospermum acerifolium Willd.	Sterculiaceae	Hatipaile	Decor	Lf	50,00,000	Frt : Rs. 20/ 1000 pcs	Oct-Nov	LC
Rauvolfia serpentina (L.) Kurz.	Apocynaceae	Sarpagandha	Med	Rt, lf	20 qtls	Rs. 5/kg	Oct-May	LC
Sapindus rarak DC.	Sapindaceae	Ritha	Detergent	Frt	10 qtl.	Rs. 3/kg	Oct-Dec	LC
Schima wallichii (DC.) Korth.	Theaceae	Chilaune, Mukrisal	Med	St-brk	NK	NK	Jan-Dec	C
Scoparia dulcis L.	Scrophulariaceae	Petberela	Med	Lf	2,00,000	Rs. 2/ 100 leaves	Jan-Dec	Ab
Shorea robusta Gaertn.f.	Dipterocarpaceae	Sal	Leaf-plate, incense, Ed	Lf, resin, sd	Lf : 60,00,000 Resin : 1000 kg	Lf : Rs. 5/ 1000 pcs Rs.10/kg	Lf:Apr-Oct Resin : Oct-May	VC
Sida cordifolia Wight & Arnott	Malvaceae	Berela	Med	WPl	5,00,000	Rs. 2/ 10 plants	Jan-Dec	Ab
Sida rhombifolia L. & *S. acuta* L.	Malvaceae	Berela	Med	WPl	10,00,000	Rs. 2/ 10 plants	Jan-Dec	Ab
Solanum anguivi Lamk.	Solanaceae	Rambegun	Med	Frt, sd, rt	NK	NK	Oct-Feb	Ab
Solanum nigrum L.	Solanaceae	Kakmachi	Med	Fl, frt, sht	NK	NK	Jan-Dec	Ab
Solanum torvum Sw.	Solanaceae	Gothbegun	Med	Fl, frt, rt, lf	NK	NK	Aug-Oct	C
Sterculia foetida L.	Sterculiaceae	Bakso badam	Ed, Med	Sd	10,000	Rs. 10/ 100 seeds	Jan-Feb	LC
Sterculia villosa Smith	Sterculiaceae	Olal/ Odal	Decor	Dehisced pericarp	25-30 truckloads	Rs. 300/ 1000 pcs	Feb-Mar	VC
Swietenia macrophylla King *Swietenia mohaginy* (L.) Jacq.	Meliaceae	Mehagini	Decor	Frt axis	50,000 pcs	Rs.300/ 1000 pcs	Apr-Jun	LC

Contd...

1	2	3	4	5	6	7	8	9
Syzygium cumini (L.) Skeels	Myrtaceae	Jam	Ed, Med, Fod	Frt, sd, lf, brk	NK	Sd: Rs. 2/kg Brk : Re. 1/kg	Sd:Jul-Aug Brk:Jan-Dec	C
Terminalia arjuna (Roxb. ex DC.) Wt. et Arn.	Combretaceae	Arjun	Med	Brk	2,00,000	Rs. 2/kg	Jan-Dec	C
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Bahera	Med	Frt	2,00,000	Rs. 350/ 1000 pcs	Dec-Feb	C
Terminalia alata Roth.	Combretaceae	Panisaj	Decor	Frt	15,000	Rs. 200/ 1000 pcs	May-Jul	VC
Thysanolena latifolia (Roxb. ex Hornem.) Honda	Gramineae	Jharu	Decor, broom	Infl	150 qtls	Rs.800/ qtl	Oct-Jan	Ab
Tinospora cordifolia (Willd.) Hook. f. & Thom.	Menispermaceae	Gulancha	Med	St, lf	28 qtls	Rs. 2/kg	Jan-Dec	C
Tithonia diversifolia (Hemsl.) A. Grey	Compositae	Daisy, Sunflower	Decor	Fruiting capitula	2 MT	Rs. 200/ 1000 pcs	Dec-Feb	Ab
Toona ciliata Roem.	Meliaceae	Toon	Med, Decor	Lf, frt	2,00,000	Rs. 150/ 1000 pcs	Frt: Oct-Dec	C
Trema orientalis (L.) Blume	Ulmaceae	Kuail	Fod	Lf	NK	NK	Jan-Dec	VC
Typha elephantine Roxb.	Typhaceae	Hogla	Thatch, Decor	Lf, infl	Infl : 20,000 pcs	Infl : Rs. 200/ 1000 pcs	Infl : Oct-Feb	LC
Vitex negundo L.	Verbenaceae	Nisinda	Med	WPl	1 MT	NK	Jan-Dec	VC
Woodfordia fruticosa (L.) Kurz.	Lythraceae	Dhaiphul	Med	Fl, lf	NK	NK	Fl:Nov-May	VC
Wrightia arborea (Dennst.) Mabberley	Apocynaceae	Dudhkarabi	Med	Sd, brk, lf	NK	NK	Brk & Lf: Jan-Dec	VC
Ziziphus mauritiana Lam.	Rhamnaceae	Kul	Ed, Med, Fod	Frt, lf	50 qtls	Frt : Rs. 2/kg	Frt : Jan-Mar	VC

Abbreviations used : Ab = abundant, Apr = April, Aug = August, brk = bark, C = common, Dec = December, Decor = Decorative, Ed = edible, Feb = February, Fod = Fodder, frt = fruit, Jan = January, LC = less common, Infl = Inflorescence, lf = leaf, Mar = March, Med = Medicinal, NK = not known, Nov = November, Oct = October, pcs = pieces, rep = repellant, rhz = rhizome, rt = root, sd = seed, sht = shoot, Spt = September, st = stem, VC = very common, WPl = whole plant.

the present work grassland productivity has not been considered. Only four species from Gramineae has been included in the present work. Even with such consideration, as much as 116 dicotyledonous, 14 monocotyledonous and two pteridophytic (total: 132) species has been recorded during the present work which are collected and marketed and/or regularly used by local residents. The taxonomic distribution of these plants has been shown in Table 2.

Table 2

Taxonomic distribution of NTFP producing plants from Jaldapara Wildlife Sanctuary.

Taxa	Numerical representation		
	Families	Genera	Species
Pteridophytes	2	2	2
Dicotyledons	51	93	116
Monocotyledons	8	13	14
Total	61	108	132

Considering the habit classes, there are 61 trees, 15 shrubs, 16 climbers, three liana, 15 perennial herbs and 22 annuals among the recorded plants. Such type of distribution is good as this indicate that plants representing almost all strata in the vegetation are the suppliers of NTFPs in JWLS.

Diversity of NTFPs : An wide array of NTFPs are regularly collected from the vegetation of this sanctuary, which include:

(i) medicinal plants – 91 spp.
(ii) decorative articles – 30 spp.
(iii) fodder plants – 24 spp.
(iv) edible plants – 22 spp.
(v) thatching – 03 spp.
(vi) religious articles – 03 spp.
(vii) leaves for plate making – 02 spp.
(viii) masticators – 02 spp.
(ix) construction materials – 02 spp.
(x) broom – 02 spp.
(xi) brewing additive – 01 sp.
(xi) floss – 01 sp.
(xii) bath sponge – 01 sp.
(xiii) detergent – 01 sp.
(xiv) snake repellent and – 01 sp.
(xv) spice – 01 sp.

However, the greater proportion of these plants is with more than one type of uses. Plants like bamboos, *Bombax ceiba, Luffa aegyptiaca, Shorea robusta, Ziziphus mauritiana*, etc., are plants of multiple uses. Escaping *Shorea robusta* from logging can no longer be considered as loss as only the leaves of this species can be used in cottage industry for months together for making biodegradable plates of different shapes and sizes. In addition, the sal-resin is also of high commercial value. If the fruits of this species are collected properly that can be used for producing very high quality edible fat.

In this way, there are numerous other plants (e.g. *Ficus recemosa, F. religiosa, Michelia champaca* etc.) leaves of those are collected regularly as very good fodder and also for extracting veins which are used widely in producing decorative articles. Even the dehisced pericarp of some capsular fruits is collected regularly for export market.

Bark, dry inflorescence, seed, rhizome, root, latex, gum, leafy shoots etc., of numerous plants are collected regularly and many of these are reaching well-established industries or to the export market.

The Market : The market for NTFP is quite fluid or unstable not only in this region but in the entire country. West Bengal Forest Department is having a small price list which is quite insufficient to deal the present situation. On the other hand, local collectors hand over the materials to the middlemen at a very low price. Again, for most of the materials there are no fixed price and are sold against a bargained price for the entire bulk of the collection. However, the prices of numerous NTFPs are still unknown. During present survey it was not possible to determine the reliable prices of at least 33 materials.

Out of all the recorded plants only 22 species are having more or less established market in the country. These plants include *Acacia catechu* (gum), *Aegle marmelos* (fruit & leaf), *Alstonia scholaris* (bark), *Artocarpus heterophyllus* (fruit), *Asparagus racemosus* (root), *Azadirachta indica* (seed), Bamboos (culm), *Bombax ceiba* (floss), *Calamus rotang* (stem), *Cinnamomum tamala* (leaf), *Dillenia indica* (fruit), *Diplazium esculentum* (tender leaf), *Mangifera indica* (fruit), *Murraya koenigii* (leaf), *Phyllanthus embelica* (fruit), *Rauvolfia serpentine* (root), *Sapindus rarak* (fruit), *Shorea robusta* (leaf & resin), *Terminalia arjuna* (bark), *T. bellirica* (fruit, bark), *Thysanolena latifolia* (inflorescence) and *Ziziphus mauritiana* (fruit). But, majority of the others are collected and supplied against demand only.

However, looking at the market and to the uses of different recorded plants, 27 materials/ plants have been selected for which proper marketing policy need to be developed. These are *Abroma augusta* (root), *Achyranthes aspera* (whole plant), *Bauhinia scandens* (stem), *B. vahlii* (leaf), *Boehravia diffusa* (whole plant), *Calotropis gigantea* (root), *Cassia fistula* (fruit), *Centella asiatica* (leaf), *Costus speciosus* (rhizome), *Cyperus rotundus* (rhizome), *Ficus racemosa* (leaf), *F. religiosa* (leaf), *F. semicordata* (bark & fruit), *Hemidesmus indicus* (root), *Holarrhena pubescens* (bark), *Justicia adhatoda* (whole plant), *Luffa aegyptiaca* (fibrous mesocarp), *Michelia champaca* (leaf), *Mucuna pruriens* (seeds), *Oroxylum indicum* (fruit), *Plumbago zeylanica* (whole plant), *Pterygota alata* (fruit), *Scoparia dulcis* (leaf), *Sida cordifolia* (whole plant), *Syzygium cumini* (seed), *Tinospora cordifolia* (stem) and *Vitex negundo* (leaf).

The availability and/or the demand of other selected plants are needed to be assessed and, accordingly, marketing strategy should be formulated

Management of NTFP Collection : At this moment there is no proper control over the collection of NTFPs at least in this part of the country. It is now essential to :

(i) establish proper standard for collected materials,
(ii) strategies for issuing permits,
(iii) strategies to check over-exploitation,
(iv) defining proper gestation periods for different materials, and
(v) establishing properly regulated market for gathering (from collectors) to export.

Establishment of Cottage Industries : A good proportion of these NTFPs are exported to different countries including USA without any modification. To avoid such type of marketing cottage industries needed to be developed for the manufacture and/or modification of many of these materials so that the final products can be

exported. These products are expected to have very good domestic urban markets also.

Conclusion

Jaldapara Wildlife Sanctuary is a small area, but there are wide forested areas specially in Tarai, Duars and hills of Darjeeling. The present status of knowledge about the availability and proper utilisation of these materials is quite poor. Recognition, quantification and market surveys are pre-requisites for the proper utilisation of this vast amount of natural wealth. It is now essential to take necessary decisions at proper level and to formulate appreciable strategies for sustainable exploitation of NTFPs of North Bengal.

SUMMARY

Jaldapara Wildlife Sanctuary has been surveyed for the availability of type and amount of Non-timber Forest Produces. A total of 132 species has been recognised as NTFP producers which include plants of different habit groups, occupying different strata and types of vegetation. While the existence of an established market for only 22 of these articles are there a list of another 27 articles have been provided for which proper markets need to be developed immediately. Prices for at least 33 articles could not be ascertained. Stress has provided for the proper survey of NTFPs in North Bengal vegetations and to develop strategies for their proper sustainable extraction and utilisation.

जल्दापाड़ा वन्यप्राणि अभयारण्य की प्रकाष्ठेतर वनोपज – एक अनुमान

पी०के० पण्डित, चन्द्र घोष व ए०पी० दास

सारांश

जल्दापाड़ा वन्यप्राणि अभयारण्य का सर्वेक्षण उसमें मिलने वाली प्रकाष्ठेतर वनोपजों के प्रकार और उनकी मात्राएं जानने के लिए किया गया है । कुल मिलाकर 132 जातियां प्रकाष्ठेतर वनोपज उत्पादकों के रूप में पहचानी गई है जिनमें विभिन्न प्रवृतियों वाले, विभिन्न स्तरों वाली वनस्पतियों और विभिन्न प्रकारों के पेड़ पौधे सम्मिलित हैं । हांलाकि इनमें से 22 जातियों की वस्तुओं का ही सुस्थापित बाजार इस मसय है, 27 वस्तुओं की और एक सूची दी गई है जिनके लिए तत्काल एक उचित बाजार विकसित करने की आवश्यकता है । कम से कम 33 वस्तुओं की कीमतें नही जानी जा सकी । इस बात पर जोर दिया गया है कि उत्तरी बंगाल की प्रकाष्ठेतर वनोपजों का समुचित सर्वेक्षण तथा उनको दीर्घकाल तक निरन्तर निकालते और उपयोग करते रहने के लिए उपयुक्त समरनीतियां विकसित की जानी चाहिए ।

References

Agarwal, A. (1992). The Price of Forests. *Proc. Seminar on the economics of the Sustainable use of Forest Resources*. Centre for Science and Environment, New Delhi.

Anderson, A.B. (1990). Extraction and Forest Management by Rural inhabitants in the Amazon Estuary. *Alternative to Deforestation: steps towards sustainable use of the Amazon rain forest* (Anderson, A.B., ed.). Columbia University Press, New York. pp.65-85.

Anon. (1990). The major significance of minor forest products. *The local use and value of forests in the West African human forest zone* (Koppell, ed.). FAO, Rome. p. 232.

Anon. (1997). *Management Plan of Jaldapara Wildlife Sanctuary, West Bengal.* Wildlife Circle, Department of Forests, Govt. of West Bengal.

Banerjee, L.K. (1993). *Plant Resources of Jaldapara Rhino Sanctuary*. Botanical Survey of India, Calcutta.

Blay, Dominic, Jr, (1996). The use and management of Non-Timber Forest Products in Ghana. *Management of Minor Forest Produce for Sustainability* (Shira and Mathur, eds.) Oxford & IBH, New Delhi, pp. 224-228.

Chakravarthi, R. (1990). Tribal and Minor Forest Produce, Some Policy Issues. *J. Trop. For.*, **6**(4).

Champion, H.G and S.K. Seth (1968). *A revised survey of the forest types of India*. Manager of Publications, GoI, Delhi.

Chandrashekharan, C. (1996). Non-wood Forest Products – a global view of potential and challenges. *Management of Minor Forest Produce for Sustainability* (Shira and Mathur, eds.). Oxford & IBH, New Delhi. pp. 3-13.

Das, A.P., C. Chosh and D. Bhowmick (2003). *Project Report on Estimation of Palatable Biomass in Jaldapara Wildlife Sanctuary with Special Reference to Rhinoceros unicornis* L. Department of Botany, University of North Bengal, India.

FAO (1990). The major significance of Minor Forest Products: The local use and value of forests in the West African Humid Forest Zone Community. *Forestry Notes* 6. FAO, Rome.

FAO (1993). Development of Non-wood Forest Products in Latin America and the Carribbean. Secretariate note at the *18th session of Latin America and the Carribbean Forestry Commission*, Maldonado, Uruguay, 6-10 December.

Goday, Ricardo and K.S. Bawa (1993). The economic value and sustainable harvest of plants and animals from the tropical rain forest: Assumptions, hypothesis and methods. *Economic Botany,* **47**: 215-219.

Pandit, P.K. (1996). *Management Plan of Jaldapara Wildlife Sanctuary* (Vols. I – III). Wildlife Circle, Department of Forests, Govt. of West Bengal.

Peter, Charles, Alwyn Gentry and Robert O. Mendelsohn (1989). Valuation of an Amazonian Rain Forest. *Nature,* **339**: 655-656.

WII (1997). West Bengal World Bank Aides Forestry Project: Study on the Management of Rhinoceros (*Final Report*). Wildlife Institute of India, Dehra Dun.